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Being And The Good: Natural Teleology In Early Modern German Philosophy

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Abstract
This dissertation examines the problem of teleology in early modern German philosophy. The problem, briefly, is to account for the proper sources and conditions of the use of teleological concepts such as design, purpose, function, or end in explaining nature. In its modern guise, the status of these concepts becomes problematic with the rise of modern science in the seventeenth century, which reconceived the physical world as fundamentally inert and purposeless and rejected the medieval view of the world as governed by goal-directed powers. This disssertation argues that the reception of the new science in Germany was deeply conditioned by the metaphysics of late-medieval scholasticism. It situates the better known thinkers of the German Enlightenment, such as Gottfried Leibniz, Christian Wolff, and Immanuel Kant, in relation to the later medieval tradition, originating with sixteenth- and seventeenth-century authors such as Francisco Suárez, Christoph Scheibler, and Johann Clauberg. I show that Leibniz, Wolff, and Kant inherit from neo-scholasticism two classical assumptions bearing on teleology: first, a version of the classical thesis of the equation of being and the good (ens et bonum convertuntur), or that every being manifests goodness or desirability in some measure; and second, a tight conceptual dependence of final causation on rational cognition such that any appeal to purposes or ends in explanation entails an appeal to rationality. Leibniz's, Wolff's, and Kant's acceptance of these positions underlies their shared commitment to view not only goal-directed animal behavior but also any contingent unity of laws (such as the unification of Newtonian laws of motion through the law of universal gravitation) as presupposing a rational connection. Teleological unity, or a unity of purpose, appears in this tradition as an evident natural fact in need of explanation at the cosmological, biological, and psychological levels. At the same time, Kant departs from his predecessors in crucial respects. For Kant, the conditions for legitimately judging nature as if it were purposively constructed are borrowed not from a divine guarantee of order but from the essence of human reason itself, when, in his terms, reason is properly described as a goal-directed natural power. The problem of teleology, with Kant, becomes reconfigured as essentially concerned with the ends of human reason.

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BEING AND THE GOOD: NATURAL TELEOLOGY IN EARLY MODERN GERMAN PHILOSOPHY

Nabeel Hamid

To my parents

نہ تھا کچھ تو خدا تھا، کچھ نہ ہوتا تو خدا ہوتا

غالب

Bis hierher ist das Bewusstsein gekommen.

Hegel

"She tells so many different stories and they are all false."

Iris Murdoch

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ABSTRACT

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This dissertation examines the problem of teleology in early modern German philosophy. The problem, briefly, is to account for the proper sources and conditions of the use of teleological concepts such as design, purpose, function, or end in explaining nature. In its modern guise, the status of these concepts becomes problematic with the rise of modern science in the seventeenth century, which reconceived the physical world as fundamentally inert and purposeless and rejected the medieval view of the world as governed by goal-directed powers. This disssertation argues that the reception of the new science in Germany was deeply conditioned by the metaphysics of late-medieval scholasticism. It situates the better known thinkers of the German Enlightenment, such as Gottfried Leibniz, Christian Wolff, and Immanuel Kant, in relation to the later medieval tradition, originating with sixteenth- and seventeenth-century authors such as Francisco Suárez, Christoph Scheibler, and Johann Clauberg. I show that Leibniz, Wolff, and Kant inherit from neo-scholasticism two classical assumptions bearing on teleology: first, a version of the classical thesis of the equation of being and the good (*ens et bonum convertuntur*), or that every being manifests goodness or desirability in some measure; and second, a tight conceptual dependence of final causation on rational cognition such

that any appeal to purposes or ends in explanation entails an appeal to rationality. Leibniz's, Wolff's, and Kant's acceptance of these positions underlies their shared commitment to view not only goal-directed animal behavior but also any contingent unity of laws (such as the unification of Newtonian laws of motion through the law of universal gravitation) as presupposing a rational connection. Teleological unity, or a unity of purpose, appears in this tradition as an evident natural fact in need of explanation at the cosmological, biological, and psychological levels. At the same time, Kant departs from his predecessors in crucial respects. For Kant, the conditions for legitimately judging nature as if it were purposively constructed are borrowed not from a divine guarantee of order but from the essence of human reason itself, when, in his terms, reason is properly described as a goal-directed natural power. The problem of teleology, with Kant, becomes reconfigured as essentially concerned with the ends of human reason.

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CHAPTER 1: Purposes of Nature, Purposes of Mind

1. Introduction

The vet casually explains to pet-owners that cats' claws are built for hunting; the gardener worries if her petunias want fresh compost. At least some people, some of the time, have no misgivings in ascribing functions and purposes to things. We sometimes find it acceptable to think of cats and petunias as being designed or as having needs or wants. At least, we think it acceptable to speak in such ways. But does ordinary talk of designs and needs track real features of felines and flowers? Or is such language simply metaphorical whenever it is used to describe the non-human world? The question of how we should think about such concepts in describing nature is, broadly, the problem of natural teleology, a doctrine (*logos*) of the ends (*tele*) of natural things. Assuming that human beings are part of nature, we fall within the scope of the problem alongside our pets and potted plants.

The question of attributing functions and purposes to plants, animals, and their parts is distinct from the question of making such attributions to artifacts. It seems uncontroversial that bread knives are designed to slice bread elegantly; that they might find use in other tasks around the house is irrelevant to the fact that they were conceived, formed, and sold for the sake of their bread-slicing function. Most conscious, deliberate human activity is unobjectionably characterized in terms of goals and aims, whether moral, instrumental, or hedonic. Human beings sometimes give to charity for the sake of ethical principles, buy transit passes to ease their daily commutes, and go hiking for the sake of pleasure. It is more controversial whether petunias want compost for their own sakes, or if having claws is good for cats. Petunias and cats, one might object, lack categorical desires, an interest in their own flourishing, or the awareness of one's future self that seems to justify speaking of human actions as purpose-driven. Their characteristic behaviors might just be understood as a consequence of how they happen to be formed, rather than as being for the sake of their own good. What's problematic here is whether appeal to functions, purposes, ends, or goals is permissible in explaining non-human nature and, if so, under what conditions and limitations, if any. It is the central question of this work. The remainder of the introduction sketches the shared conceptual terrain, the narrative arc, and the scope and aims of subsequent chapters.

2. The conceptual situation

The problem of natural teleology has both a metaphysical and an epistemological dimension. It concerns what nature itself is like. But it also deals with what kinds of conceptual resources human investigators of nature are and are not permitted to employ. Indeed, among the distinctive features of modern sciences of nature is an increased separation of issues of methodology from those of metaphysics, and of a conception of science as research process as distinct from science as finished product. The question of what categories and rules we ought to use in studying nature has been allowed, in the modern age, to come apart from the question of what nature itself must be like. This work studies, through the lens of early modern German philosophy, the movement of thought by which this shift emerges. It argues that, in the period roughly between Leibniz and Kant, teleological ways of conceiving the natural world became epistemologized: classical precepts attributing agency or purpose to nature—such as that 'nature does nothing in vain'—came to be interpreted as conditions on how human inquirers have to approach nature. Appeal to categories of function or purpose were legitimate insofar as nature were being regarded under the particular limitations of human subjectivity. At the same time, such categories came to be seen as problematic when used for making claims about nature itself, as an object considered independently of the standpoint of human knowers.

It would be too quick to regard the gap between method and metaphysics as a bright line between the knowing subject and a radically distinct object called 'nature,' much less a line readily accepted by the characters in the period of our study. Indeed, a reluctance to separate sharply the domains of thought and being, of subject and object, of the mental and the physical, is a recurring theme of the early modern German tradition. An anxiety about reality being fundamentally fractured, a possibility made available as a systematic philosophical option by Descartes, lies at the heart of the entire period from the renovation of Protestant metaphysics in the late-sixteenth century to the rise of German Idealism in the late eighteenth. While, to the modern subject, there might be "nothing quite so intuitively plausible as the… distinction between body and mind,"[1] a categorical fissure between the mental and the physical is, to our early modern authors, nothing if not philosophically troubling. For G.W. Leibniz, Christian Wolff, and

[1] Peter McLaughlin, *What Functions Explain* (Cambridge: Cambridge University Press, 2001), 11.

Immanuel Kant, the possibility that human subjects might stand opposed to an intrinsically unknowable realm of objects, that nature might be a mere spectacle for observers constituted in a radically different way, is a challenge to be overcome.

The problem of teleology is intimately tied to wider early modern problems of unity and duality of nature. Paralleling a cleft between the physical and the mental as domains of being is a growing split between the factive and the evaluative as forms of judgment. Teleological concepts—purpose, goal, end, aim—find their primary home in this period in questions of value: of morality, aesthetics, and generally, in the space of practical reason. Appeals to the ends or purposes of things signals the involvement of motives and choices, thus judgments of value. Value judgments, moreover, are tied to the ability to have choices and to act for the sake of motives. They thus pertain most intuitively to rational, deliberative agents like ourselves, rather than to animals and plants. To the extent that teleological concepts figure in questions of fact, or about the observable (and increasingly manipulable) world of bodies, they likewise signal the involvement of rational choices. But, should the realms of facts and norms turn out to be radically distinct—an influential strain of early modern thought—such normativity must then be grounded in the motives and purposes of some mentalistic agent. Whether an intelligent source of norms in nature should be identified with God as its author, with the human subject as its student, or with nature itself as somehow inspirited, are some of the available positions in seventeenth- and eighteenth-century Europe. Each of these will be studied in the following chapters.

From the point of view of knowledge, three kinds of answer to the problem of teleology are especially salient. At least since Kant, the notion that all talk of purposes in nature is metaphorical has enjoyed wide currency. A view of nature *as if* it were designed with specific purposes or intentions has the virtues of being a useful heuristic, and, for some, as a stimulus for an aesthetic or a religious spirit. It offers a perspective on the spectacle of nature by which we transpose our first-personal experience of intentional agency onto an essentially unknowable substrate. Such a perspective provides the artistic imagination with the freedom to inhabit other points of view, to picture other ways the world could be. It also aids scientific practice by suggesting models for inquiry, especially, but not only, in the life sciences, where casual attribution of functions and purposes to organic parts is widespread. In everyday life, meanwhile, it is sometimes just convenient to attribute desires and intentions not just to plants and animals, but even to inanimate objects. Yet, as with all metaphors, this view of nature demands a suspension of disbelief. In philosophical rigor, it remains a mere projection of the imagination onto the world.

A different view of nature regards it as the product of an intelligent craftsman. From its manifestation in Plato's demiurge shaping the world out of primordial stuff, to the Abrahamic creator-God, to innumerable origin stories around the world, the idea of nature as divine artifact has deep psychological roots. As David Hume casually remarked in an otherwise anti-religious essay: "The whole frame of nature bespeaks an intelligent author; and no rational enquirer can, after serious reflexion, suspend his belief a moment with regard to the primary principles of genuine Theism and Religion."[2] Where the metaphorical view treats nature as if it were the result of artifice, the standpoint of intelligent design regards it as literally created by, typically, a wise architect. Like the metaphorical view, intelligent design also requires a suspension of disbelief; or, positively stated, it requires an act of faith.

One feature common to each of these attitudes, which partly underwrites their prevalence in the early modern worldview, is an identification of the purposive with the intentional: that only intention could be a source of purposes, designs, and functions. As tool-makers and tool-users, human intentions are a familiar source of purposes. Not just the bread knife, but even organic beings such as bonsai trees and collies are expressions of human intentions moulding nature for certain ends. If intentionality is the mark of the purposive, one might grant that the collie exists for the sake of some end, *qua* creature-bred-for-herding, but not necessarily *qua* creature-that-chases-squirrels. As herding dog, one may think it acquires its purpose from the fact that humans have bred dogs of its kind for the sake of herding livestock. At the same time, as a creature that instinctively runs after squirrels in the park, it remains unclear whether the collie has a purpose of its own, which it would have had even if herding had never existed. We certainly speak of dogs as wanting to chase squirrels, as being happy to chase squirrels, as needing to satisfy their instinct to chase squirrels. But, according to the metaphorical and design stances, such talk is a projection from the structure of intentional agency taken either figuratively

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[2] *The Natural History of Religion*, §1. David Hume, *Dialogues concerning Natural Religion; and The Natural History of Religion*, ed. J.C.A. Gaskin. (Oxford: Oxford University Press, 1993), 134.

(nature as if designed) or literally (nature as designed). On these views, dogs do not have purposes or intentions except as determined on their behalf by by God or humans.[3]

Must the purposive be identified with the intentional? Pretheoretically, it seems just as plausible to construe human intentionality as one species of purposivity in nature, as it is to demand an exclusion of purposivity from non-human nature. That is, intentional agency, or acting for the sake of a represented end, might be a peculiarly human form of a more basic, natural feature of acting for an end, on philosophical par with, say, being extended in space and time as a natural feature of bodies. Unless we have already decided that nature is intrinsically passive or inert, we could certainly conceive the petunia's phototropism or the collie's chasing of squirrels as goal-directed actions, without attributing to these creatures the capacity for conscious beliefs and desires. For starters, it simply reflects our natural ways of speaking; a case needs to be made to disinterpret our ordinary ways of judging nature and instead to treat it as inert and purposeless. With Aristotle, we could maintain that not everything that comes to be for the sake of an end does so as a result of intention or deliberation. The class of purposive things may include not only what is due to conscious thought, but also what is due to a more generic source

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[3] Recent psychological research points to a tendency toward attributing intentions and purposes to inanimate objects beginning in early infancy and being robust through adulthood, regardless of education levels or socio-economic class. See Deborah Keleman, "Functions, Goals, and Intentions: Children's Teleological Reasoning about Objects," *Trends in Cognitive Science* 3 (1999): 461–68; Deborah Keleman and Evelyn Rosset, "The Human Function Compunction: Teleological Explanation in Adults," *Cognition* 111, no. 1 (2009): 138–43; György Gergely and Gergely Csibra, "Teleological Reasoning in Infancy: The Naive Theory of Rational Action," *Trends in Cognitive Science* 7, no. 7 (2003): 287–92.

of purposiveness, which he calls "nature."[4] In Aristotle's usage, for something to exist *by nature* is for it to exist without the mediation of thought and intention, and yet for the sake of some end. If it is to exist *by nature*, in this sense, the collie should exist for the sake of an end whether or not it had been bred to herd goats or cattle. We could call this third view, opposed to the metaphorical or design views, naturalism. Naturalism qualifies intentional purposiveness as a limitation of a wider genus of natural purposiveness.

We can specify the notion of something's being purposive by nature rather than by intention by asking where, so to speak, its purpose lies. Herding livestock, we might say, is an external purpose of the collie, which resides properly in the dog-breeder's intention. By contrast, we may locate its natural, or internal purpose, in its own nature. According to naturalism, a complete account of what it is for something to be a collie should include facts about what its own purposes are; that is, it should include the collie's internal ends *qua* dog, rather than just its external ends *qua* goatherd's instrument. To be naturally purposive is to be directed by those ends or purposes which something has just in virtue of being the kind of thing it is, rather than in virtue of what purpose it could serve another.

The notion of a being having internal ends or purposes raises the difficult question of what is required for something to have an end of its own. Inasmuch as something's having an end amounts to having a good outcome for the sake of which the thing acts, the question amounts to what is required for something to have a good for itself. In virtue of what may we attribute internal ends or goods to plants and animals as determiners of their

[4] *Physics* II.5 196b18-30.

actions, just as we attribute intentions to humans for the sake of which they, at least some of the time, act? Let's provisionally gloss 'being by nature' as 'being instinctive'. Then, to be for the sake of an end by nature is to be whatever we ordinarily think of as being due to a creature's instincts. With respect to non-deliberative actions, we may then ask: is it sufficient for an act to be for the sake of the agent's good that it be instinctive? Do we retain a non-trivial sense of the good in describing the dog's instinctive darting after the squirrel, or the fern's instinctive inclining toward sunlight, as good-for-the-dog or good-for-the-fern? If the answer is yes, that instinct-satisfaction may be a proper good for a creature, how far along the chain of being do we attribute intrinsic goods? Do chemotropic bacteria have goods? Do fungi? Does earthy matter fall in order to reach its proper place at the center of the universe, as some medievals believed?

This is the exercise of distinguishing purposive or normative being—being that is also characterized in terms of the good—from non-purposive, non-normative being—being that is described only by non-evaluative facts, as a mathematical equation might describe the period of a planet's revolution around the Sun. One option is to draw the line under intentionality: only fully-rational, conscious acts may be deemed purposive, and thus to be judged under the aspect of goodness or badness, correctness or wrongness. In that case, only humans and non-human spirits (angels, demons, gods, should these exist) would have goods or ends of their own. Alternately, we may draw the line wherever we encounter some set of normatively significant features: responsiveness to environmental stimuli, reproduction, or rule-governed organization. Depending on which features we include as criteria, the field of normative being could potentially encompass the entire universe. If rule-governed organization is sufficient, the world as *cosmos*, as a structure governed by permanent physical laws, might be the proper extension of the normative. If reproduction of kind is the criterion of relevance, microbes and colonies of coral (and perhaps many social institutions such as neighborhoods or universities) should count as having goods. If the requirement is sensory representation of the environment, the class of normative being would be much smaller.

This work treads over much of the conceptual territory just sketched. It does not, however, aspire to settle these metaphysical matters. It instead focuses on a key episode in the history of modern philosophy of nature in which concepts of norms, purposes, and functions became rehabilitated on the side of method and epistemology, as important but limited tools for theorizing nature. In the period from Leibniz to Kant, teleological notions are recognized as necessary and good commitments of scientific inquiry, rooted ultimately in the nature of the human mind.

Teleological explanation embeds certain structural features that distinguish it from other kinds of explanation. At a first pass, a teleological explanation accounts for a process, event, or fact in terms of a possible outcome or consequence of that process, event, or fact. For example, you might invoke the intended outcome of brewing coffee to explain my action of grinding coffee beans. A legal clerk's actions could be judged in terms of her functional role in the judicial system. Some might appeal to the goal of pumping blood as the reason for the existence of the heart. A medieval doctor would have prescribed ground-up snake's head for the sake of combating venom from a snake bite. In each of these cases, a possible future state—the brewing of coffee, the dispensation of justice, the pumping of blood, the combating of venom—figures in an explanation of a fact or event.

The most intuitive home for such explanations is the class of deliberate, intentional action. Thus, teleological explanations are most naturally given and accepted in human and social contexts. But teleological reasoning also figures prominently in thinking about the domain of the living, and about organic systems such as cats, ferns, eyes, and leaves. Living systems, like social systems, are intuitively conceptualized as systems of discrete functions, so that each part of an eye, just like each department of a corporation, could be conceived as existing for the sake of a distinct causal role in the production of a systemic aim. For some theorists, organic systems not only can, but ought to be conceptualized as artifacts.[5]

The use of teleological explanations also has a history in the inorganic domain. If teleological explanation is understood minimally as reasoning from end state to initial state, or as judging a thing to be such-and-such on the basis of certain future outcomes, then it could plausibly extend over a wide range of physical phenomena. Take a classical principle of physics, the principle of least action. It states that the average kinetic energy of the true motion of a particle moving from point A to point B is the least possible from among all possible trajectories from A to B. In using this principle—often credited to the eighteenth-century French physicist Pierre Maupertuis—the physicist explains an actual

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[5] For a recent defense of the organism-artifact analogy in biological science, see Tim Lewens, *Organisms and Artifacts* (MIT Press, 2004). Interest in the epistemological value of the analogy goes back to Aristotle. In the modern period, a positive appraisal of the analogy is typically associated with Kant.

process (the particle's trajectory) by invoking the end-state of satisfying the criterion of minimizing energy in a closed system of particles. Here, an occurrent process is explained by appeal to a non-occurrent outcome. Contrast this with what we might call a "mechanical" explanation in classical physics. Using Newtonian equations of motion, you would determine the initial values of a body's mass and acceleration in order to predict its future state at a definite time. The order of mechanical explanation proceeds from knowledge of initial state to a predicted future state on the basis of a mathematical expression of relation between quantities. The order of teleological explanation, by contrast, begins from knowledge of an end state, and purports to explain a process toward that end state in terms of a qualitative principle of economy.

Explanations of such a form abound in the history of science. The Varro conjecture has its origins in Roman antiquity: it proposes that honeycombs are built of hexagons because a hexagonal arrangement maximizes storage space. Opticians from ancient Greece to medieval Iraq to seventeenth-century France understood light rays to follow the principle that the time taken from origin to terminus should be a minimum. Physicists today continue to employ such explanatory strategies under the rubric of the calculus of variations, principles which express the local minimization or maximization of magnitudes as outcomes guiding physical processes. Whether or not accounts of natural phenomena involving exclusive use of variational principles constitute genuine explanations continues to be debated among philosophers of science.[6]

[6] For recent discussions, see Alan Baker, "Mathematical Explanation in Science," *British Journal for the Philosophy of Science* 60 (2009): 611–33; Otavio Bueno and Mark

The prospects of a unified theory of teleology, a single account that would underwrite all the explanatory projects that at various times have been deemed exercises in teleology, appear dim. Nor is it my intention to attempt such a unification. My intent in the foregoing has been to identify some of the contexts in which reasoning about nature may involve appeal to functions, goals, ends, or desires. All of the above contexts and senses of teleology are live options in the seventeenth and eighteenth centuries. Even if the sense in which the least action principle is teleological appears strained by our contemporary lights, influential founders of modern physics such as Leibniz and Maupertuis took it to be important evidence of design in nature. The empirical success of principles of natural harmony and order, for many authors, constitutes a reason to accept *cosmical* teleology—the idea that nature as a whole and in its parts is directed toward harmony and order by universal tendencies of economy, beauty, or optimal form. Similarly, Wolff would regard as an expression of natural ends *teleomatic* processes in inorganic nature—those processes that have a determinate end point under varying conditions, such as coastal wind currents, or rivers flowing into the sea. All of the authors discussed in the following chapters, from Descartes to Leibniz to Kant, recognize the validity of the language of functions and uses in the context of what are now called *teleonomic* processes—exhibited paradigmatically in programmed, functional behaviors of evolved, biological systems such as organisms and their parts. Finally, to reiterate, teleological talk is most uncontroversial among our authors in the case of intentional

Colyvan, "An Inferential Conception of the Application of Mathematics," *Nous* 45, no. 2 (2011): 345–74; Marc Lange, "What Makes a Scientific Explanation Distinctively Mathematical?" *British Journal for the Philosophy of Science* 64, no. 3 (2013): 485–511.

actions of thinking beings, paradigmatically humans.[7] Depending on how we restrict the meaning of teleology, greater or fewer phenomena will be permitted as legitimate candidates for explanation in terms of teleological concepts.

There is a further theoretical position we have not discussed so far, which is also a live—and subversive—option in our period. This is the position associated in the early modern imagination with Democritus, Epicurus, and Lucretius, which conceives all natural phenomena as the product of either chance or necessity. The Epicurean world knows nothing of direction or goal, and even less of perfection or goodness as internal goals of natural processes. Well-adapted mechanisms, such as cows' flat teeth for grinding down tough grasses, evolve by chance combinations of matter, and simply happen to become useful for creatures that possess them. But there are no normative reasons for such facts. Cows' teeth don't exist because they are good for cows to have; instead, cows chew grass rather than hunt small rodents because they happen to have teeth suitable for chewing fibrous grasses and not for piercing flesh and bone. Still less does the world as a whole exist on account of a plan in the mind of a divine artisan. Indeed, if it has originated at all instead of just existing from eternity to eternity, the reason for the world's existence could only be attributed to a chance accident, just as cheese spontaneously emerges from milk when conditions happen to conduce to curdling, or as carbon-based life, on some modern speculations, may have accidentally originated in a primordial chemical soup. The Epicurean and Lucretian thesis, along with more

[7] The taxonomy of cosmic, teleomatic, teleonomic, and intentional (or purposive) processes is due to Ernst Mayr, "The Idea of Teleology," *Journal of the History of Ideas* 53 (1992): 117–35.

recent accidental-origins views, shares its family tree with gnostical traditions that have persisted in the history of Abrahamic cultures.[8] For the German authors who are the focus of this dissertation, however, the Epicurean position represents a dangerous specter. To have one's position on a topic be declared Epicurean or Lucretian is tantamount to being challenged to defend oneself against a fatal threat, much as, today, an aspiring moral realist might be accused of relativism, or a realist about perceptual knowledge threatened by noting skeptical consequences of her view. For Leibniz, Wolff, or Kant, the Epicurean option recurs as an obstacle to be steered clear of, but never as a resting place.

2. The historical situation

The demise of teleological views of nature used to be a platitude about the origins of European modernity. Histories of philosophy from the nineteenth century onward ranked the decisive rejection of final causes, or of the use of ends and purposes to explain natural change, among the key achievements of the episode glorified as the Scientific Revolution. The leading propagandists of the new science of the seventeenth century largely succeeded in convincing their descendants that nature has no place for teleology. Instead, the physical world knows objects only as packets of inert, lifeless matter

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[8] The image of the cheese and the milk is due to the sixteenth-century Italian miller, Menocchio, who was tried and burned at the stake in 1599 for espousing an accidental origin view of the world. See Carlo Ginzburg, *The Cheese and the Worms* (Baltimore, MD: The Johns Hopkins University Press, 1980), for a biography and cultural history centered on Menocchio's trial. For a study of Epicurean undercurrents in early modern Europe, see Catherine Wilson, *Epicureanism at the Origins of Modernity* (Oxford: Clarendon, 2008).

arranged in variable sizes and shapes moving with variable velocities. The physical world should be conceived as a machine indifferent to purposes, except insofar, perhaps, as designed by an intelligent agent. Thus, Francis Bacon declared the search for final causes as barren, “like a virgin dedicated to God, [which] brings forth nothing.” René Descartes warned against inquiring into the ends or purposes of natural things, “because we ought not to presume so much of ourselves as to think that we are confidants of His intentions.” And Baruch Spinoza famously compared final causes to a “sanctuary of ignorance,” banishing them from the study of nature as “nothing but human inventions.”[9] The story of the moderns’ despiritualization of nature remains entrenched in academic and non-academic discourse alike. Darwin’s theory of evolution by natural selection, in particular, is sometimes credited with having once and for all put to rest spiritualized meanings of teleology by providing natural science with a non-teleological account of biological function. Modern evolutionary biology, on these views, disentangles cosmical teleology from the more restricted notion of programmed functions in organic systems subject to the forces of natural selection, genetic drift, or mutation. Darwin’s self-appointed bulldog, T.H. Huxley, triumphantly declared as early as 1864 that, with *The Origin of Species,* “Teleology, as commonly understood, had received its deathblow at Mr. Darwin’s hands.”[10]

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[9] Francis Bacon, *The Advancement of Learning,* ed. Joseph Devey (New York: P.F. Collier and Son, 1901), Bk 3, Ch. V; Descartes, *PP* I.28; Spinoza, E I Appendix.
[10] Thomas H. Huxley, *Darwiniana*, (London: Macmillan, 1907), 82. Michael T. Ghiselin, *The Triumph of the Darwinian Method* (Berkeley, CA: University of California Press, 1969), Marjorie Grene, “Aristotle and Modern Biology,” *Journal of the History of Ideas* 33 (1972): 395–424, and Mayr, “Idea of Teleology,” broadly agree with Huxley’s

Such proclamations are quoted more often than they are understood. Each of the authors just cited in fact held more qualified views about teleology. To take the example of Bacon, C.D. Broad explains the meaning of the epigram as "a statement of the obvious fact that there is no art of Applied Teleology as there is an art of Applied Physics."[11] That is, the application of final causation is not wholly illegitimate, but rather misplaced. Final causes have their proper place in ethics and in metaphysics, but only a derivative role in physical research. The story of teleology in early modern Europe has not gone unchallenged in recent scholarship. Reconsiderations have taken various forms. Some have scrambled the camps of proponents and opponents. Don Garrett, for instance, has drawn attention to ways in which Spinoza is much closer to Aristotle on the topic of teleology than is Leibniz, who has traditionally featured as a notable seventeenth-century advocate of final causes. For Garrett, Descartes rather than Spinoza is the arch-nemesis of Aristotelian teleology.[12] By contrast, Alison Simmons and Peter Distelzweig have defended richer accounts of function and teleology in Descartes, paying close attention to his physiological and psychological ideas.[13] While Leibniz's customary role has been that

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assessment. For a counterpoint, see James Lennox, "Darwin Was a Teleologist," *Biology and Philosophy* 8 (1993): 409–21.

[11] C.D. Broad, *The Philosophy of Francis Bacon* (Cambridge: Cambridge University Press, 1926).

[12] Don Garrett, "Teleology in Spinoza and Early Modern Rationalism," In *New Essays on the Rationalists,* ed. Rocco J. Gennaro and Charles Huenemann, 310–55 (Oxford: Oxford University Press, 1999). For a defense of the traditional reckoning of these authors, see Jeffrey McDonough, "The Heyday of Teleology and Early Modern Philosophy," *Early Modern Philosophy Reconsidered, Midwest Studies in Philosophy* 35 (2011): 179–204.

[13] Alison Simmons, "Sensible Ends: Latent Teleology in Descartes' Account of Sensation," *Journal of the History of Philosophy* 39, no. 1 (2001): 49–75, argues for a broadly teleosemantic account of Descartes' account of sensory content. Peter M. Distelzweig, "The Use of Usus and the Function of Functio: Teleology and Its Limits in Descartes's Physiology." *Journal of the History of Philosophy* 53, no. 3 (2015): 377–99,

of a defender of natural teleology, Julia Jorati, among others, has recently argued for a bold revision of Leibnizian teleology as a kind of goal-directedness "without goodness and without God."[14] Others have tempered the severity of the most famous pronouncements on the issue. Andrea Sangiacomo has carefully distinguished the targets of Spinoza's famous polemic, identifying these as the overtly theological uses of final causes by Spinoza's Dutch contemporaries such as Adriaan Heereboord, while excluding Aristotle's own use of the concept of final causes.[15] Even recent scholarship on Francisco Suárez has questioned his role in the standard narrative. Whereas Suárez has long featured as the most sophisticated representative of a moribund tradition, Stephan Schmid has suggested that Suárez retains only an attenuated notion of final causation and, before Descartes, had already lowered teleology from its privileged explanatory place in earlier scholasticism.[16]

Moving into the eighteenth century, Kant's views on natural teleology have received much attention in recent times. Unlike the focus on Kant's influential characterization of the use of design and functions in nature as metaphor, nature *as if* it

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finds Descartes deploying both mechanical and etiological notions of functions in medical and physiological contexts.

[14] Julia Jorati, "Monadic Teleology and Goodness without God," *The Leibniz Review* 23 (2013): 43–72. Laurence Carlin, "The Non-Aristotelian Novelty of Leibniz's Teleology," *The Leibniz Review* 21 (2011): 69–90, also finds Leibniz's teleological talk as radically un-Aristotelian.

[15] Andrea Sangiacomo, "Aristotle, Heereboord, and the Polemical Target of Spinoza's Critique of Final Causes." *Journal of the History of Philosophy* 54, no. 3 (2016): 395–420.

[16] Stephan Schmid, *Finalursachen in der Frühen Neuzeit* (Berlin: De Gruyter, 2010), 107-162. For pushback, see Sydney Penner, "Final Causality: Suárez on the Priority of Final Causation," In *Suárez on Aristotelian Causality,* ed. Jakob Leth Fink, 122–49 (Leiden: Brill, 2015).

were designed, recent commentators have found more substantive appraisals of teleology in the Kantian corpus. Angela Breitenbach and Dalia Nassar have emphasized the importance of teleology in Kant's epistemology, especially in legitimating inductive and analogical judgment, while Pauline Kleingeld and Bernd Dörflinger have drawn attention to broader teleological presuppositions in Kant's theory of cognition.[17] Hannah Ginsborg has perhaps been the most influential recent commentator on the topic. She has characterized Kant's principle of purposiveness as justifying belief in primitive natural normativity, and has also found Kant and Aristotle as being broadly on the same page with respect to their ideas of nature as a productive principle distinct from art.[18] The story of teleology and final causes in modernity continues to be written, even if its broad contours remain relatively fixed in wider discourse.

It should not have escaped notice that comparisons with Aristotle appear and reappear in scholarship on the history of modern teleology. Aristotle—real and imagined—remains a touchstone for contemporary discussion of purposes, ends, and functions in nature, much as he was for the early moderns. Just as opposition to Aristotle and his authority was a rallying cry for generations of intellectual revolutionaries in the

[17] Angela Breitenbach, *Die Analogie von Vernunft und Natur* (Berlin: De Gruyter, 2009); Dalia Nassar, "Analogical Reflection as a Source for the Science of Life: Kant and the Possibility of the Biological Sciences." *Studies in History and Philosophy of Science* 58 (2016): 57–66; Pauline Kleingeld, "The Conative Character of Reason in Kant's Philosophy." *Journal of the History of Philosophy* 36, no. 1 (1998): 77–97; Bernd Dörflinger, *Das Leben theoretischer Vernunft* (Berlin: Walter de Gruyter, 2000).
[18] Hannah Ginsborg, "Kant on Aesthetic and Biological Purposiveness," In *Reclaiming the History of Ethics: Essays for John Rawls,* ed. Andrew Reath, Barbara Herman, and Christine Korsgaard, 329–60 (Cambridge: Cambridge University Press, 1997); and "Two Kinds of Mechanical Inexplicability in Kant and Aristotle," *Journal of the History of Philosophy* 42, no. 1 (2004): 33–65. Where Kant and Aristotle differ, for Ginsborg, is in the strength of their respective metaphysical commitments.

sixteenth and seventeenth centuries, juxtaposition with Aristotle serves a hermeneutical strategy for scholars grappling with teleological concepts in contemporary philosophy of nature. This work embraces the strategy, but with the intent of advancing a specific historiographical thesis. I argue that the history of philosophy of nature from the sixteenth to the early nineteenth centuries contains the recovery of a de-Christianized Aristotelianism. For a variety of contingent factors, this recovery was carried out as a more-or-less self-conscious project in the German context. It occurred within a wider negotiation, rooted in cultural and intellectual forces unleashed by the Renaissance and the Reformation, of the respective claims of faith and reason. Within the institutional framework of the early modern university, this negotiation took place in debates originating with Luther, Calvin, and Zwingli and carried on by academics belonging to the new confessions concerning educational reform and what role, if any, the old arts curriculum should have in Protestant institutions. The rest of this section sketches the historical conditions for the selective rehabilitation of Aristotle in the German Enlightenment.

One cultural-historical factor is simply the predominance in early modern Germany of the university as a site of intellectual activity. With their roots in the Aristotelian tradition, the universities preserved some of the core elements and tendencies of medieval scholasticism. The fragmentation of German-speaking lands of Central Europe became increasingly entrenched along confessional lines during the Reformation. The Peace of Augsburg of 1555 formalized the tie between church and state by entitling each prince to determine the faith of his dominion (*cuius regio, eius religio;* the choice in

1555, though, was limited to Roman Catholicism or Lutheranism). Since the right to grant degrees also rested with princes, German universities quickly assumed strong confessional identities in the sixteenth and seventeenth centuries. When a prince converted, so did the university. This happened, for instance, with Heidelberg, which went from its pre-Reformation founding as a Catholic institution to briefly becoming a Lutheran university, before turning into a prominent Calvinist institution with the Elector of the Palatinate Friedrich III's embrace of Calvinism in 1563, and finally reverting back to Catholicism in 1685.[19] The theology faculty of the University of Frankfurt (Oder), to take another example, effectively became an arm of the Brandenburg court after Johann Sigismund's conversion to Calvinism in 1613.[20] In the increasingly polarized atmosphere of the time, German universities served as the principal sites for the articulation and defense of theological doctrine, partly in service of the religio-political ends of their respective states.

Moreover, the misfortunes suffered by German communities in the Thirty Years' War (1618-48), paradoxically, may have contributed to safeguarding the social preeminence of the university. The scale of misery inflicted upon Central Europe not only left German territories more fragmented than before, but also considerably poorer. Thus, in the second half of the seventeenth century, as Europe's intellectual centers of gravity began to shift away from universities and toward the royal academies of Paris, London,

[19] Notker Hammerstein, "The University of Heidelberg in the Early Modern Period: Aspects of Its History as a Contribution to Its Sexcentenary," *History of Universities* 6 (1987): 112-3; R.J.W. Evans, "German Universities after the Thirty Years' War," *History of Universities* 1 (1981): 189.
[20] Bodo Nischan, *Prince, People, and Confession* (Philadelphia: University of Pennsylvania Press, 1994), 128-30.

or Florence, and private salons of rich patrons of learning, German princes struggled to keep pace. Unlike in France or England, where universities came to be seen increasingly as repositories of Aristotelian orthodoxy, German universities remained the center of intellectual life, as the princes of Brandenburg, Saxony, or Holstein directed their efforts to restore their once-flourishing universities or to found new ones. It was not until 1710, with the diplomatic skills of Leibniz, cosmopolitan courtier to the Duke of Hanover, that the Elector of Brandenburg created a non-university research center in Berlin modeled after the Royal Academy of London and the Academy of Sciences of Paris. And it would not be until the 1740s that the Berlin Academy would attain stature comparable to its more established cousins in London and Paris. It is no coincidence that the German Enlightenment— unlike the French, English, or Scottish—is a product of new universities such as those founded at Halle (1694) and Göttingen (1737). It is likewise no coincidence that its most famous theorist—Kant—was a university professor, unlike the most notable French or British Enlightenment figures such as Locke, Hume, Diderot, or Rousseau. With its institutional continuity with the scholastic Aristotelian tradition, the early modern university presented a natural home for the further evolution of Aristotelian thought.

Two intellectual-historical factors drive the formation of early modern Aristotelianism. The first is a recovery—guided by the humanistic clarion call to return to original sources (*ad fontes*!)—of Aristotle's texts as read through the lens of his ancient rather than his medieval interpreters. A key discovery of the new, Renaissance humanism was that Aristotle himself seems to deny the core Christian doctrine of creation in favor of an eternal universe. The second factor, especially prominent in Central Europe, was the *reformatores'* emphasis on the distinct normative character of what should be accepted on faith in revelation as opposed to what can be known by natural reason, and their privileging of the former in matters of ultimate truth. Briefly, these two factors opened the possibility of distinguishing questions of normativity in nature from the question of the origins of functional adaptations in natural systems. Once the thirteenth-century compact between Aristotle and the Church had been weakened, it became possible to restore specific Aristotelian ideas without the demand that Aristotle's harmony with Church doctrine be preserved. Consequently, appeals to purposiveness in nature need not find their ultimate resting place in a theory of divine ideas, as had been the case for Albert the Great or Thomas Aquinas. If the apotheosis of this movement several centuries later is the unabashedly teleological *Naturphilosophie* of Schelling and Hegel, its origins lie in the Renaissance and the Reformation. I will briefly sketch some of the key sixteenth- and seventeenth-century events relevant to the development of Aristotelianism in early modern Germany.

The first of these events is the publication of Pietro Pompanazzi's *Treatise on the Immortality of the Soul* (1516), which precipitated a crisis in relations between theology and metaphysics. While not the first humanist to detect discord between Aristotle and Scripture upon applying the new exegetical principles to the *corpus aristotelicum*, Pomponazzi's arguments for the impossibility of proving the immortality of the soul from Aristotle's texts struck a nerve. The treatise appeared as the Fifth Lateran Council was still convening (1512-17), in spite of the Council's express condemnation in 1513 of teaching the view that the human soul, according to Aristotle, is mortal. Recognizing that Aristotle's *De anima* belongs to physics, thus deals with animated bodies, Pomponazzi declared as contradictory any conclusion from arguments grounded in Aristotle's texts that an immaterial, spiritual, incorruptible substance—as the human soul is understood in theology—is generated in a material substrate. Aristotle's text is clear, for Pomponazzi, that the soul is a material form and, therefore, can only be generated from the potency of matter. Aristotelian souls, moreover, can only operate on data gathered from sense experience, and are inapt to receive naturally the kind of knowledge required by the doctrine of grace. A Christian philosopher wishing to assert that the human soul is created would need recourse to divine causality, whereby spiritual substances capable of receiving grace are placed directly in bodies. But Aristotle's physics rejects creation in favor of an eternal world. For Aristotle, forms appearing in the world do not subsist in a transcendent ground, but have their reality through the beings which instantiate them. Natural, changeable forms do not have independent reality in the mind of a supernatural, creative intellect. The Christian doctrine of creation, along with the doctrine of the immortality of created souls and the possibility of salvation through the light of grace, should certainly be affirmed, according to Pomponazzi, but exclusively on the basis of faith. Aristotle knew nothing of such theses, and his texts do not contain adequate foundations for Christianity.[21]

[21] Eckhard Kessler, "The Intellective Soul," In *The Cambridge History of Renaissance Philosophy,* ed. Charles B. Schmitt, Quentin Skinner, Eckhard Kessler, and Jill Kraye (Cambridge: Cambridge University Press, 1988), 500-7.

As commentators have noted, what especially inflamed the Pomponazzi affair was not any specific doctrine, either of creation or of the immortality of the soul, but instead Pomponazzi's implicit challenge to the presumed harmony of Aristotle with theology.[22] The clear suggestion that something could be true in philosophy but false in theology and vice versa implied a fundamental opposition between reason and faith. It thus threatened to undermine well-established philosophical accounts of sacred doctrine in the Christian metaphysical tradition beginning with the reception of Aristotle in the twelfth century. In the university, it also threatened to undermine the authority of the theology faculty to interpret Scripture. From the perspective of the arts faculty, meanwhile, it demanded a daunting reform of the arts curriculum, should the arts masters still aspire to discharge effectively their function of preparing students for the higher faculties of medicine, law, and theology. Quite apart from the events soon to unfold in Wittenberg, Pomponazzi largely succeeded in his challenge to the existing conception of philosophy's relation to theology. The identity of Christian philosophy with Aristotelian authority effectively ended, and would be replaced later in the century by a new, ecumenical approach, which flourished above all on the Iberian Peninsula.

The Jesuit scholasticism associated with Spanish and Portuguese university professors of the late-sixteenth and early-seventeenth centuries, such as Suárez, Toledo, Pereira, and Fonseca, has its roots in a concern to preserve the univocality of being and

[22] Charles H. Lohr, "Metaphysics," In T*he Cambridge History of Renaissance Philosophy,* ed. Charles B. Schmitt, Quentin Skinner, Eckhard Kessler, and Jill Kraye (Cambridge: Cambridge University Press, 1988), 603, remarks: "The formulation of the Lateran Council's condemnation shows that the Fathers were less concerned about the question of immortality than they were about the view that a doctrine could be true in philosophy, but contradict a truth in theology."

truth. Responding to the prospect of double-truth, of separate domains of reality for theological and philosophical truths, these authors aimed to restore a univocal account of being and its identity with unity, goodness, and truth (*quodlibet ens est unum, bonum, verum*). Truth cannot contradict truth, so truths known by reason acting on the data of experience must at bottom be reconcilable with truths known through faith in revelation. Philosophy ought to retain its traditional role of handmaiden to theology by articulating Christian dogma using the natural faculty of reason, available to believers and heathens alike. At the same time, it must take Pomponazzi's challenge seriously. If Aristotle resists assimilation to Christian truth, the modern philosopher must be prepared to reject his absolute authority in matters of reason. As Francisco Toledo saw the situation, the task of philosophy is not to explain Aristotle but to rationalize Christian doctrine. Accordingly, Jesuit scholasticism exhibits both a tendency away from the letter of Aristotle (and from Thomas as the authoritative interpreter of Aristotle), and the construction of a new metaphysical framework to serve as *ancilla theologiae*. It marks an important stage in the divorce between Aristotle and Christian theology, which would make possible piecemeal uses of Aristotle's texts, or none at all. In the works of the Jesuit scholastics, Aristotle takes his place alongside a wide range of ancient and modern authors. Thus, while Suárez and Fonseca are indeed bound by the Order of the Society of Jesuits to follow St. Thomas in theology and Aristotle in philosophy, in practice they display greater latitude in departing from canonical views. It is not uncommon to find Suárez attributing a specific position to Aristotle, but endorsing a contrary one. What we find instead is a substantially different metaphysics, one deliberately crafted to safeguard creationist, Christian metaphysics against the kinds of challenge arising from the Renaissance and Reformation.

A key feature of Suárez's reconstructed metaphysics is a confessionally-neutral interpretation of the doctrine of creation. It is what should secure the relevance of metaphysics to theology, ground the unity of rational and revealed truth, and guide the reform of the arts curriculum as preparation for the higher faculties. Suárez defines the subject matter of metaphysics as real being (*ens reale*). Being, however, is only available for philosophical analysis through an objective concept [*conceptus objectivus entis*], or insofar as it can be made the object of possible, non-contradictory thought. Real being divides into three substantial species: uncreated being (*ens increatum*), created immaterial being (*ens creatum immateriale*), and created material being (*ens creatum materiale*), with the latter two also involving accidental beings.[23] The distinction between infinite and finite being grounds one between uncreated and created being. For Suárez, finite, created being depends on God as infinite, uncreated being for its actuality or existence. Finite beings are those possible beings which could be brought into existence as creatures by God's infinite power. As such, Suárezian metaphysics begins with a sharp distinction between the possible and the actual as two modes of real being. By conceiving God and creatures univocally as real being, Suárez's metaphysics purports to range over truths concerning God, or theology, as well as over truths concerning nature, or philosophy. And by conceptualizing the relation between God and natural substances in terms of creation as the causal power of an infinite being, it anchors itself in a doctrine

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common to all Christian confessions. Of great consequence for the history of metaphysics over the next two centuries would be Suárez's emphasis on metaphysics as a science of being as such. Where Aristotle had spoken of metaphysics sometimes as the science of divine things, and sometimes as the science of being *qua* being, Suárez's *Metaphysical Disputations* (1597) would be received by contemporaries primarily as ontology, as a science of the most general predicates of reality, rather than as philosophical theology. As pure ontology disentangled from earlier associations with Catholic dogmatics it also found its way into Northern European, Protestant contexts with its publication in Mainz in 1605. By mid-century, the Suárezian conception of metaphysics gets expressed in labels approaching 'ontology' rather than 'metaphysics': in 1647, Johann Clauberg (1622-1665) titles his first attempt at systematic ontology as *Elementa philosophiae sive ontosophia, scientia prima, de iis quae Deo creaturisque sua modo communiter attribuntur (The Elements of Philosophy, or Ontosophia, First Science, concerning those things which are attributed in common to God and Creatures*). The discipline of ontology would find its most elaborate treatment in Wolff's 1730 *Philosophia prima, sive Ontologia*.

As the Pomponazzi controversy unfolded in Italy, Martin Luther was advocating a radical separation of the values of faith and reason in Saxony. The unshakeable core of Luther's doctrine of *sola scriptura* or *sola fide* is the unique sufficiency for justification of personal faith in the salvific character of the life of Jesus as recounted in the Gospel. For Luther, whatever else natural reason might be good for, it is fundamentally incapable of accessing the most important truths of Christian faith, those required for personal salvation. Luther's attack on the intellectual excesses of Catholic theology directly targeted Aristotle and the universities:

> What are they [i.e. the universities] but places where loose living is practised, where little is taught of the Holy Scriptures and Christian faith, and where only the blind, heathen teacher Aristotle rules far more than Christ? In this regard my advice would be that Aristotle's *Physics*, *Metaphysics*, *On the Soul*, and *Ethics*, which hitherto have been thought to be his best books, should be completely discarded along with all the rest of his books that boast about nature, although nothing can be learned from them either about nature or the Spirit.[24]

Luther's hostility toward philosophy as an element in the institutional apparatus of the Catholic Church is well-known.[25] But his legacy in the dialectic of faith and reason is complex. On the one hand, certain radical fringes of Lutheranism certainly invoked his antipathy toward reason in defining their own identities. But, on the other, Philipp Melanchthon (1497-1560), to whom Luther had entrusted the task of educational reform, was quick to reintroduce the teaching of Aristotelian texts at the University of Wittenberg. Aristotle's expulsion from the arts curriculum was short-lived, and Melanchthon's restoration of selected texts from the *corpus aristotelicum* exemplifies the

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[24] "To the Christian Nobility of the German Nation concerning the Reform of the Christian Estate" (1520), in Martin Luther, *Luther's Works.* Various translators (Minneapolis, MN: Fortress Press, 1957-86), vol. 44, 200.

[25] That the crude impression that Luther deemed philosophy to be utterly useless is, however, an exaggeration; for a balanced interpretation of the place Luther accords to reason in theology, see B.A. Gerrish, *Grace and Reason: A Study in the Theology of Luther* (Oxford: Oxford University Press, 1962).

kind of piecemeal recovery of Peripatetic philosophy made possible by the upheavals of the sixteenth century.

For Melanchthon, philosophy and revelation occupy their own normative domains, each equally ordained by God. Philosophy, as rhetoric, physiology, or civic morals, according to Melanchthon, "is a good creation of God, and the principal among all natural gifts."[26] Philosophy is a divine institution through the faculty of natural reason for the sake of instituting civic morality and order in public affairs. The Gospel, meanwhile, is not so much concerned with order in the practical affairs of human life, but "is the forgiveness of sins and the promise of reconciliation and eternal life for the sake of Christ."[27] Gospel is distinguished from philosophy by its subject matter, which is a moral one of personal salvation and redemption. Philosophy, by contrast, secures its value in improving public life and the material conditions of human flourishing. And while philosophy cannot be assimilated to Gospel, because only through faith can salvific truth be apprehended, it is not on that account a human invention. For philosophy is, according to Melanchthon,

> the law of nature itself divinely written in men's minds, which is truly the law of God concerning those virtues which reason understands and which are necessary

[26] Philip Melanchthon, *Orations on Philosophy and Education,* ed. and trans. Sachiko Kusukawa and Christine F. Salazar (Cambridge: Cambridge University Press, 1999), 23; from "On the Distinction between the Gospel and Philosophy" (1527).
[27] Ibid. 24.

> for civil life. For philosophy, properly speaking, is nothing other than the explanation of the law of nature.[28]

Philosophy, in other words, has its proper vocation in explaining that part of divine law which concerns the institution of natural and social order. With philosophy, nothing can be understood concerning the special dispensation of grace; to that extent, reason cannot serve theological ends. Reason's purpose instead lies in understanding human life in the created world and, insofar as the world is ruled by divine purpose, its purpose is to comprehend a specific part of divine law.

As a result, Melanchthon emphasizes Aristotelian natural philosophy and ethics, while omitting its metaphysics. Practical ethics borrows from Aristotle's physics, including *De anima*, the general doctrine of the purposivity of nature, which underwrites the assumption that human beings were created for a certain end. Physics teaches that nature as a whole is intrinsically well-ordered, and moral philosophy specifies the purpose of human nature as the pursuit of civic virtue.[29] For these pedagogical benefits, Melanchthon underscores the continuing relevance of Aristotle's *Physics* and *Nicomachean Ethics*. In fact, he concludes a commencement oration on the life of Aristotle (1537) by warning of the dangers of abandoning Peripatetic philosophy:

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[28] Philip Melanchthon, *A Melanchthon Reader,* ed. Keen R.A. (New York: Peter Lang Publishing, 1988), 204; from "Epitome Ethices" (1532).

[29] For a detailed study of Melanchthon's role in renovating Aristotle's teleological philosophy of nature and his perfectionist ethics, see Sachiko Kusukawa, *The Transformation of Natural Philosophy: The Case of Philip Melanchthon,* (Cambridge: Cambridge University Press, 1995). She argues that Melanchthon turned to classical ethical philosophy in order to defend Luther's cause in the wake of civil unrest resulting from divergent interpretations of the *sola fide* doctrine in the 1520s, by arguing for the importance of civic peace and obedience to the rule of law; see, esp. 64-73, and 79-82.

> I certainly think that a great turmoil of doctrines would follow if Aristotle were neglected, who is the one and only master of method. And no one can become acquainted with the method by any other way than by getting some practice in that type of Aristotelian philosophy. Therefore, I beseech you, not only for your own sake, but also because of all coming generations, diligently to cherish and preserve this kind of knowledge.[30]

Yet, Melanchthon keeps metaphysics in exile, for no part of philosophy should pretend to be able to prove or demonstrate theological doctrine. And, should Aristotle conflict with Scripture, Melanchthon would not hesitate to depart from Athens in favor of Jerusalem, as he makes clear in the preface to his commentary on *De anima*.[31]

It would be several generations before metaphysics would reassert its earlier preeminence in German universities. It would have to survive increasingly bitter disputes between literalist interpreters of the doctrine of *sola scriptura* and those, following Melanchthon, who wished to preserve a constitutive role for the liberal arts in Lutheran education. Most notorious was the controversy at the close of the sixteenth century around the Helmstedt theologian Daniel Hofmann (1538-1611), who, in an attack on Calvinist academics, had called for philosophy to be eliminated entirely from the universities. On Hofmann's view, not only does philosophy—or, strictly speaking, metaphysics, upon which the Aristotelian system rests—fail to produce adequate knowledge of divinity and creation, it is positively harmful for Christian youth. Instead of

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[30] Melanchthon, *Orations,* 211; from "The Life of Aristotle" (1537).
[31] Kusukawa, *Transformation of Natural Philosophy*, 86.

cultivating piety and humility, it instills hubris and leads impressionable minds astray on theological matters, which could be learned with more ease and certainty through Scripture alone. Reason fights against faith and, in this struggle, Lutheran educators ought to side with the latter.[32]

To some extent, Hofmann's polemics occurred against the intellectual grain of his time. Systematic metaphysics, as ontology, rational theology, and psychology (or pneumatology), had already found a footing in Calvinist institutions such as Marburg, Heidelberg, and Steinfurt, where Rudolf Göckel, Bartholomaeus Keckermann, and Clemens Timpler had begun to produce new textbooks.[33] Their works express a deliberate interest in a return to a systematic conception of philosophy and the liberal arts in which each discipline had its proper place in a rationally ordered encyclopedia. Metaphysics was to enjoy the distinction of the highest or architectonic (as it would be termed later) science, as the most general doctrine of whatever can be the object of rational thought. It was primarily this Calvinist milieu which prepared the ground in Central Europe for the reception of the new Catholic metaphysics taking shape in Iberia. But the works of Suárez and Fonseca, and the collective commentaries on Aristotle's texts by the professors at the University of Coimbra quickly found an audience among Lutheran scholastics as well after their appearance in German presses in the first decades of the seventeenth century. The most notable exponent of the Spanish-inflected,

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[32] Carsten Nahrendorf, *Humanismus in Magdeburg* (Berlin: De Gruyter, 2015), 311-3; Stefan Heßbrüggen-Walter, "How Philosophy Became a System: Casmann against Hofmann on Christian Wisdom and Double Truth," (ms).

[33] See Ulrich Leinsle, *Das Ding und die Methode* (Augsburg: Maro Verlag, 1985), esp. Chs. 3-5, for the contributions of Calvinist professors to the restoration of metaphysics.

Protestant neo-scholasticism in Germany would be the Gießen professor Christoph Scheibler (1589-1653), whose textbooks found wide readership not just in German universities, but as far afield as Oxford and Cambridge. On the eve of the Thirty Years' War, during which the universities would suffer heavily along with much of the social infrastructure of Central Europe, a new framework for metaphysics was in place. Metaphysics in general had become ontology, while the doctrines of created and uncreated spirits were to be treated in the special metaphysical sciences of pneumatics and natural theology, respectively.

If rationalist metaphysics had to be saved in the sixteenth century from the excesses of Lutheran evangelism, the pendulum would swing in the other direction over the course of the seventeenth and the eighteenth. As the horrors of the wars of religion receded and an interest in reconciliation set in, a new optimism began to emerge. Its most prominent representative is perhaps Leibniz, whose theodicy is colored not only by faith in providence, but also by a firm conviction in the power of reason to perfect itself and humanity in the course of history. Fittingly, the early optimism characteristic of the early German Enlightenment would climax in another famous academic *Streit*, this time in 1723 at the young University of Halle. Having daringly argued for the sufficiency of natural reason for the attainment of virtue by drawing comparisons between Christian ethics and the heathen philosophy of Confucius, Christian Wolff incurred the wrath of Halle's Pietist theologians, who successfully pleaded their case to the Prussian court to have Wolff removed from his chair. Despite Wolff's exile from Brandenburg, his brand of rationalism, and rationalist theology, came to dominate German university philosophy in subsequent decades. At the close of the century, it would fall to Kant to restore the balance with his denial of knowledge in order to make room for faith.

"The Enlightenment in Germany," from Hegel's vantage point, "was conducted in the interest of theology."[34] This work agrees with Hegel's opinion in framing the conceptual negotiations which produced the renovation of Aristotelian natural teleology. The distinctively Aristotelian view, that nature should be understood as a purposive principle of change, and the natural world as a whole as an expression of reason, emerges with especial salience in the German tradition between the time of Leibniz and the German Idealists. Teleological commitments in cosmical, organical, and intentional modes occupy the focal authors of this work. Reflection on the sources of teleology underpins Leibniz's, Wolff's, and Kant's efforts to reconcile physical necessity with rational freedom, the factive with the valuative and, ultimately, the new scientific view of nature with faith in the goodness of creation.

3. Scope and aims

The following work braids together several related themes in early modern philosophy and its historiography. Conceptually, it is a study of final causation, and its transformation from being one among several kinds of natural principle, to being restricted exclusively to the domain of intentional action. The noted scholar Michael Frede observes that, "[a] good part of the unfortunate history of the notion of a final

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[34] G.W.F. Hegel, *The Philosophy of History,* trans. J. Sibree (Kitchener, ON: Batoche Books, 2001), 464.

cause has its origin in the assumption that the final cause, as a cause, must act and in the vain attempt to explain how it could be so."[35] The present study covers an episode in this *Begriffsgeschichte*, one in which the final cause found a relatively stable and well-defined home in the sphere of the mental, leaving the efficient cause to govern the physical world in familiar events of colliding billiard balls and falling rocks. As categories of explanation the efficient and final cause align with modernity's peculiar obsession with the uniqueness of the moral, human microcosm as distinct from the rest of the physical world. To thinkers dissatisfied with the notion of a primitive duality in nature the challenge is to explain the possibility of a transition from one to the other. Once having become accustomed to a sharp line between *causa moralis* and *causa physica*, between the realms of intention and brute necessity, responses to this problem exhibit the close tie between final causation and marks of subjectivity: rational freedom, self-consciousness, and the ability to have a point of view. Accordingly, it is characteristic of several authors of this study, from Suárez to Kant, to proceed by reflecting on the character and limits of knowledge produced in the natural sciences, and thus on features of the human subject which condition such knowledge. One consequence of an increased focus on the human standpoint, or what a limited human subject uniquely contributes to constituting nature as intelligible, is a decisive shift in the doctrine of teleology. Where teleological notions had once been applied univocally to nature regarded from any point of view, they now have their value as necessary conditions under which a finite, rational observer must approach

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[35] Michael Frede (1987), "The Original Notion of Cause," in *Essays in Ancient Philosophy* (Minneapolis: University of Minnesota Press, 1987), 126.

nature. The doctrine of teleology becomes, in the early modern period, the doctrine of the ends of human reason.

Historiographically, this work is a step toward the construction of an interpretive category I shall clumsily label 'early modern Aristotelianism.'[36] I regard Aristotelianism in its early modern, European guise as a distinctive philosophical framework characterized by a set of non-mutually-entailing features. To be clear, these features are not unique to early modern Aristotelianism. They appear in a wide range of non-scholastic authors of the period. Yet, they are also important commitments of the tradition I am identifying here, and I take that to be sufficient warrant to include them in its description. Institutionally, the natural home of this tradition is the university, whose medieval heritage enabled aspects of Aristotelianism to be poured into the Enlightenment brew of old and new ideas. As canvassed above, neo-scholastic Aristotelianism flourished in the relative backwaters of German-speaking lands, far from the rich, cosmopolitan centers of London, Paris, or Amsterdam. It remains to describe briefly its characteristic features.

In the first place, early modern Aristotelianism draws on core texts and a common vocabulary as inspiration and resource. It is different from the Aristotelianism of

[36] Another candidate might be 'early modern scholasticism', to designate the framework characteristic of early modern university philosophy. While it might be a safer historiographical choice—it would cleanly pick out all and only those authors who were university or gymnasium professors—it is less philosophically committing. By using 'Aristotelianism' rather than 'scholasticism' as the term of significance, we are bound to identify substantive and methodological themes that bind texts and authors to earlier (i.e. medieval and ancient) and later (i.e. nineteenth and twentieth century) understandings of affiliation with Aristotle.

Averroës or Thomas, inasmuch as the *corpus aristotelicum* does not represent for the moderns the apogee of rational philosophy. Instead, for authors such as Scheibler and Wolff, Aristotelianism comprises a distinctive structure of the parts of philosophy, which begins with ontology, is followed by one or more special metaphysical disciplines of kinds of substance (pneumatology, cosmology), and leads to as many divisions of special empirical sciences as needed. Its philosophical vocabulary is directly transmitted from the medieval tradition. Especially prominent is the Scotistic analysis of being into a series of disjunctive predicates such as essence and existence, necessary and contingent, one and many, true and false, perfect and imperfect, followed by the relational predicates of being, notably cause and effect, and sign and signified. As vocabulary, however, the interpretations given to these terms can vary drastically.

Early modern Aristotelianism also embeds a commitment to systematic philosophy, or a rational account of reality that does not countenance sharp breaks in its object. Indeed, the discipline of ontology, which constitutes the philosophical core of early modern Aristotelianism, is self-consciously intended to provide foundations for the unity of theoretical and moral knowledge. Systematicity had long been recognized as a key virtue of Aristotelian philosophy, which sustained it through its erosion in the age of Renaissance humanism. Keckermann's advice neatly sums up the importance attached to method and system in this inherently conservative tradition: "better to teach methodically ordered traditional positions, even if erroneous and questionable, than as yet unmethodized new theories, even if true."[37] Seen in this light, Descartes' overarching achievement could be taken to consist in the construction of a systematic alternative to Aristotelian philosophy, and thus to have presented a viable alternative to the university curriculum. For our purposes, one particularly relevant consequence of the ideal of unified philosophy is that natural science, insofar as it aspires to speak to reality, can never be fully isolated from questions of value. For reasons at once theological, ontological, and psychological, natural philosophy in early modern Aristotelianism remains aware of its answerability to questions of norms and values in nature, thus of the involvement of teleological concepts.

A third feature of early modern Aristotelianism is its orientation toward perception and experience as the locus of philosophical meaning. Characteristic of Sturm, Wolff, or Kant is a clear rejection of intellectual intuition: they consistently deny universal validity to any epistemic capacity that involves non-discursive intuition of truth. In this regard, early modern Aristotelianism exhibits a principled opposition to the ancient schools of Platonism and Pythagoreanism, which had persisted in medieval hermetical and mystical traditions and were revived in fifteenth- and sixteenth-century humanism. Whereas Descartes initiates his intellectual revolution by turning the mind away from the senses to focus on the pure intellect, early modern Aristotelians insist on the necessary codependence of sensation and intellection. Such opposition is prominently expressed in multiple slogans: from Wolff's conception of philosophy as "a marriage or

[37] Cited in John Gascoigne, "A Reappraisal of the Role of the Universities in the Scientific Revolution," In *Reappraisals of the Scientific Revolution*, ed. Robert S. Westman and David C. Lindberg (Cambridge: Cambridge University Press, 1990), 214.

reason and experience," to Kant's slogan that "[t]houghts without content are empty, intuitions without concepts are blind."[38] The idea that truth could be known by the intellect operating independently of sensory experience is uniformly rejected in this tradition.

A fourth feature of early modern Aristotelianism is related to the third, and directly rooted in the persistence of Aristotelian logic. With the intellect's dependence on sensory givens, its constitutive operation consists in abstracting from empirical particulars to form general concepts. The intellect functions, roughly, much as a recent strand of Aristotle scholarship interprets the function of *nous* in Aristotle's epistemology.[39] On some readings of *Posterior Analytics*, the intellect does not grasp first principles by an intuitive grasping, which then serve as major premises in demonstrative syllogisms. Rather, the same processes of induction which yield intermediate conclusions from limited evidence are also responsible for the more robust, well-confirmed principles at the core of any theory of nature. Knowledge of the necessity of such conclusions, consequently, typically eludes us; while my belief that a stone would become warm were it to be left out in sunlight enjoys a high degree of certainty, affirming its status as a necessary truth is difficult, if not impossible, for finite reasoners to establish. The

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[38] DMet §540; KrV A51/B75.

[39] E.g. J.H. Lesher, "The Meaning of NOUS in the POSTERIOR ANALYTICS," *Phronesis* 18 (1973): 44–68; Jonathan Barnes, *Aristotle: Posterior Analytics* 2nd ed. (Clarendon Press: Oxford University Press, 1994); Murat Aydede, "Aristotle on *Episteme* and *Nous*: The Posterior Analytics," *Southern Journal of Philosophy* 36, no. 1 (1998): 15–46. The interpretation of Aristotle's epistemology, especially in *Post. An.* II.19, is, of course, the subject of ongoing debate. I do not wish to take a stand on these debates, but simply note one position, which happens to bear resemblance to the views of the early modern figures who are my concern.

production of knowledge in the epistemology of early modern Aristotelianism proceeds in two stages. In the first, analysis of the contents of experience yields general concepts. In the second, knowledge is reconstructed by synthesizing the products of analysis to yield statements of empirical regularities ordered into taxonomies of natural kinds. For many of our authors, the dual procedure is prescribed by the natural limitations of the human understanding, which is incapable of intuitively knowing the first principles with which it may attain perfect certitude.

A fifth commitment has to do with the theory of universals. Early modern Aristotelians exhibit a partiality toward a naturalistic realism about universals, a position known to the medievals as *universalia in rebus* (universals in things). On this view, the reality of universals—'human', 'cat', or 'oak', for instance—consists in the shared properties which constitute individuals of definite kinds. To judge that 'snow is white' is not to identify whiteness as a form existing independently of white things in which snow participates, but to attribute to the stuff falling from the sky an essential property which is necessary for something's being snow. Sets of particular things—such as all things which are snow, or all animals which are cats—are constituted by determinate sets of properties, which are jointly shared by all and only members of that kind. It contrasts with the Platonist view of *universalia ante rem* (universals prior to things), or universals as existing as transcendent forms or ideas, whether or not any individuals expressing those universals do. On Platonism, the universal form of cat-hood would exist—it would be real—even if no cats existed. The Aristotelian view also contrasts with the nominalism associated with much of the early modern canon, from Leibniz to Locke to Hume.

According to the nominalist theory of *universalia post rem* (universals posterior to things), judgments of individuals as belonging to certain kinds only names linguistic conventions. Everything real is particular and individual. Universal concepts are only means by which linguistic communities ease communication by agreeing to use certain signs to denote certain sets of characteristics. For the Aristotelian, by contrast, universals are real, though only through the individuals in which they are expressed.

To reiterate, I do not take these features as forming necessary and sufficient conditions for a seventeenth- or eighteenth century author to be counted an Aristotelian. Rather, they are meant to describe a family of views related historically in the long tradition of commentary and exegesis of Aristotle, and institutionally in the medieval and early modern university in which these practices were cultivated. The significance of proposing early modern Aristotelianism as a historiographical category lies in the continued neglect of the later Aristotelian tradition. This neglect is rooted in deeply entrenched narratives about, for instance, the comprehensive embrace of nominalism by early modern theory of concepts, or in their decisive separation of form and matter in metaphysics. As a recent reviewer of a rare volume on early modern theories of universals remarked: “There was a time, not long ago, when no one would have dared publish a book on early modern treatments of the problem of universals,” for the simple reason that the early moderns had considered the problem solved.[40] This is just one instance of the way in which taking a handful of canonical figures as definitive of an age

[40] Benjamin Hill, “The Problem of Universals in Early Modern Philosophy,” *Notre Dame Philosophical Reviews*, 2018. https://ndpr.nd.edu/news/the-problem-of-universals-in-early-modern-philosophy/. While the appearance of an edited volume on the topic is refreshing, the range of authors it covers is disappointingly familiar.

can lead to tunnel vision. Restricting the range of texts and authors as sources of historical ideas engenders a kind of selection bias and the perpetuation of one-sided narratives as conclusive. The following chapters provide a partial corrective by reconstructing a tradition which was allegedly swept away by modernity. They do so through the lens of a philosophical interest long associated with the name of Aristotle: the purposiveness of nature.

CHAPTER 2: The Problem of Final Causes in Later Scholasticism

1. Introduction

Rejection of the Aristotelian philosophy of nature was a key feature of the so-called Scientific Revolution of the seventeenth century. The new science sought to replace the explanatory framework of goal-directed causal powers with one of mathematical laws governing quantities of size, figure, and motion. The banishment of final causes figured centrally in the modernist program: henceforth, all natural change, from planetary motions to animal functions, should be explained by appeal to quantitative laws describing interactions among material parts. But final causation was not an unproblematic notion before the age of Bacon, Descartes, and Galileo. The task of explaining, or explaining away, the appearance of functional organization in animal bodies, the adaptations of creatures to their habitat, or the orderly course of the heavens exercised Aquinas and Suárez just as much as it did the moderns. And, just as the mechanists' rejection of natural teleology was more qualified than Spinoza's passionate polemic against design in the natural world would suggest, the Aristotelian defense of finality required nuance and subtlety.

This chapter sets the historical stage for the defense of teleology in modern German philosophy, from Leibniz's rehabilitation of final causes in mechanical physics, through Wolff's founding of a science of *Teleologia*, to Kant's "long, worried, ambivalent book"[1] of 1790 concerning the place of finality in nature and its investigation.

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[1] As Wilson, *Epicureanism*, 98n23, describes Kant's *Critique of the Power of Judgment.*

This background consists, first, in the status of final causation in sixteenth-century Jesuit scholasticism and, second, in its reception in the Protestant German academic context. As will become clear, while scholastic Aristotelians from Thomas Aquinas and Jean Buridan to Francisco Suárez and Christoph Scheibler never doubted the goal-directedness of all natural change, the question of whether and how the end exercises causality remained notoriously vexed. Among later writers, a consensus begins to emerge concerning both the character of the problem and its solution. Jesuit scholastics—and the Protestant German authors who followed them from the beginning of the seventeenth century—typically treat the problem of final causation as concerning the causality of a being that is at the same time affected by the causal process. That is, final causation occurs whenever the efficient cause or agent is also affected by its own agency. The paradigms for such reciprocal causality are organisms. But, for many authors, such a model of causation presupposes judgment and, consequently, entails a close dependence of causation on the joint activity of a rational intellect and a rational will. Action for the sake of an end brings rationality and intention into play. Final causation becomes limited, as a result, to human agents who are able to represent their own goods or purposes. For Suárez, for instance, the end exercises causal efficacy just in case its representation in the intellect as good moves the will to choose it; or, in a frequently used formulation, when the will is "metaphorically moved" by its desire for the cognized good. By contrast, the end-directed motions of non-rational agents, or all agents except God and human beings, require an ordering of means to ends established by a rational agent—God as the author of nature in the case of natural agents such as birds and stones, and humans in the case of artifacts.[2]

[2] While my focus in this chapter is scholasticism in the late sixteenth and early

The chapter is structured as follows: Section Two discusses some varieties of end-directedness in the Aristotelian framework. Section Three turns to the concept of a cause in general and finds the emergence in later scholasticism of the efficient cause as the paradigm of the genus. Section Four then articulates the restricted scope of the final cause in Jesuit commentaries on Aristotle's *Physics*, which, by understanding final causation as presupposing mentality, relegate the goal-directed activity of non-rational beings to God's purposes. Section Five concludes with a discussion of Descartes' critique of final causes in physics, and sets the stage for Leibniz's recovery of natural teleology.

A few methodological remarks are in order before we proceed. First, I should comment on my use of the interpretive categories, 'scholasticism' and 'Aristotelianism.' The title 'scholastic' has a relatively clear signification, which I follow in the rest of this work: it identifies an author's affiliation with the institution of the university. 'Scholasticism' then refers to the rather more nebulous construct of the kind of philosophy produced in medieval universities. I shall not attempt to analyze the label, and leave it as a nominal category to pick out whatever philosophical activity took place in the universities of the period under study. A term which does demand further comment is the one sometimes taken—including by many early modern critics of the Schoolmen—to

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seventeenth centuries, the immediate targets of the mechanical philosophers, the emergence of this thesis was under way in the fourteenth century in the work of William of Ockham and Jean Buridan. For Ockham and Buridan on the separation of natural final causality from rational final causality, see Anneliese Maier, *Metaphysische Hintergründe der spätscholastischen Naturphilosophie* (Rome: Edizioni di storia e letteratura, 1955), Ch. V; Stephen F. Brown, "Ockham on Final Causality," In *Studies in Medieval Philosophy,* 249–72 (Washington, DC: The Catholic University of America Press, 1987); and Marilyn McCord Adams, "Ockham on Final Causality: Muddying the Waters," *Franciscan Studies* 56 (1998): 1–46.

be synonymous with 'scholasticism,' namely, 'Aristotelianism.' Given the heterogeneity of views expressed by university professors of philosophy from the thirteenth to the seventeenth centuries, one may rightly wonder whether the label 'Aristotelian' can be applied univocally, or whether it should not instead be replaced by a collection of labels that include 'Thomism,' 'Scotism,' 'Averroism,' and perhaps even 'Jesuitism.' I do not wish to settle the issue here. I do believe, however, that the terms 'Aristotelian' and 'Aristotelianism' can be usefully employed for the simple reason that the authors in this tradition took themselves to be expounding the views of Aristotle, no matter how heteredox their interpretations of the *corpus aristotelicum*. Further, the Latin authors also share the common institutional setting of the university, and are engaged in the production of a recognizable, even though evolving, genre of texts: the commentary literature organized topically into *quaestiones* and *disputationes*, which self-consciously took Aristotle and one or more of his medieval commentators (such as Albert, Aquinas, or Scotus) as authorities. Finally, they have in common a highly technical philosophical vocabulary on the basis of which Suárez or Fonseca at the end of the sixteenth century could readily treat Albert and Aquinas as if they were his contemporaries. In this chapter, I use the terms 'Aristotelian' and 'Aristotelianism' to refer to this Latin tradition of commentary on Aristotle's texts produced by university teachers in Europe from the thirteenth to the seventeenth centuries. Whenever I discuss Aristotle's own texts, I shall refer to Aristotle by name.[3]

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[3] For further discussion of the problematic character of the terms 'Aristotelian' and 'Aristotelianism,' see Charles B. Schmitt, "Towards a Reassessment of Renaissance Aristotelianism," *History of Science* 11 (1973): 159–93; and Edward Grant, "Ways to

Second, this introduction to final causation in later scholasticism by no means aims to give an exhaustive account of the concepts of end and final cause in that tradition. Nor do I wish to deny the obvious fact of the diversity of views in this period. The purpose, rather, is to approach the modern critique of final causes as continuous with an existing problematic in the Aristotelian framework in order to identify some key conceptual issues for understanding the positions on causal explanation taken by various actors of the seventeenth and eighteenth centuries. The core texts in my discussion are those of sixteenth- and seventeenth-century scholastics, especially those produced by Jesuit teachers. These include Francisco Suárez's *Disputationes metaphysicae* (1597), and the collaborative commentary on Aristotle's *Physics* (1592) produced by the professors at the University of Coimbra. They are supplemented by the Cistercian monk, Eustachius a Sancto Paulo's *Summa philosophiae quadrapartita* (1609), a widely published compendium praised by Descartes as the best presentation of scholastic philosophy, and the Lutheran Christoph Scheibler's *Opus metaphysicum* (1617), an influential work that earned for its author the equivocal title of the 'German Suárez.'

Several considerations motivate the choice of these texts. In the first place, Jesuit texts were leading representatives of Aristotelian philosophy in the seventeenth century. They formed the basis of the curriculum at Jesuit colleges such as La Flèche, where Descartes studied. Their indirect influence was perhaps even more extensive. Popular *compendia* of philosophy, such as Eustachius', drew from hefty tomes such as those of Suárez and the Coimbra commentators. Jesuit commentaries on the *corpus aristotelicum*

Interpret the Terms 'Aristotelian' and 'Aristotelianism' in Medieval and Renaissance Natural Philosophy," *History of Science* 25 (1987): 335–58.

served as models for textbooks at universities throughout Europe, including at the Protestant universities such as Leipzig and Jena where Leibniz and Wolff took their philosophical educations.[4]

In the second place, scholastic texts from this period mark a shift away from earlier tradition in light of their encounter with the cultural forces of the Renaissance and the Reformation. The Jesuits' professed obligation to follow St. Thomas in theology and Aristotle in philosophy was complicated by the pressures resulting from the new humanistic and theological ideas of the period. Some of these directly threatened to undermine the alliance established in the thirteenth century between theology and philosophy, on which philosophy's task was to supply rational defenses of certain general theological precepts. Pietro Pomponazzi's interpretation of Aristotle—following the

[4] For Descartes' education at La Flèche and his relation to Jesuit authors, see Roger Ariew, *Descartes among the Scholastics* (Leiden: Brill, 2011), 18-27. Alison Simmons, "Jesuit Aristotelian Education: De Anima Commentaries," In *The Jesuits: Cultures, Sciences, and the Arts,* ed. S.J. O'Malley, John W., Gauvin Alexander Bailey, Steven J. Harris, and T. Frank Kennedy, 522–37 (Toronto: Toronto University Press, 1999), gives an overview of the Jesuit method of education using their *De anima* commentaries as a model. See Peter Petersen, *Geschichte Der aristotelischen Philosophie im protestantischen Deutschland* (Leipzig: F. Meiner, 1921), 283-94, Martin Grabmann, *Mittelalterlisches Geistesleben,* I. (München: Max Huber, 1926), 525-35, Max Wundt, *Die deutsche Schulmetaphysik des 17. Jahrhunderts* (Tübingen: J.C.B. Mohr (Siebeck), 1939), 40-2, and Jean-François Courtine, *Suarez et le système de la métaphysique,* (Paris: Presses Universitaires de France, 1990), 405-35, for the decisive influence of Suárez, Fonseca, and the Coimbra commentaries in the teaching of Aristotelian philosophy in seventeenth-century Germany via textbooks written by German professors. Representative texts of Protestant Aristotelianism include Jakob Martini's (1570-1649, professor at Wittenberg) *Theorematum metaphysicorum exercitationes* (1603); Christoph Scheibler's (1589-1653, professor at Gießen) two-volume *Opus metaphysicum* (1617), and Johannes Scharf's (1595-1660, professor at Wittenberg) *Exemplaris metaphysica* (1625). We know that these last two were studied by Wolff. One of Leibniz's teachers Johann Adam Scherzer (1628-1673, professor at Leipzig) wrote *Breviarium Eustachianum*, a (further) compendium of Eustachius' popular *Summa philosophiae quadrapartita*.

humanist call to shed interpretive encrustations and returning to the original ancient sources—presented a reading of *De anima* according to which the soul does not outlive the destruction of the body and, more generally, an Aristotle who knew nothing of creation. A growing interest in skepticism and fideism in the sixteenth century, meanwhile, questioned the validity and even the need for the Thomistic or Albertist syntheses of Christian doctrine with Aristotelian philosophy. Suárez and his fellow Jesuits of the later sixteenth century are seeking a new synthesis, one which could respond to the intellectual forces unleashed by the Renaissance. As a result, their texts engage with a diversity of authors that far outstrips the scope of earlier scholarship.

This heterogeneity manifests both in the literary form as well as in the content of Jesuit writings. Suárez's *Disputationes*, for instance, are not only unlike earlier treatises in their structure and in their radically reordered treatment of Aristotle topics in the *Metaphysics*, but also reflect the expanded range of antique and modern sources available in the sixteenth century. Similarly, the Coimbran texts, while formally closer to the translation and commentary tradition, are more willing to raise and leave difficult questions unsettled.[5] The pattern holds beyond the Order of the Society of Jesus. Eustachius' *Summa* reflects the burgeoning influence in the dissemination of philosophy, driven in part by pedagogical demand, of the *cursus*, a concise summary of key philosophical doctrines without the technical detail that marks high scholasticism. An apologetic tone on behalf of philosophy for the sake of restoring its traditional role as

[5] See John Heilbron, *Electricity in the 17th and 18th Centuries,* (Berkeley and Los Angeles: University of California Press, 1979), 109n55, for some examples. Simmons, "De Anima Commentaries," makes similar observations with respect to Suárez's commentary on the *De anima*.

ancilla theologiae is also common. In a period of heightened confessional struggles, the *prooemium* opening Suárez's *Disputationes* is a plea for the value of philosophy for the defense of theology. Indeed, Suárez's metaphysics, as has been noted, is a deliberate attempt to provide a confessionally-neutral framework to theologians of all Christian confessions, requiring of them only a commitment to a few shared doctrines such as that of creation *ex nihilo*. It is partly for this reason that metaphysics textbooks penned by Catholic theologians could find a receptive audience in Protestant Germany, where the earlier excesses of anti-intellectualist theology had started, by the early seventeenth century, to cede ground to rational theology. Thus, following Suárez's *Disputationes*, Scheibler's *Opus metaphysicum* motivates itself with an apology for philosophy, in the form of a dedication to the Duke of Hesse, on the grounds of its utility for defending Lutheran doctrine against the Calvinists.[6]

The confluence of intellectual currents in later scholasticism has two important implications: in the first place, these texts exemplify the impressive capacity of Aristotelian philosophy to assimilate innovative ideas and to respond to challenges.[7] Aristotelianism did not die a sudden death in the seventeenth century with the emergence of the mechanical worldview, but continued to evolve in creative ways that allowed its

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[6] See Lohr, "Metaphysics," esp. 605-38, for more discussion of the themes in this paragraph.

[7] Indeed, Grant, "Ways to Interpret," 352, notes this elasticity as a feature of Aristotelianism throughout its long history: "Over the centuries when it was a force to be reckoned with, much that was deemed fundamental to Aristotelianism at some period in its history was challenged, though not usually abandoned, at a later time by something that was at variance with what Aristotle himself had said or what his followers had at one time assumed. Aristotelianism often included conflicting earlier and later opinions simultaneously. It was always a domain of both traditional and innovative concepts and interpretations and was therefore inevitably elastic and absorbent."

influence to persist into the eighteenth. Recent scholarship has done much to correct an earlier tendency to dismiss early modern Jesuits, for all their erudition, as fundamentally inimical to new ideas.[8] Second, the broad scholarship of the textbooks in this period may be seen as preparing the ground from within the university tradition for the ecumenical spirit of the German Enlightenment. Indeed, a proclivity to situate their philosophical positions in dialogue with a wide range of schools and authors is common to Leibniz, Wolff, and Kant.[9] This feature is already on impressive display in Scheibler's *Opus metaphysicum*, which assimilates alongside Aristotle and Suárez authors as diverse as Cicero, Petrus Ramus, Julius Scaliger, Marsilio Ficino, and Jacopo Zabarella. Importantly, this humanistic aspect also affects the reception of Cartesianism in Germany, and effectively tempers the revolutionary spirit in which it was sometimes interpreted elsewhere in seventeenth-century Europe. As we shall see, Johann Clauberg, the most important disseminator of Cartesian thought in the second half of the

[8] See, e.g., the collection of papers in Mordechai Feingold, ed., *Jesuit Science and the Republic of Letters* (Cambridge, MA: The MIT Press, 2003); Marcus Hellyer's monograph on physical research among the Jesuits, *Catholic Physics* (Notre Dame, IN: Notre Dame University Press, 2005); and Michael Elazar's excellent study of Honoré Fabri's technical work in mechanical science following Galileo: *Honoré Fabri and the Concept of Impetus: A Bridge between Conceptual Frameworks* (Dordrecht: Springer, 2011).

[9] Johann Christoph Sturm (1635-1703, professor at Altdorf) would self-consciously develop eclecticism as a philosophical methodology in his *De philosophia selectaria et electiva* (1679). See Christia Mercer, *Leibniz's Metaphysics: Its Origins and Development* (Cambridge: Cambridge University Press, 2001), Ch. 1, and Donald Kelley, "Eclecticism and the History of Ideas," *Journal of the History of Ideas* 62, no. 4 (2001): 581ff, for the development of eclecticism in Germany. Riccardo Pozzo, "Aristotelismus und Eklektik in Königsberg," In *Die Universität Königsberg in der Frühen Neuzeit,* eds. Hanspeter Marti and Manfred Komorowski, 172–85 (Köln: Böhlau, 2008), 173, regards "die Aristotelismus und Eklektik als die zwei tragenden Säulen der Königsberger Traditionsgeschichte für die Genese der Kantschen Philosophie".

seventeenth century, creatively interprets the new philosophy in order to harmonize it with Aristotelianism while making it suitable for instruction in universities.

With this brief look at the intellectual-historical situation, we can turn now to the problem of final causation at the dawn of the seventeenth century.

2. Ends in nature

In their commentary on Aristotle's *Physics,* the Coimbra professors consider the possibility of a Lucretian world in which all change occurs from blind necessity. But a conception of a world in which everything happens by chance would face grave difficulties. For on the Lucretian picture, according to the Coimbrans, anything could arise from anything else indiscriminately: humans from the sea, scaly creatures from land, and winged creatures could burst forth from the sky.[10] The problem is not that the Lucretian world is logically incoherent. Nor do they worry that it would be unable to account for regularities observed in nature.[11] Rather, the problem lies in the impossibility of providing a causal account of nature's regularities, rather than a merely predictive one. For the Coimbra commentators, only the postulation of ends can explain why natural

[10] *Phys.* II.ix.q1a1: "primum, quia iam quodlibet sine discrimine in quodlibet opus incurreret, atque ita promiscue omnia ex omnibus fierent, neque certo res semine indigerent, illudque Lucretij primo sui poëmatis, quod iam alibi retulimus, eveniret: E mari homines, e terra posset oriri Squamigerum genus, & volucres erumpere coelo." See Dennis Des Chene, *Physiologia* (Ithaca, NY: Cornell University Press, 1996), 177-9.
[11] Indeed, Suárez, for example, acknowledges that even if, *per impossibile*, God were not to concur in natural change, stones would descend and fire produce its effects as usual: "lapis descenderet deorsum, ignis generaret sibi simile, et sic de caeteris; non est ergo haec finalis causalitas, sed mera naturalis necessitas" (DM 23 10.8).

regularities—the falling of stones, or the migrations of birds—hold, as opposed to how, or even simply *that*, they occur. The thesis of nature's purposefulness is not only intended to secure God's supremacy over the world. Rather, ends are required in order to make efficient causation, and hence nature as a domain of change, intelligible. The notion of an end toward which an action tends explains the determinacy of natural events. Acorns produce oaks, not willows; fire heats rather than cools bodies in its vicinity; and the sheep flees at the sight of the wolf, rather than cuddling up to it.

Efficient causes are essential to such processes, insofar as they are the means by which a material being acquires its definite form and behaves in certain characteristic ways. But the efficient cause here does not denote a law-like relation of antecedents and consequents. Rather, it picks out an agent which brings about change in the properties of another being. The doctor actually has to exercise her medical knowledge in order to heal the patient, and the swallow has to move around in order to gather sticks for its nest. But, in the Aristotelian structure of explanation, the causality of agents is bound to the ends that their internal capacities naturally seek. The explanatory demand of introducing ends in nature rises with events of increasing complexity, as in processes of generation, the coordination of multiple capacities in organisms, and intelligent behaviors such as building nests and finding food. In all cases, regularity in nature demands the directedness of effective means to definite ends. As Aquinas explains the relation between the efficient cause and the end or final cause:

> The efficient cause is the cause of the final cause inasmuch as it makes the final cause be, because by causing motion the efficient cause brings about the final

> cause. But the final cause is the cause of the efficient cause, not in the sense that it makes it be, but inasmuch as it is the reason for the causality of the efficient cause. For an efficient cause is a cause inasmuch as it acts, and it acts only because of the final cause. Hence the efficient cause derives its causality from the final cause.[12]

An efficient cause is properly so-called only in virtue of being directed toward an end, which entices it to act. Conversely, the end depends on properly functioning efficient causal mechanisms for its realization.

Yet, while the dictum, “every agent acts for an end,” commands a central place in Aristotelian natural philosophy, not everyone is willing to grant that all ends are causes of change.[13] As Suárez explains, “end and final cause are not entirely the same, for an end as such only expresses a *terminus* to which [*terminus ad quem*] an activity tends or to which motions are ordered, but a final cause is that which moves an agent to acting.”[14]

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[12] SM §775.
[13] “Omne agens agit propter finem.” See, for example, Aquinas, ST I.q44a4. For a discussion of the centrality of this thesis in Aristotelian natural philosophy, see Maier, *Metaphysische Hintergründe,* 277-8.
[14] DM 23 9.8: “finis et causa finalis non omnino sunt idem, nam finis ut sic solum dicit terminum ad quem tendit operatio, vel ad quem motus ordinantur; causa autem finalis est, quae movet agens ad operandum.” Suárez takes his definition from Gabriel, whom Scheibler also cites in prefacing his discussion of ends and final causes. Scheibler further illustrates the distinction by analogous distinctions of matter and material cause, and form and formal cause: “Ita mors est finis, non autem causa finalis. Subjectum est materia, no autem causa materialis. Determinatio quantitatis est forma, non autem causa formalis” (*Opus met*. I.xxii.t23).

Underlying Suárez's thought is the Aristotelian definition of motion as "the act of a being in potency, insofar as it is in potency."[15]

The term '*motus,*' broadly construed as change or motion, signifies a relation between the concepts of *actus* and *potentia*.[16] Taking the latter first, in the context of natural change '*potentia*' may be restricted to *potentia naturalis*, or the natural tendency of a thing toward a certain state.[17] A stone is naturally inclined to move downward, an oak to grow new rings. When a natural *potentia* is brought into existence, the process of change has reached completion. Importantly, the definition does not identify change with the actualized state that comes about, but with the exercise of a power or capacity *insofar* as it is *in potentia*. Natural change consists, strictly speaking, in the exercise of a tendency to change state, as with the stone's falling motion, or the oak's growing of rings, rather than with the form that results at the end of a process.[18]

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[15] DM 49 2.2: "Motus est actus entis in potentia, ut in potentia est." The Coimbrans add several variants of the basic definition: "Motus est actus eius, quod in potestate est, quatenus tale est"; "Motus est actus eius rei, quae vim habet, ut moveatur, quatenus eam vim habet"; "Motus est actus mobilis, prout mobile est"; "Motus est actus eius, quod agere & pati potest, quatenus tale est" (*Phys.* III.ii.q1a1). In his *Philosophia compendiosa* (1618), Scheibler follows Aristotle in making explicit the teleological import of the definition of *motus* by glossing it as "entelechy": "motus est actus, sive entelecheia, entis in potentia, qua tale est" (*Phil. comp*. III.iii).
[16] Here I draw on Roger Ariew and Alan Gabbey, "Body and the Physical World: Scholastic Background," In *Cambridge History of Seventeenth Century Philosophy,* eds. Daniel Garber and Michael Ayers (Cambridge: Cambridge University Press, 1997), 440-7, and Des Chene, *Physiologia*, 26-32.
[17] Other senses include *potentia logica*, roughly understood as logical possibility; and *potentia neutra*, or indifferent physical possibility, as a block of marble is indifferent to infinitely many possible shapes; and *potentia obedientialis*, or the capacity to receive change non-naturally. We will not consider these senses here.
[18] Thus, the Coimbrans write: "Motus secundum suam propriam rationem, non est forma per se, nec forma pariter cum fluxu, seu acquisitione, sed est acquisitio ipsa tendentia ad

In this sense, ends are located in the suite of powers and capacities that make up all physical beings and guide their goal-directed processes. Yet, *qua* tendencies to change, it is controversial whether ends function as causes. The falling stone undergoes a successive change in its place. But the explanation of its motion involves its quality of heaviness, which in turn depends on its earthy matter. It is unclear why the stone's acquisition of successively lower positions should be considered a cause of its motion. The case of non-rational ensouled beings, namely, plants and animals, is more complex, but the causal role of ends in their activities is similarly disputed. While the production of a nest requires that the swallow gather and arrange sticks, it is unclear whether nest-building is a final cause of its activity, rather than simply the outcome of efficient causal powers it exercises instinctively given its species nature. The efficient causes of the nest must, on the Aristotelian explanatory schema, be directed toward an end, either for the actualization of the capacity for nest-building, or for the sake of the nest itself. But Suárez, for one, is reluctant to admit that such ends are what cause the agents' (the swallow's, the stone's) activity. For: "the end does not stand as a principle with respect to these actions, but only as a *terminus*. For the place below with respect to a stone is not the principle of motion by which it descends but only its *terminus*."[19] Suárez draws a

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formam" (*Phys*. III.ii.q1a1). Eustachius' example is helpful: "acquisitio caloris est motus, quia est actus seu perfectio aquae calesit, quaeque est in potentia ad novam aliquam partem caloris, quatenus continuè ad eam pergit" (*S. Phys*. I.iii.d4.q1).

[19] DM 23 10.4: "finis respectu harum actionum non se habet ut principium, sed tantum ut terminus; locus enim deorsum respectu lapidis non est principium motus quo descendit, sed tantum terminus." The case of non-human animals is tricky. Suárez ascribes to higher animals an analogue of judgment in virtue of possessing instincts and the estimative power of the sensitive soul. But he ultimately rules against the attribution of final causation to animal behavior, on account of their inability to cognize the concept of an end, of a representation as agreeable or useful: "ratio est quia non cognoscunt formalem

reasonable distinction between an end point of a natural change, and a cause of that change. A place nearer to the center of the universe might be where the motion of the stone naturally terminates, but it is not what moves the stone. The sea might the end point of a river, but it is hardly judged to be the cause of the river's flow.

While the separation of ends and final causes is not without difficulties, for now we should note that ends and final causes are at least distinguishable. The viability of the distinction depends on one's characterization of the concepts 'end' and 'cause.'

2.1 Cosmological ends

In its most general sense, the Latin Aristotelian notion of an end follows Aristotle's own usage: it is *that-for-the-sake-of-which*, or *propter quid,* something occurs. Within the concept, commentators make several divisions, the most important of which for our purposes is that between an end-of-which (*finis cuius*), and an end-for-which (*finis cui*).[20]

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rationem convenientiae vel utilitas; ergo non ita moventur ut possint ordinare unum in aliud, nec etiam aliquid formaliter appetere ut propter se amabile; ergo non tendunt formaliter in finem ut finem, nec in medium ut medium, neque in finem propter se et in medium propter finem, sed quantum est suo modo operandi, aeque tendunt in utrumque, et ideo merito dicuntur materialiter potius quam formaliter propter finem operari." Consequently, animals belong with inanimate beings, or "natural agents", with respect to final causation: "Quapropter, quantum ad formalem relationem in finem, ita existimandum est de actionibus brutorum sicut aliorum agentium naturalium" (DM 23 10.15).

[20] DM 23 10.2; Coimbra, *Phys.* I.ii.q20a2; Eustachius, *S. Phys*. I.ii.2.6; Scheibler, *Opus met.* I.xxii.t26.a2. The distinction between the genitive (*cuius*) and dative (*cui*) interpretations of the end is found already in Aristotle, who distinguishes two senses of *that-for-the-sake-of-which* in *Physics* II.2: "For the arts make their material (some simply make it, others make it serviceable) and we use everything as if it was there for our sake. (We also are in a sense an end… 'That for the sake of which' may be taken in two

In its genitive formulation (*finis cuius*), the end signifies a relation between a capacity or act and the aim it seeks to bring about; in its dative form (*finis cui*), it signifies a relation between something and its beneficiary or user. To take a canonical example, a doctor's medical practice aims to bring about health. But the patient who is healed as a result may also be regarded as an end, insofar as she benefits from the doctor's art. To take another example, the roots of an oak act for the sake of drawing nutrients from the soil. But while the roots aim at the successful extraction of nutriment, the beneficiary of the process is the individual oak. The end of nutrient extraction is at once the exercise of the proper function of the roots (*finis cuius*), and the flourishing of the individual tree (*finis cui*). We can understand the *finis cuius* as the end-as-aim, the state toward which any local change is directed, and the *finis cui* as the beneficiary of the end or the user of the process.[21]

The distinction captures the ordinary intuition that not everything which is the result of an aim or target is thereby of benefit to another. Reproduction aims at the generation of offspring, but it is not obvious that, say, a foal is for the benefit of the mare. Typically, in the scholastic Aristotelian tradition, the end-as-aim provides the primary causal meaning of the end. Effective actions—the curing of a patient, the flight from the wolf, the drawing of nutrients—are guided by the natural ends-as-aims—state of good

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ways…) The arts, therefore, which govern the matter and have knowledge are two, namely the art which uses the product and the art which directs the production of it" (194a36), and again in *De anima* II.4 (415b1-3): "The phrase 'for the sake of which' is ambiguous; it may mean either the end to achieve which, or the being in whose interest, the act is done" (415b1-3); again: "that for the sake of which has two senses, viz., the end to achieve which, and the being in whose interest, anything is or is done" (415b20-22).

[21] As with other distinctions of significance, there is a healthy diversity of views among commentators. The interpretation of the distinction as presented here follows Suárez and the Coimbra commentators; and as Maier, *Metaphysische Hintergründe*, 280n13, points out, it is also more widely held.

health, the removal of danger, the provision of nutrition—for the sake of which they are performed. As Maier notes, the end construed as *finis cuius* did not present very many difficulties for the Aristotelians.[22] The aim of any action is in the first place simply the realization of a natural terminating point of that activity. In the second place, the end of any action resolves into God's purposes in creation.[23] In the Christian Aristotelian framework, the aim of any natural change, its *terminus ad quem*, follows, in the first place, from the definition of natural change as the actualization of a tendency to some particular state. In the analysis of change, *finis cuius* is simply that state toward which an action is directed. But in the second place, the aim of every natural change is directed toward God, insofar as all natural beings, rational or otherwise, are subordinated to God's purposes in creation. In that respect, every natural change aims to bring about a divinely-intended state of the world. The totality of nature, thus, is construed as a structure of ends in service of an ultimate end in the divine mind. At the same time, Suárez allows that,

> it is true that out of the things themselves which he [God] made, certain ones are ordered to others as to ends or, rather, all are connected among themselves so that some are of service to others in turn, and in this way under God himself other common or universal ends can be assigned to which individual creatures, together

[22] Maier, *Metaphysische Hintergründe*, 281; also, Des Chene, *Physiologia,* 172.
[23] The case is similar for the end of the beatific vision, which for Suárez is the proper function of rational, created agents: "This is confirmed: for the *finis cuius* includes, as I will say below, the object of activity, as God is the object of activity with respect to the beatific vision. Hence, not only does a human being love the vision of God for himself, but he also loves God himself with the concupiscent love pertaining to hope, as the theologians teach" (DM 23 2.4).

> with their private ends, are ordered by the Creator himself, especially toward the order or beauty of the universe.[24]

The cosmological ends of nature find expression in familiar Aristotelian principles such as that "nature does nothing in vain," or "nature always follows the best course possible."[25] Suárez's appeal to beauty as an end of creation is uncharacteristic; for him, the question of the ultimate end of creation belongs properly to moral philosophy.[26] The Coimbra commentators, by contrast, exhibit a penchant for invoking cosmic order and beauty.[27] In defense of the dictum that nature abhors a vacuum, for instance, they assert that in all corporeal parts there is a mutual love of conjunction and society, and that drops of water form into a sphere because the sphere provides the greatest conciliation of union.[28] Principles of universal harmony and sympathy among created beings appear here as the kinds of principle that stitch together local changes into a unified design for nature. The schematic admits of both universal and local application. The notion of an end as an entity's functional role in a system can be applied in the context of the cosmos as a whole, in ecological relations among entities in a bounded region, or in the analysis of the

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[24] DM 24 1.15: "Unde, licet verum sit ex ipsis rebus quas creat, quasdam ordinare ad alias ut ad fines, vel potius omnes ita inter se connectere ut aliae aliis vicissim deserviant, atque hoc modo sub ipso Deo assignari possint alii fines communes vel universales ad quos singulae creaturae, praeter privatos fines, ordinantur ab ipsomet creatore, et praesertim ad ordinem vel pulchritudinem universi."
[25] Found widely throughout Aristotle's works, for example, at *De caelo* II.11 291b13; II.5 288a2-3; *Physics* VIII.7 260b22-23; *Gen et cor* II.10 336a27; *Parts of Animals* III.1 661b30-32.
[26] DM 24 *proemium.*
[27] Unsurprisingly, the Coimbrans refer heavily to Aristotle's *De caelo*, in which Aristotle deploys in his explanations, perhaps more than in any other work, optimality principles, or what Leibniz would later call "architectonic" principles.
[28] *Phys*. IV.ix.q1a3; see also Des Chene, *Physiologia*, 175-6.

capacities of a complex system such as plant physiology or an animal eye. At any level of generality, one could admit ends in nature without attributing to them causality.

2.2 Individuals as ends

The other species of end, the beneficiary, by contrast, poses more difficulties. Worries such as the one about offspring being for the benefit of parents, and the dubious suggestion that benefit to the farmer might be a cause of rainfall, lead some authors, such as John Buridan, to dismiss the second notion of end, the *finis cui*, as a causal concept altogether. For one thing, it is not at all clear that many common kinds of natural change, such as the birth of a new individual, have a beneficiary. A foal is not obviously for the benefit of the mare, and the thought that rainfall is for the benefit of the farmer has struck many, in antiquity and today, as suspicious. Still more puzzling would be the claim that every local change, even the falling of a stone, should have a beneficiary. Most authors, however, maintain that every instance of end-directed motion has a beneficiary, and its correct identification is part of a full explanation of the phenomenon. One approach to attaining univocality instrumentalizes the *finis cuius*: tendencies toward changes of state grounded in the powers and dispositions of substances are not so much ends as efficient causes of their activities. Only the beneficiary is an end in the proper sense. But taking this position to the extreme, Buridan admits only one beneficiary, namely, God, which effectively eliminates final causes from the natural world altogether.[29]

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[29] Maier, *Metaphysische Hintergründe*, 305-18; Des Chene, *Physiologia*, 172-3.

True to his conciliatory temperament, Suárez aims to unify the two kinds of end such that "the proper *ratio* of an end can be saved in each of these [*finis cui* and *finis cuius*], though sometimes they are so conjoined that one complete end coalesces from both [*ut ex utroque coalescat unus integer finis*]."[30] In contrast to those who deny causality to the end-as-beneficiary, Suarez's strategy is to subordinate particular aimed-for ends to the intentions of a user or beneficiary. Suárez notes that each end, the individual human being, as well as health, can on its own incline the will to select it; general care for the self, just as much as concern for a particular aspect of one's well-being, can serve as a motive for choice. In seeking health, the human being has both herself (the *finis cui*), as well as a particular state of health (the *finis cuius*) as ends. But this circumstance does not entail the reduction of the end as *finis cuius* to mere means, so that medicine would only be sought in order to remove illness. The end of health as the aim of medical activity, rather, might be desired for its own sake, since it perfects the human being for whom (*cui*) it is sought. Thus, Suárez concludes: "this whole, the healthy human being, is the complete and adequate end of that action."[31] The aim and the beneficiary of volitional acts coincide in the human being as *finis integer*.

The integration of the particular ends of an individual—say, finding food, respiring, taking baths, the beatific vision—ultimately requires appeal to the doctrine of substantial form. The notion, much maligned by the mechanical philosophers, serves, in the first place, as a principle of individuation that confers an essence to a material substance, a set of properties that determine a certain part of matter as falling under a

[30] DM 23 2.5.
[31] DM 23 2.5.

particular genus and species. In the technical language of the scholastics, substantial form actualizes matter, making it be a certain thing characterized by a determinate suite of powers or capacities. The ovine form confers on a sheep the set of capacities that determine it to grow a wool coat, to flee the wolf, and to be herded by sheep dogs. Likewise, the form of a heart accords to a certain part of the sheep a definite structure and function. In constituting a hylomorphic substance, the substantial form also functions as the principle of identity over time, and accounts for both change and unity.[32]

Besides a purely formal interpretation of substantial form as a structure of attributes of a possible individual, later Aristotelians increasingly understood it as a physical principle. In this sense a substantial form is the principle that organizes the parts of an individual into a unified stucture in virtue of which the individual produces its various appearances. By composing the matter and form of a physical being, the substantial form defines its nature. As Robert Pasnau notes, substantial form increasingly came to be treated as a kind of internal efficient cause sustaining and regulating a material individual. This conception of the substantial form was widely maintained, even by detractors of final causes such as Buridan, and, Pasnau suggests, gradually assumed priority in the scholastic metaphysics of natural substance. It is central to Suárez, who emphasizes its theoretical role in unifying the powers and operations of natural beings in a single essence: "the most powerful arguments establishing substantial forms are based

[32] See Robert Pasnau, *Metaphysical Themes: 1274-1671* (Oxford: Clarendon, 2011), 552-9, for further discussion; also, Des Chene, *Physiologia*, 64-75.

on the necessity, for the perfect constitution of a natural being, that all the faculties and operations of that being are rooted in one essential principle."[33]

To the extent that one construes faculties and accidents as ends toward which natural change tends, the physical substantial form unifies the particular ends of an individual substance. The substantial form of a sheep integrates the ends of grazing for food, growing a wool coat, running from the wolf, as well as the metabolic processes that preserve it in a well-functioning state. Insofar as one regards the organized and self-organizing individual as a *finis cui*, or the beneficiary for whose sake those particular end-directed procesess take place, the substantial form can also be viewed as the principle that defines Suárez's whole, healthy human being as *finis integer*. But, while Suárez grants this status to the human being, it is less clear that he can place a sheep or an oak, still less earth or fire, on equal footing. The reason for this restriction leads to the question of the causality of an end, or the conditions under which an end may be identified as a causal factor in the actualization of a state. In later scholasticism, such conditions are increasingly those of rational cognition and volition. While Aristotelians of all stripes agree that the stone descends for the sake of reaching the center of the universe, they are reluctant to attribute to the stone a capacity to relate to that end as its

[33] DM 15 10.64 (trans. in Pasnau, *Metaphysical Themes*, 561-2). The Coimbra commentators concur: "In all it cannot be denied that, for each and every natural thing, there is a substantial form, by which it is established, through which its degrees of excellence and perfection among physical composites is selected, on which every propagation of things depends, from which its aspect and character is stamped on each thing, which undertakes whatever task there is in nature given its power, which elicits all actions both of life and of all other functions, to which support accidents come, as if instruments, and finally, which marvelously distinguishes and furnishes the theater of this admirable world in its variety and beauty" (*Phys*. I.ix.q9a2, Pasnau trans. in, *Metaphysical Themes*, 562).

own end. Suárez, following a line of thinkers reaching back to Avicenna, maintains a tight connection between cognition and final causation: "in order for the end to cause, it is entirely necessary for it first to be cognized."[34] Although ends that guide efficient causes exist everywhere in nature, they may be admitted in causal explanation only in the case of rational agents. For a variety of reasons, the causality of an end becomes restricted to intellectual representations of states of affairs as good, which could move a rational will. Only in cases of conceptual cognition of the good as good, denied to sheep, oaks, or stones, may the end be considered a cause of the action. The question of the causality of the end leads to the question of what counts as a cause in general.

3. Efficient cause as a new paradigm

Aristotle did not offer a definition of cause in general beyond glossing it as that which answers a 'why' question. Instead, he identified four kinds of answer to such questions: the material, formal, efficient, and final causes of any thing, fact, event, or state of affairs.[35] A basic division among the four causes distinguishes intrinsic (material and formal) from extrinsic (efficient and final) causes, a division retained throughout the later Aristotelian tradition. Intrinsic causes are principles that compose a substance, while extrinsic causes are responsible for bringing about change. Thus, the bronze is the

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[34] DM 23 7.2: "ut finis causet, necessarium omnino est ut praecognitus sit". Citing this passage from Suárez, Scheibler concurs: "the end does not exercise causality, except as moving the agent to act by being desired and loved. But desire or love, because it is an act of will, necessarily presupposes intellection or cognition… And from this it is drawn out, that an unknown thing [*incognitum*] cannot be an end" (*Opus met*. I.xxii.t25.a3.q4).

[35] *Physics*, II.3 194b17-195a3.

material cause of the statue, its figure the formal cause. Its production, meanwhile, requires the sculptor as efficient cause acting for the sake of fulfilling the terms of his commission to the city, the final cause of the statue's existence. In Aristotle's methodology, each of the causes occupies an essential place in a complete explanation, and the student of nature ought to identify each of the four. Nevertheless, in several places, Aristotle emphasizes the primacy of final and formal causes over the material and efficient.[36] The priority of the final cause, especially, is repeated widely in the later tradition, with Aquinas' declaration of the end as the "cause of all causes" perhaps the most famous.[37]

The question of a generic definition of cause yielded a rich diversity of proposals. In particular, later Aristotelians were concerned to formulate a definition of cause that would distinguish it from a mere principle of reasoning, or an item that could serve as a premise in a deductive syllogism.[38] If the notion of cause should have a distinctly

[36] For example, *Parts of Animals* I.1 639b14-15; *Gen et cor* II.9 335b35.
[37] "Also, the end is not the cause of that which is the efficient cause, but it is the cause of the efficient cause being an efficient cause; [for example health does not cause the doctor to be a doctor I am speaking of the health which comes about by the doctor's activity but it causes the doctor to be an efficient cause. Therefore the end is the cause of the causality of the efficient cause, because it causes the efficient cause to be an efficient cause.] Likewise, the end causes the matter to be the matter and the form to be the form, since matter receives the form only for the sake of the end and the form perfects the matter only through the end. Therefore we say that the end is the cause of causes, because it is the cause of the causality in all causes" (PN, c4). The thought is retained in seventeenth century Aristotelianism as well, as Eustachius concurs: "necesse est ut finis caeteras omnes causas origine saltem praecedat, quatenus nempe movet & excitat ipsum agens ad operandum" (*S. Phys*. I.ii.d2.q6).
[38] Even here, there's an apparent problem for the final cause that is widely recognized: an Aristotelian principle is always the first item in a chain of reasoning or the first in explanation. But the end is what occurs last. The problem receives a standard answer in the tradition: the end is last in execution, but the first in intention. That is, it is first in the

physical interpretation, as the end-agent structure of explanation appears to require, it must play a role distinct from the one that, for instance, geometrical axioms play in Euclidean proofs. The Coimbrans, for instance, identify four options before offering their own preferred definition of cause: "Cause is that on which something else *per se* depends."[39] The cause, they explain, is that without which an action would not occur, when certain requisite conditions obtain.[40]

Suárez's novel contribution to this development rests in his physicalist interpretation of counterfactual dependence, such that a cause is to be distinguished from other general principles of reasoning by the condition that it should be a productive entity, in virtue of the activity of which a change in another entity comes about.[41] This narrowing of the meaning of cause gets expressed in Suárez's own generic definition a

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sense that action begins from the recognition of the end, even though it occurs last in the order of existence, e.g., ST I-II.q1.a1; DM 12 3.3.

[39] Pseudo-Plutarch's, "Causa est, per qua aliquid contingit"; Avicenna's: "Caussam censet esse, id quod tribuit esse rei"; Boethius': "Caussa est id, ad quod aliud sequitur"; and their own: "Caussa est id, à quo aliquid per se pendet" (Phys. II.vii.q1a1). The Coimbran commentators are in fact following verbatim their elder colleague Pedro Fonseca's definition in his 1585 commentary on Aristotle's *Metaphysics* (Comm. Met. I.vii.q1a3). Eustachius offers a similar definition, after emphasizing the distinction between cause and principle: "licet omnis causa sit principium, non tamen omne principium esse causam proprie dictam. Causa igitur sic accepta definiri solet, Id à quo aliquid per se pendet" (*S. Phys.* I.ii.d1.q1).

[40] Robert Schnepf, "From Scholasticism to Modern Physics - and Back? The Transformation of Traditional Causal Concepts in Descartes and Occasionalism," in *Thinking about Causes,* eds. Peter Machamer and Gereon Wolters (Pittsburgh, PA: Pittsburgh University Press, 2007), 81-2, observes that the Coimbran definition reflects an important development in the Aristotelian tradition, beginning with Scotus and Ockham, toward an analysis of causation as counterfactual dependence.

[41] This was certainly not a novel development. Frede, "Original Notion," convincingly argues that this conception of causation emerges with the Stoics, and appears already to have been the common view in Sextus' time.

few years later: "Cause is a principle *per se* inflowing being to something else."[42] With the phrase '*per se*' Suárez explains that he intends to exclude accidental dependence relations and privations as proper causal factors. And with his graceless use of the verb *influit*, which in ordinary usage might, for example, involve a river flowing into the sea, he intends to capture a distinction between causal powers and the necessary conditions for their exercise. Fire *per se* inflows heat into water. But fire also needs to be proximate enough to the water, a circumstance necessary for fire to operate its power but still a distinct kind of factor in the process.

The key challenge resulting from this definition, which Suárez takes up in the next fifteen disputations, is to explicate the sense in which formal, material, and final causes "inflow being" into another entity. For, as Suárez is well aware, his general definition of cause closely approximates a standard conception of the efficient cause as an agent that brings about change in the quality, quantity, or place of something else. Indeed, in his comparison of the four causes in DM 27, he affirms that efficient causes most properly inflow being, particularly in contrast to material and formal causes. The latter, according to Suárez, are not principles of activity at all, but rather of the composition of a thing, and thus are only called causes analogically. While matter and form have the title of "principle," a source of reality, Suárez pointedly maintains that they are called causes only by convention.[43]

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[42] DM 12 2.4.

[43] "Nam [causa] efficiens propriissime influit esse: materia autem et forma non tam proprie influunt esse, quam componunt illud per seipsas, et ideo secundum hanc rationem videtur nomen causae primo dictum de efficiente: ad materiam autem vel formam esse

Yet, Suárez is concerned to retain parity between the two extrinsic causes. Immediately following the definition, he emphasizes that the verb "inflow" should be taken in a general sense as "giving or communicating being to something else," with which he hopes to capture adequately the other three causes, and especially the final cause which "also inflows into being by that way in which it moves."[44] Wishing to follow Aristotle in philosophy and St. Thomas in theology, Suárez wants to uphold the centrality of the final cause. Yet, he struggles. For even though the final cause is conceptually prior to the efficient for the reason that the activity (not the existence) of the efficient cause depends on its being moved by an end, he admits it is still the case that,

> because the influence of the final cause is very obscure, especially with respect to real and physical change, one may briefly say that even though the final cause might be prior in the order of intention, the efficient cause is nonetheless first in execution; *indeed, it is even that cause alone which really influences or moves* per se *and extrinsically.*[45]

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translatum per quamdam proportionalitatem. Unde licet illae duae causae sint proprie partes essentiales, et principia intrinseca rei naturalis, causae vero dictae videntur per dictam analogiam, licet iam secundum communem usum simpliciter sit illis tribuendum nomen causae" (DM 27 1.10). Eustachius' summary presentation clearly draws on Suárez: "rationem formalem causae, quam *causalitatem* appellant, positam esse in reali influxu in effectum; ità ut *causare* effectum nihil aliud sit quàm realiter in ipsum influere communicando illi esse" (*S. Phys* I.ii.d1.q1).

[44] DM 12 2.4: "Sumendum est autem verbum illud *influit*, non stricte, ut attribui specialiter solet causae efficienti, sed generalius, prout aequivalet verbo dandi, vel communicandi esse alteri… causa etiam finalis eo modo quo movet, influit etiam in esse, ut postea declarabitur."

[45] DM 17 1.3; emphasis added. "Sed tunc occurrit tertia difficultas, quia definitio sic declarata potius convenit causae finali quam efficienti; est enim finis principium per se et extrinsecum et est prius in causando quam efficiens; nam efficiens non agit nisi motum a

Suárez, as Anneliese Maier notes, may be regarded as culminating a tradition beginning with Avicenna of a gradual repositioning of the four Aristotelian causes such that not only are matter and form reduced to an analogical sense of cause, but also the efficient cause attains prominence over the final.[46] To the extent that formal attributes of a physical substance are part of the explanation of natural change, their contribution is interpreted as the efficient causality of substantial forms. The causality of the end, meanwhile, will now be understood as a "metaphorical motion" of the will elicited by an intellectual judgment, thus restricting final causation to the activity of rational agents. The locution of metaphorical motion comes from Aristotle's *On Generation and Corruption*, where he uses the phrase to contrast the role of the end from that of the active power in producing an outcome. Health, Aristotle tells us, is a non-active cause in the process of healing, and therefore its contribution to change or motion is called metaphorical.[47] Suárez's interpretation of the notion will depart from Aristotle's.

Suárez's definition of cause would prove to have lasting significance—one need only glance at the debates between occasionalists, physical influx theorists, and friends of sympathies and antipathies in the seventeenth century to appreciate the impact of his

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fine, et ideo causa finalis solet dici prima inter omnes causas. Sed quia influxus causae finalis valde obscurus est, maxime respectu physicae et realis mutationis, ideo breviter dicitur, etsi ordine intentionis causa finalis prior sit, tamen in exsecutione efficientem causam esse primam; immo illam solam esse quae per se et extrinsece realiter influit seu movet". See Schmid, *Finalursachen*, 109-121, for an elaboration of Suárez's "influxus" theory as paradigm of causation.

[46] The classic account of the second part of this transformation is in Maier, *Metaphysische Hintergründe*, Ch. V, and in particular her discussion of Buridan's attempt to reduce final causes to efficient causes.

[47] *Gen. et Cor.* I.7 324b13-17.

allegedly barbaric use of *influere*.[48] More directly to our purposes, the Suárezian definition (and its forerunners in Coimbra and Fonseca) turns up in numerous German textbooks of the seventeenth century, which Leibniz and Wolff would have encountered at Leipzig and Jena.[49]

4. Final causes and cognition

The flip side of the transformation of Aristotelian causality invites scrutiny into the reasons for restricting the final cause to rational action. The core motivations of later scholastics to circumscribe the causality of the end to rational agents originated in worries about backward causation and the causality of non-existent entities, in the context of a production model of causation in general. The resulting picture treats rational agents, who are able to cognize themselves as beneficiaries of their end-directed acts, as the proper domain of final causes. Thus, final causation requires, first, an intellectual judgment of truth with respect to some actual or possible state of affairs; and second, a will responsive to intellectual reasons to elect a represented end as its aim. The instinctual

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48 Eileen O'Neill, "Influxus Physicus," in *Causation in Early Modern Philosophy,* ed. Steven Nadler, 27–56 (State College, PA: Penn State, 1993), offers a brief history of the physical influx theory leading up to Leibniz's influential division into the three systems of occasionalism, physical influx, and his own pre-established harmony. In 1670 Leibniz singled out for criticism the grammatical awkwardness of Suárez's definition, in particular the unusual transitive use of *influere,* as a "most barbarous and obscure expression" (*Preface to an Edition of Nizolius*, G IV 148; L 126).

49 Scheibler, for instance, explicitly follows Suárez: "Causa est principium, unde (vel a cuius influxu) pendet aliud" (*Opus met.* I.xxii.t2.a2).

goal-directed acts of non-rational creatures, meanwhile, are referred to God's designing intentions.

To be clear, Suárez never denies that, in its own way, every agent, divine, human, or natural, acts for the sake of an end. Nevertheless, final causation is most properly ascribed to humans, for it is "better known to us in created intellectual agents and it has more of a certain quality and special mode in them."[50] Intellectual agents are able to cognize ends and means, their relation to one another, and learn the nature of each. And finite intellectual agents, unlike God, have genuine needs for the sake of which they set and pursue ends. In privileging the teleology of human nature, Suárez reflects a distinctly modern anxiety about preserving normativity in the human subject in the face of its erosion from the cosmos at large.

His defense of final causation is not entirely free of tensions and his focus on the human case partly results from a recognition of difficulties in upholding a wider realism about natural teleology, specifically of attributing freedom and judgment to non-human creatures. Suárez structures his account of final causation as a defense of the familiar Thomistic position that, "the efficient cause, unless it is to act blindly, must act for the sake of something."[51] He raises a series of doubts (six in all) about the causality of the end, of which we shall consider two. The place of final causation in Suárez's general

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[50] DM 23 1.8: "Causalitas ergo finis licet suo modo locum habeat in actionibus horum omnium agentium, tamen in creatis agentibus intellectualibus nobis notior est, et maiorem quamdam proprietatem, et specialem modum habet."
[51] DM 23 1.7: "causa efficiens nisi temere agat, alicuius gratia agere debet."

theory of cause culminates in his account of rational agency as presupposing a functional organization of spontaneously active cognitive faculties.

The first objection results directly from Suárez's definition of cause: "it belongs to the *ratio* of a real cause *per se* and really to inflow into the effect… but an end does not really inflow being into the effect; therefore it is not a cause."[52] Were the end to be a cause, it should either effect change before it existed or after. But non-existent things cannot have causal influence; and upon the coming into existence of the end, the activity of the agent stops, thus the causality of the end is no longer needed. Recall that, in Aquinas's formulation, the causality of the end consists in its being the "cause of the causality of the efficient cause," or the reason why the efficient cause brings about the change that it does. But if existence is a condition for a cause to exercise its causality, and the end does not exist unless the activity of the efficient cause has been completed, it is hard to see how the end could act as a cause.

Closely related is the "principal reason" for doubting the causality of the end: "the end can be considered in its *ratio* either as a principle moving and enticing the agent to act, or as a *terminus* to which the action tends… But under neither *ratio* can an end have the true *ratio* of a cause."[53] On the one hand, the end cannot be a cause in the sense of a *terminus* of action, for then it should rather be regarded as an effect and not as a cause. As a mere *terminus,* the end is ill-suited to fulfill the criteria of Suárez's productive

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[52] DM 23 1.2: "de ratione causae realis est ut per se ac realiter influat in effectum… sed finis non influit esse realiter in effectum; ergo non est causa."

[53] DM 23 1.4: "finis considerari potest aut in ratione principii moventis, et aliicientis agens ad agendum, vel in ratione termini ad quem tendit actio… Sed sub neutra ratione potest finis habere veram rationem causae."

notion of a cause, since it only comes into existence at the completion of a productive act. Nor, on the other, can it properly be regarded as a motive principle, since the motion of the end is only metaphorical;[54] the role of food, for instance, in producing appetite is not the same as the role of an active power such as fire in producing heat. And, it is only in a metaphorical sense, Suárez emphasizes, that one may speak of God as being moved by the end of communicating himself to creatures, or stones as wanting to reach the center. For God does not act for the sake of fulfilling needs, and stones don't have desires. At this stage, Suárez raises the specter that he would later concede: a conception of final causation as metaphorical motion, together with that of causation as production, undermines internal goal-directedness in all beings lacking intellect and will.[55]

One response to the problem of theorizing internal goal-directedness, which would have been available to Suárez from the tradition, is to place a cognitive condition on final causation, so that the end may not be considered a causal factor except insofar as it is cognized. Already in the tenth century, Avicenna had responded to the problem of the causality of non-existent things and of backward causation by restricting final causation to the realm of cognitively mediated actions. He maintained that the end "is not a cause unless it is realized as an image in the soul or as whatever plays a similar role."[56] That is, the end causes only insofar as it is an object of thought, which moves the desire and appetite to pursue the cognized good; the end considered as existing independently of

[54] The origin of the notion is traced to Aristotle, cited by Suárez: *Gen et cor* 324b14-17. As usual, see Eustachius, *S. Phys.* I.ii.d2.q6, for a summary of the position.
[55] "if an end has the character [*ratio*] of a cause under this notion [i.e., of metaphorical motion] alone, then—at least with respect to natural agents—the end cannot be a real cause, because it cannot move or entice [such agents] to act" (DM 23 1.4).
[56] *Met. Healing*, VI 5.28 (translation modified).

the soul cannot be a cause of an action. Note that Avicenna's formulation, as well as Aristotle's account in *De Anima* III.10, which Suárez cites in this context, seems to admit both sensible and intellectual mental states as final causes. The state, as impressed on the soul by external objects or produced as idea in the mind, could be an object of either sensible or rational appetites. But Suárez, as we shall see, denies that sensible ends are immanent causes. For him, sensible ends need to be formally cognized in order exercise causality. Part of the attraction of the cognitivist proposal accrues independently of considerations about the non-human rational world from the common phenomena of wishful thinking: even a non-existent and non-realizable state of affairs may effectively move an agent, as long as its representation in the mind sufficiently motivates the will to pursue it, as abundantly attested by experience.

At the same time, however, Suárez is attracted to a different, realist position on final causes. He recognizes a worry with any kind of cognitivism, which is the result that it seems difficult to treat objective, as opposed to represented, states of affairs as the ends of voluntary actions. That is, it threatens a different intuition, that motivationally effective representational properties should be grounded in non-representational properties of real objects. Averroës, for instance, whom Suárez agrees with in this matter, objects that in desiring a bath, one's end is the actual bath, not the image of the bath in one's soul. Avicenna's image in the soul, which excites the will, according to him, should rather be construed as an *efficient* cause, one in a chain of mediating causes leading to an act, which aims at a real outcome in the world: "The form of the baths, insofar as it is in the soul [i.e. as image] is the efficient cause of the desire and of the motion, and insofar as it is outside the soul [i.e. the bath] it is the end of the motion, not its agent."[57] The end, should it operate as the cause of the causality of efficient cause, must be a state of the world conceived as existing independently of any representation of it.[58]

The debate between the two positions, hence the possibility of locating a middle ground, turns on two key issues. The first concerns the distinctness of the final cause from efficient cause, insofar as the latter can be identified with the cognition of the desired end. That the image in the soul should be an efficient, rather than a final cause of action rests in an Aristotelian commitment to locate the four causes at distinct moments in the occurrence of change. If every efficient cause acts for the sake of an end, which Suárez accepts as a conceptual truth, then the end must not be identical to the producer except in the special case of God, who efficiently creates, conserves, and concurs with nature in order to communicate his goodness. But given the limited nature of enmattered beings, external ends have to figure as reasons for their acts. Swallows and humans, unlike God, build nests or take baths for the sake of their perfection *qua* swallow or human. Since a mental item such as an image or a judgment possesses merely cognitive being (*esse intentionale*, or *esse cognitum*), it is better classified, on the realist view, among the efficient causal conditions determining the act. If the end is to be a distinct

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[57] *Met L*. text 36 [1072a26ff.].

[58] Averroës' discussion is embedded in a broader treatment of the causality of the prime mover. The larger point is that being enmattered—of the bath, and of the individual human being—leads to a need to distinguish efficient and final causes. When the object of desire is immaterial, as in the desire of finite beings for the prime mover, the object imparts motion both as efficient and final cause.

kind of causal principle, it must somehow be identified at the site of the actual or intended activity, namely, the nest or the bath considered as real being (*esse reale*).[59]

The second question, meanwhile, centers on an ambivalence between the status of the end as cause and as aimed-at effect. The cognitivist position is partly motivated by the thought that the desired state of affairs in the world is better construed as a possible effect of an agent acting for the sake of its own needs or desires. If so, then the productive force of the end must somehow have one foot on the side of the subject, in order for her effective powers to make contact, as it were, with the desired end. But such a position is more easily accommodated by someone like Avicenna, who is willing to admit sensible ends as causes *qua* tendencies to act.

Suárez is sensitive to each of these intuitions. His solution attempts to secure real final causation in the case of rational action, one which does not reduce ends to modifications of the agent, while remaining within the confines of his influx theory of causation. It is no easy task, and one worries that his account ultimately remains unstable. But the instabilities, as we shall, get located on the side of rational psychology, in

[59] The distinction between *esse intentionale* and *esse reale* is central to many scholastic questions. For our purposes, it suffices to gloss this as a distinction between the ontological status of something *qua* an object of thought, and its ontological status as something real independently of its cognitive representation. For example, the doctor treats the patient for the sake of bringing about actual health (its *esse reale*), not just for the sake of the idea of health in her mind (its *esse intentionale*); see Des Chene, *Physiologia*, 191-4. The question of whether the end is a cause with respect to its real being, or only its intentional being is common in discussions of the final cause by the seventeenth century; e.g. Eustachius, *S. Phys.* I.ii.d2.q7; Scheibler, *Opus met.* I.xxii.t25.a4.

balancing the competing roles of intellect and will. Suárez removes immanent final causes from non-human nature.

Suárez endorses the realist position he attributes to Averroës that the end moves according to its real being, so that its cognition is only a necessary but not a sufficient condition of final causation.[60] But at the same time, he affirms the opposite intuition that the end need not even exist in order to cause, for it is enough that the end is apprehended.[61] He needs to respond to the objection, then, that final causation is not possible because the end does not exist prior to action. For this, he invokes the distinction between an end-as-aim (*finis cuius*), and an end-as-beneficiary (*finis cui*). Here, he glosses the former as that for the sake of which an action is done, and the latter as that for the sake of which the end is acquired (*acquiritur*). He now targets the premise, that the end does not inflow being or produce change because it doesn't yet exist, by noting that the objection only goes through if the end is taken as the *aim* for which (*finis cuius*) the desired object is pursued. But it fails when the end is taken in the other way, as the agent who acts for the sake of their own advantage. In effect, he inverts the traditional priority of the first sense of final cause, the aimed-at-end, as the core, technical causal notion in Aristotelian physics, in favor of the rational agent as the "objective end or *finis cui*," or as the source of reasons for efficient causes.

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[60] "Between these views this latter one [i.e., the realist] seems to me to be true, strictly speaking. And the whole matter appears so clear that there can hardly be strength for dissenting except some equivocation in the words themselves" (DM 23 8.6).
[61] "neither the being of a true essence nor the being of possible existence is really necessary for causing finally [*causandum finaliter*]" (DM 23 8.7).

With this adjustment, Suárez grants that, on the cognitivist solution, the end is indeed not a real cause except insofar as an appetite aims at a representation. But while the aim, the intended bathing on account of which Averroës walks to the bathhouse, for instance, need not exist except in the mind, Averroës, the agent who acquires bathing for his own sake, must really exist, and his action should be regarded as resulting from reasons grounded in his free decision. Represented ends, in other words, are subjective ends of agents *qua* reasons for actions. But they are regarded as a distinct kind of causal factor, one not reducible to a chain of mediate efficient causes, in virtue of being formally and not just materially apprehended as being good for the agent. Since this requires judgment, final causation necessarily involves cognitive agents.

What makes final causation real, for Suárez, involves the requirement that sensible content, or the object of sensible appetites, be rendered into an intellectual form that a rational appetite, a free will, can elect or not elect. The intellect's apprehension of an object, its formal judgment of truth or falsity, presents reasons to the will to pursue or avoid the proposed state. But the represented end only *becomes* a final cause, or exerts influence of a sort which is not the necessity of efficient causes, or the necessity of a determining condition leading to production, insofar as it becomes the object of a will freely determining itself to elect the good.[62] Final causes, in other words, originate in the spontaneous activity of intellect and will. For final causation, Suárez writes,

[62] DM 19 4.1: "a free cause is one which, with all the things required for acting having been posited, is able to act and able not to act."

> it is sufficient that it [the end] exist in the intellect's apprehension and judgment. This is because the motion is intentional and (as I will put it) animal, coming about through the sympathy and concordance of the powers of the soul, namely the intellect and will.[63]

Intellect and will thus stand in close dependence. But the will assumes important priority, for Suárez, in virtue of being genuinely free. The immanent act of intellect consists in judgments of truth or falsity, or assent. The act of will consists in freely electing or not electing possible courses of action.[64] The act, or motion, of the will here has two senses, and this brings Suárez back to the doctrine of metaphorical motion. In the first place, the influence of a represented end elicits the will. When an agent is moved to pursue an end—to take a bath, to see the doctor—her will elects or chooses the end. In this sense the causality of the end is metaphorical, because the will's aim lies outside it in the intellect. But its *real* act results from spontaneity, from the will considered as an active power intrinsically directed toward the good. The will, as a real causal power, certainly needs an end-as-aim to motivate it, and it needs such motives to be presented to it as

[63] DM 23 1.11: "et de illo recte responsum est, sufficere quod sit in apprehensione et iudicio intellectus, eo quod eius motio intentionalis sit, et (ut ita dicam) animalis, per sympathiam et consonantiam potentiarum animae, intellectus scilicet et voluntatis."

[64] For Suárez, there is an important difference between intellect and will with respect to freedom. The intellect is not free insofar as it cannot judge as true what is presented to it as false, and vice versa. It is constrained by the material content of representations. It likewise cannot assent in cases of indifference, i.e when the content of two representations appears identical. Only the will, for Suárez is truly free, for it can choose not to pursue the intellect's judgments: "[the will] is determined by the intellect with respect to sufficiency, but it determines itself with respect to efficacy" (DM 8 4.11); see Sydney Penner, "Free and Rational: Suárez on the Will," *Archiv für Geschichte der Philosophie* 95, no. 1 (2013): 25-6.

intellectual judgments.[65] But as an efficient causal power, it is internally directed toward the good for itself as free rational agent. Put another way, to the extent that the will is moved by an intellectual judgment of a state of affairs as good, its motion is due to an aimed-at end. But to the extent that the will is moved intrinsically to elect the good, its motion is an actualization of its own natural capacity to determine itself without external influence. In this latter respect, the act of the will results from its own *efficient* causality for the sake of its internal principle to pursue the good and to avoid evil. Just as the intellect spontaneously judges content presented to it by following its internal, formal principles of judgment, the will freely acts for the good in electing courses of action. Thus, Suárez writes:

> one and the same action of the will is caused by the end and by the will itself, and insofar as it is caused by the will it is effective causality but insofar as it is caused by the end it is final causality. And for the former reason it is real and proper motion, because such an action flows from the power as from a proper physical principle, but for the latter reason it is a metaphorical motion, because it flows from an object enticing and attracting the will to itself.[66]

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[65] In slogan form, the will is blind and needs the intellect to see for it, as it were.

[66] DM 23 4.8: "ita aiunt unam et eandem actionem voluntatis causari a fine et a voluntate ipsa, et prout est a voluntate esse causalitatem effectivam, prout vero est a fine esse causalitatem finalem, et priori ratione esse motionem realem ac propriam, quia talis actio manat a potentia ut a proprio principio physico, posteriori autem ratione esse motionem metaphoricam, quia manat ab objecto alliciente et trahente ad se voluntatem." The distinction is that between *first act* (with respect to the will as efficient cause), and *second act* (that due to the final cause); DM 23 4.4-5.

The crucial point, once again, is that the concordance of intellectual judgment and free election is a condition for a mental state to *be* a final cause. Without the intellect's formal apprehension of some sensible content—that is, bringing sensible species into a form that makes possible judgments of truth and falsity—and without the consenting act of will, a mental state would remain an inert modification of the soul, as an effective cause of naturally necessary effects, but not as an end of free agency. To the extent that faculties governed by norms of truth and goodness are required for a state to function as an end, rather than as a condition in a chain of causes, Suárez claims a distinct causal role for ends. Cognized ends influence action in a way distinct from how non-rational sensations and non-rational appetites influence action.[67]

Given the dialectical ends with which Suárez sets out—namely, to be a direct realist of Averroës's sort about final causes—one might object that this result should not be satisfactory by his own lights. Given his distinction between a real, efficient causal, and a metaphorical, final causal motion of the will, it seems that the causal role of ends-as-aims remains deflated, and his attempt to employ Aristotle's language of metaphorical motions just that, language. For if rational activity consists in the natural, spontaneous, efficient causality of the rational faculties, desired states would seem not to exert genuine causality, but at best to enter as conditions for the actualization of relevant efficient causal powers. Real ends in the world—an actual bath, a visit to the doctor—would simply figure as effects of the efficient causality of agents limited by their formal and material natures. Recall that formal and material causes, for Suárez, are not proper causes

[67] DM 23 8.10.

at all, but compositional principles of created substances. The actions of humans, just as those of dogs, oaks and the elements, might then be sufficiently explicable by efficient causal powers embedded in hylomorphic natures.[68] Suarez himself recognizes this worry, that as a cognized state, "the end is not related as a cause to the other [acts] but rather as a specifying *terminus* which participates more in the causality of the form."[69] That is, the contribution of the end in attracting the will seems more like that of a blueprint in the mind of a housebuilder than of a free choice of a good.

Such moves are common in the generations of philosophers following Suárez. For his part, in highlighting rational agency as that in which final causation appears most distinct, Suárez underscores the distinctive feature that cognized ends can be freely related to oneself as beneficiary. In doing so, he distinguishes functional teleology from what one might call rational or moral teleology. The psychology of rational animals certainly shares with non-rational creatures the teleological feature of functional organization. The organs of plants and animals occupy reciprocally specified causal roles, and constitute a system in which each part is for the sake of another. Such functional

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[68] As Suárez himself recognizes, in response to what he deems as an inadequate account of the metaphorical motion theory, "the end is not related as a cause to the other [acts] but rather as a specifying *terminus* which participates more in the causality of the form" (DM 23 4.4). Again, Buridan had already drawn the conclusion that Suárez wishes to avoid, namely, to reject the metaphorical motion theory, and to insist that when the end acts by enticing the will, it acts as an efficient cause of the motion of the will, thus effectively eliminating final causes (but not ends) from nature; see Maier, *Metaphysische Hintergründe*, 325. Vincent Carraud, *Causa Sive Ratio: La raison de la cause à Suarez et Leibniz* (Paris: Presses Universitaires de France, 2002), 145-63, argues that Suárez's position does amount to the sort of reduction of final causes to efficient causes that he wishes to avoid.

[69] DM 23 4.4: "finis non se habet ut causa, sed potius ut terminus specificans, qui potius participat causalitatem formae."

organization is a necessary condition of end-directed change. But by itself, Suárez insists, functional organization does not suffice for final causation, as a factor responsible for bringing about real change in the being of a thing. Instead, for action to be intrinsically goodness-directed, and thus for the good end to be a cause determining the state of a substance, the agent requires a capacity to cognize the good for itself. The relation between the rational faculties and their acts differs from the relation a heart has to its aim of pumping blood in that the intellect and will act for the sake of goods graspable as goods for the agent. In rational souls, particular soul-functions are not only subordinated to a higher end, which Suárez identifies with the "whole, healthy, human being," but these can also be freely pursued as one's own.

What about the rest of nature? Suárez's cosmos is not lifeless geometrical extension, as it would be imagined shortly after his time. Where rational agents are capable of, to a limited extent, ordering and cognizing their own ends, species-appropriate goodness for other creatures lies in divine providence. On Suárez's picture, while the swallow does not build its nest for the sake of a cognized end of raising its young, it is nevertheless directed toward its ends by God's guidance of its otherwise blind, efficient causal powers. Insofar as the swallow's act stems from its own dispositions, it is merely efficiently caused; but insofar as it is divinely directed, it is final causation. The reason for this restriction is, once again, that animals perceive the good only "materially," or only insofar as it is available to them through the senses. The apprehension characteristic of rational intellects, and necessary for a judgment to be elected by the will, is absent in the swallow, whose appetites result from the necessity of its instincts. Lacking a principle for representing goodness or utility to itself, its act remains a merely "material motion of the end rather than formal," and thus imperfect.[70] For Suárez, "natural agents themselves are not said to act for the sake of the end, as instead to be directed to the end by a superior agent."[71] Yet, it is equally an error, Suárez thinks, to regard animals as stones or other inanimate things, for the reason that, despite lacking a free will, they nevertheless have something analogous to rational appetite. We must not, he warns, conceive animals as mere, lifeless machines, moving as iron is drawn by a magnet. While we cannot attribute to animals the capacity to relate ends and means or to cognize utility in their actions, experience sufficiently suggests an analogue of cognition and desire guiding animal natures.

We are perhaps left at an anti-climax. In attempting to recover a realist conception of final causation, Suárez ends up entrenching the cognitivist view, and cleaves apart natural and moral or rational teleology.[72] In the end, even the causality of a merely potentially existing end, on his account, requires an intellect and will working in conjunction. Suárez begins and concludes his response to objections by distinguishing the causality of the end with respect to three kinds of agent: God, created rational agents (i.e.,

[70] DM 23 10.15: "Nihilominus tamen, addendum est illam causalitatem adeo esse imperfectam in eo genere ut sit quasi materialis motio finis potius quam formalis."
[71] DM 23 10.5: "Et ideo ipsa agentia naturalia non tam dicuntur operari propter finem, quam dirigi in finem a superiori agente. Ita explicarunt rem hanc sapientiores theologi et philosophi, D. Thom., 1 part., q. 103, a. 1, et III cont. Gent., c. 25, ubi utitur communi exemplo de sagitta quae in certum scopum tendit, non tamen in illum se dirigit, sed a iaculante dirigitur." Scheibler concurs in referring the ends of natural agents to the First Agent, and explicitly ties God's direction of their activities with the doctrine of divine concurrence (*Opus met.* I.xxii.t25.a2).
[72] The air of paradox is partly explained by the fact that much of the motivation of DM 23 owes to ethical questions. See Penner, "Free and Rational," for a discussion of Suárez's struggles in accounting for the freedom of the will.

human beings), and natural agents, or those lacking intellect and will, and affirms the operation of human beings alone as the proper domain of final causes in nature.[73] The end-directed motions in plants, animals, and the inorganic world get referred to God's intentions.[74] Divine craftsmanship is the causal ground of the good order of nature for the sake of which the efficient causal powers of stones, trees, and birds are mere instruments; the intrinsic ends of reaching the center, growing tall, and building nests are subordinated to a higher end assigned to them in the divine mind.[75] The idea of nature as a non-cognitive, internal principle of purposive change, which lay at the heart of Aristotle's philosophy, is here subordinated to divine and human nature.[76] Far removed from

[73] DM 23 1.8; 10.1 *proemium*. The threefold division, and the restriction of final causation in the proper sense to rational agents, is found also in the Coimbra commentary (Phys. II.ix.q2a2). Their assessment of the case of animals agrees with Suárez's in regarding animals as able to perceive the good only "materially": "Secundum est eorum, quae ad summum, percipiunt finem materialiter". Animals are moved through natural instinct toward what is useful and agreeable, but are not able to discern an end or a means as such. Cf. DM 23 10.15. In this regard, both the Coimbrans and Suárez follow Aquinas, ST I-II.q1a2. Eustachius affirms the cognitivist requirement for final causation in his summary (S. Phys. I.ii.d2.q7).

[74] The case of plants and animals is more complex and the site of greater vacillation. Buridan consistently maintains that their actions can be explained by efficient causes guided by their species natures together with the celestial bodies and God: "These [actions such as egg-laying and nest-building] are produced from divine art and celestial bodies and particular agents, both extrinsic and intrinsic, like the substantial forms of natural things themselves" (In Phys. I.i.q13; cited in Des Chene, *Physiologia*, 199, trans. slightly modified). But Suárez and the Coimbrans, as noted above, resist the radical conclusion, distinguishing between the "material" and "formal" apprehension of an end, denying both to plants and attributing only the former to animals. The Coimbra commentators take the apparent inner purposiveness of animals to license attributing to them an analog of cognition, while denying the logical operations of composition and division that characterize rational thought (Phys. II.ix.q4a2). See Des Chene, *Physiologia*, 199-200.

[75] DM 23 10.7; *Phys.* II.ix.q2a2.

[76] Suárez is determined, nonetheless, to find support for his external teleology of a Platonic demi-urge in the works of Aristotle: "And in the same way he says in *The Parts of Animals* Book 2, Chapter 13, that nature does nothing in vain. And in that very place

Aristotle's conception of nature as a goal-directed principle of change, distinct from the goal-directedness of cognition and deliberation, is the Suárezian and Coimbran finality of a divine artificer ordering the world from without.[77]

5. Descartes' challenge

Several questions could be, and were, asked about the later Aristotelian theory of final causation. In the first place, one might wonder why *rational* cognition should be a necessary condition for final causation. Why couldn't a sub-personal analogue of cognition requiring only the coordination of sensitive ends and appetites suffice for causality, a possibility explicitly rejected by the Coimbrans and Suárez? Second, given the cognitivist condition, together with the denial of intellect and will to all except human beings, does the concept of final cause retain any explanatory role in non-rational nature? An affirmative response to the first question, the seeds of which can be discerned already in Aquinas, takes the story to Leibniz's world of mind-like monads, propelled along

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he says that nature wills this or that for the sake of the end, which cannot be understood of nature unless on account of its author" (DM 23 10.5). But in his explanations of the eyelids of humans, birds, and quadrupeds in the cited passage, Aristotle nowhere invokes an authorial agent distinct from nature itself, "which makes nothing in vain, has given no eyelids to fishes, while to counterbalance the opacity of water she has made their eyes of fluid consistency" (*Parts of Animals* II.13 658a8-10).

[77] Aristotle emphasizes the distinction between nature and deliberation (or mentality) as two distinct sources of end-directed principle in, e.g., *Physics* II.5 196b17-18. As Carraud, *Causa sive Ratio,* 156, remarks, "Finality is not inscribed in natural beings (contrary to Aristotelian finality), but it is extrinsically imposed upon them. It is thus necessary to note the *coup de force* effected by Suárez: the nature of supposed natural agents [*des prétendus agents naturels*] no longer owes to the finalized nature of Aristotle."

without deliberative intention by their internal perceptive and appetitive forces.[78] But a negative answer to the second question brings us first to Descartes' emphatic dismissal of final causes, and, with his new theory of change in terms of impact and collision, even the concept of an end from physics.

Descartes famously banishes final causes as being "entirely useless in physics."[79] Despite appearances to the contrary, the injunction is not a call for a kind of pragmatism in natural philosophy. Rather, in the background of the relegation of finality in the natural world to the divine mind, Descartes' complaint expresses a conclusion one could reasonably draw from the Suárezian view of the divine guidance of falling rocks and flying birds: efficient causes together with the formal properties of matter should suffice for explaining natural phenomena, regardless of how matters stand with respect to God's knowledge. The apparent end directedness of change, meanwhile, requires introducing a different concept of motion. No longer the *actus* of a *potentia*, motion in the mechanical framework is defined as change in relative positions of quantities of size and motion carried by geometrically shaped parcels of matter.[80] The disposition of the stone to fall rather than to rise, on the new model, is no longer a disposition *toward* any place in

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[78] To be sure, Leibniz is not alone in the seventeenth century in expanding the conception of rationality to account for the orderliness of nature. In England, Henry More, Anne Conway, and Margaret Cavendish, for instance, all attribute some grade of rationality to evey being in nature. Spinoza similarly recognizes mentality alongside materiality in every finite mode of the single substance. Unlike his contemporaries, however, Leibniz subordinates the material to the mental, reducing the former to the status of a well-founded phenomenon of the latter, as we shall see in the next chapter.
[79] AT VII 55; CSM II 39
[80] "*motion is the transfer of one piece of matter, or one body, from the vicinity of the other bodies which are in immediate contact with it, and which are regarded as being at rest, to the vicinity of other bodies*" (AT IXB 53; CSM I 233).

particular due to the real quality of heaviness inhering in it in virtue of its substantial form. Instead, Cartesian dispositions are simply those possible changes in the sizes, shapes, and motions of interacting bodies that the mathematical laws of collision and impact predict. God's role in the natural world becomes restricted to being the prime mover, the giver and conserver of force to matter conceived as pure quantity. The cause of the causality of the efficient cause, as Aquinas understood the final cause, is no longer the end to which motion is directed. Instead, efficient causes are moved by the force imparted to the initial state of the world at the creation. Not only does Descartes eliminate the category of the end with his new definition of *motus*, an Aristotelian interpretation of 'efficient cause' itself becomes strained in the Cartesian explanatory framework. In the Cartesian (non-human) world, in the strict sense, God remains the only efficient cause in anything like a recognizably Aristotelian sense. Physical change in the created world appears merely as God's agency expressed in the modifications that take place in geometrically formed matter, which in itself remains inert.[81] The subsequent history of the physical universe is simply the necessary unfolding of all the forms matter could possibly assume, given God's choice of the laws of motion and the truths of geometry.[82]

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[81] See Gary Hatfield, "Force (God) in Descartes' Physics," *Studies in History and Philosophy of Science Part A* 10, no. 2 (1979): 113–40, for an influential interpretation along these lines. Tad Schmaltz, *Descartes on Causation* (Oxford: Oxford University Press, 2007), in contrast, offers a sustained defense of secondary causation in Descartes.

[82] AT VIIIA 103; CSM I 258. This consequence of Descartes' cosmology would have been anathema to the Jesuit Aristotelians. But it would also deeply unsettle Leibniz, who would comment to Philipp in 1680 regarding Article 47 of Part III of Descartes' *Principles* that, "I do not believe that a more dangerous proposition than this could be formulated. For if matter takes on, successively, all possible forms, it follows that nothing can be imagined so absurd, so bizarre, so contrary to what we call justice, that it would not hve happened and will not some day happen" (GP IV 283; L 273).

At the same time, however, Descartes frequently explains features of the natural world by appealing to notions of function, purpose, and design. Descartes talks, for instance, of the ends of sensations in the operation of the human mind-body composite,[83] and of the functional arrangements of the parts of the circulatory system, even employing an optimality principle to account for the unique number of membranes (two rather than three) in the mitral valve of the heart.[84] As commentators have noted, such passages stand in tension with his call to eliminate final causes from the natural world.[85] Some, such as Des Chene, consider the tension to be fatal, so that Descartes' functional explanations of animal economy merely project the scientist's heuristic divisions onto a material substance essentially indifferent to functions and ends.[86]

Others argue, however, that Descartes' use of functional language is consistent. Hatfield interprets Descartes as rejecting external finality, thus prohibiting any appeal to the intentions of a divine craftsman in the constitution of natural beings, while at the

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[83] AT VII 82-5; CSM II 56-9.
[84] AT VI 46-50; CSM I 134-6.
[85] See, e.g., Dennis Des Chene, *Spirits and Clocks* (Ithaca, NY: Cornell University Press, 2001), Simmons, "Sensible Ends," Gary Hatfield, "Animals," in *Companion to Descartes,* eds. John Carriero and Janet Broughton, 404–25 (Blackwell, 2008); Deborah Brown, "Cartesian Functional Analysis," Australasian Journal of Philosophy 90, no. 1 (2012): 75–92, and Karen Detlefsen, "Teleology and Natures in Descartes' Sixth Meditation," in *Descartes' Meditations: A Critical Guide,* ed. Karen Detlefsen, 153–75 (Cambridge: Cambridge University Press, 2014). The ends of the sensations of the mind-body composite, which are the subject of the Sixth Meditation, are a special case, and Descartes clearly retains a version of rational final causation in the human domain. The attribution of functions to human artifacts such as clocks is also innocent, insofar as the clock receives its functional profile from the designing intentions of the clockmaker. I restrict my discussion of Descartes' use of teleological language in the case of non-humans and the human body considered hypothetically as body only, as in the *Treatise on Man*.
[86] Des Chene, *Spirits and Clocks*, 10-11.

same time allowing for a Lucretian view of the immanent origin of natural functions. On this picture, the functions of the parts of animals and plants result from a process of "end-state" selection, such that a certain kind of part continues to exist from generation to generation because it is the kind of thing that regularly achieves a certain outcome. Nevertheless, adaptations for certain functions as exhibited by hearts and wings, according to the etiological interpretation, result exclusively from the laws of motion and the initial state of matter without reference to God's intention to bring about a specific structure and function for the heart or wing. In this way, Descartes eschews appeal to extrinsic finality to explain real functional kinds in nature, while at the same time helping himself to an intrinsic, causalist account of the existence of functions grounded in the lawful series of physical states rather than in created natures.[87]

In a different approach at making Descartes self-consistent, Brown interprets Descartes' descriptions of corporeal machines as a kind of non-normative functional analysis. On her account, Descartes ascribes functional capacities to organic parts in a causal analysis of the capacities of the organism as a whole. Hearts have the function of pumping blood in virtue neither of their causal histories nor of their having been designed for that purpose. Rather, functional capacities of material parts arise and persist due to their dependence on one another in an analysis of the production of behaviors of a larger, containing system, such as a clock, an animal, or a human body considered separately from its soul. The functions exploit dispositions of collections of material particles to be affected by movements of surrounding matter, a process governed strictly by the laws of

[87] Hatfield, "Animals," 412-15.

motion. For Brown, Descartes' rejection of finality in nature is complete and excludes both divine and intrinsic purposes.[88]

Neither attempt to rescue Descartes from his own strictures is without difficulty.[89] Brown's contention that Cartesian functions are non-normative leaves unexplained Descartes' implicit use of standards of proper function and good design. His account of death, for example, entails that it is the fact of the *body* becoming disordered or unfit to carry out its appropriate movements that impels the soul to leave it.[90] Likewise, Descartes' explanation for the structure of the mitral valve of the heart invokes principles of economy and efficiency, or of good functional design: the valve at the entrance to the pulmonary artery (or "venous artery") has two membranes rather than three, like the other valves that regulate blood flow through the atria and venticles, because the pulmonary artery, "being oval because of its location, can easily be closed with two of them, whereas

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[88] Brown, "Cartesian Functional Analysis." She further argues that Descartes' model of functional analysis is superior to the modern version familiar from Cummins because it includes a "*principle of reciprocal dependence*" such that functional relationships require a necessary interdependence between material structures; Robert Cummins, "Functional Analysis," in *Nature's Purposes,* eds. George Lauder, Colin Allen, and Marc Bekoff (Cambridge, MA: MIT Press, 1998), 85.

[89] In fact, any attempt to ascribe functions to bodies in the Cartesian framework must face the further problem that Descartes does not endorse a metaphysical principle of material individuation akin to the Aristotelians' substantial form. Animals, plants, and even the human being considered counterfactually as body alone (as in the *Treatise on Man*), share their real essence with artifacts and inorganic objects. The essence of material bodies—of cats, tables, and stones alike—consists in pure extension. But Descartes' attribution of norms of proper functioning in organic bodies presupposes that the operations of parts are for the sake of the individual organism, rather than for any other division in *res extensa*. The problem, in Aristotelian terms, amounts to identifying the beneficiary (the *finis cui*) of a tendency to local change.

[90] AT XI 225; CSM I 315.

the other openings, being round, can be closed more effectively with three."[91] The existence of a certain structure, in this case, is not accounted for by functional analysis, but requires a principle of optimal design. Even setting aside the yet more problematic cases of design in the coordination of bodily states and sensations, Descartes' use of functional language is, *pace* Brown, not normatively innocent.

Hatfield's etiological account, meanwhile, carries the matter over to its theological implications. Given Descartes' affirmation of God as the creator of the natural world who has preordained everything,[92] one might reasonably infer that the intrinsic ends of bodies have been fixed by God, and therefore are at least partial expressions of divine purposes. For even while Descartes could maintain that God did not choose the laws of nature for the sake of bringing about certain outcomes, such as the benefit of human beings,[93] God's foreknowledge of the effects of his choice of laws, together with his free choice to create, implicates God's intentions in the explanation of why this particular series of things exist rather than some other. Furthermore, Descartes admits divine providence in the order of nature and licenses appeal to it in practical matters.[94] A knowing and willing God could remain, on the Cartesian picture, the metaphysical ground of functional organization in bodies, even granting their production through a necessary natural series of changes. Just as the clockmaker legislates norms of proper function to the clock, everything in the Cartesian framework allows ascribing to God's intentions the normative standards of natural automata.

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[91] AT VI 48; CSM I 135.
[92] AT VIIIA 20; CSM I 206.
[93] AT VIIIA 81; CSM I 248-9.
[94] AT IV 316; CSMK 273.

It is hardly surprising then that Descartes' contemporaries questioned his rejection of final causes. Gassendi, himself an adherent of the mechanical philosophy, objects to Descartes' prohibition on the grounds that, since no finite mind can understand the complexity involved in the formation of organic structures such as hearts and its valves, it is reasonable to attribute their functional arrangement to divine wisdom. For Gassendi, appeal to design is compatible with Descartes' maxim to invoke only the physical causes of bodily organization. While the latter are certainly required for explanation, the good functional assembly of organic parts—that they should have the correct hardness, consistency, fit, flexibility, size, shape, and position to perform the required function—exceeds the scope of physical causes alone.[95] Gassendi's objection signals a compatibilist position with regard to the new mechanical approach championed by Descartes and the traditional recognition of divine purposes in the order of nature. Already suggested by Suárez, the Coimbrans, and Fonseca and cultivated enthusiastically in the seventeenth and eighteenth centuries in numerous tomes on physical theology, a harmony of mechanism and divine finality involves separating the issue of physical knowledge from that of functional knowledge of nature. Whatever the best description of the mechanisms instantiating functional processes in nature may be, their ultimate origin could safely be assumed to rest in God's intentions. The Christian Aristotelian tradition remained resilient in the face of the new ideas of the sixteenth and seventeenth centuries.[96] Unless

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[95] AT VII 309; CSM II 215.

[96] Schmitt, "Renaissance Aristotelianism," has persuasively argued that the Aristotelian tradition displayed impressive flexibility in the face of the new critique largely through its ability to absorb new influences. Similarly, in his study of the development of Jesuit natural philosophy in Germany until the Suppression of the Society of Jesus in 1773, Hellyer, *Catholic Physics*, 2, argues that, "although Jesuit natural philosophy was

one had already jumped the Aristotelian ship, the logical question to ask concerning final causes was: what do we know when we know the functions of natural things?

The simple answer from the compatibilist perspective is that to know natural ends is to know, however tentatively, the divine mind. It is to know God's intentions in creation, in Nature as a whole, in the individual natures of things, as well as in particular natural changes. The Coimbra commentators and Suárez express the end of Nature as a totality in the idiom of the ends of beauty and diversity of forms, or the perfection of the whole.[97] For many natural events, including all changes in the inorganic world, God's intention is the only final cause. The complex organization of plants and animals is likewise ascribed to their God-given, creaturely natures. Patterns of efficient causation in the natural world provide evidence of divine wisdom in arranging things for the sake of greatest overall order, not only in the internal functional connection of the parts of animals and plants, but also in external symbiotic relations across species, such as the oxpecker's feeding off the bugs on the backs of zebras, as well as in the adaptations of species to their habitat, as of marine life to the salinity of the ocean. Created reality, on this view, displays a structure of means-ends relations, from the least motions of matter to

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transformed in many ways between 1600 and 1773, there were also remarkable continuities as the New Science of the seventeenth century was fused onto a core of peripatetic natural philosophy in a synthesis that lasted until the middle of the eighteenth century." In Germany, the project of reconciling the ancient and the modern views were well under way at the time of Leibniz's youthful efforts in his 1671 *Theoria motus abstracti*. A striking example of such an attempt is Johannes Sperling's (1603-1658, professor at Wittenberg) *Institutiones physicae* (1639), which went through six editions by 1672 (Petersen, *Geschichte*, 151). In the fifth chapter of his nine-chapter commentary on Aristotelian physics, Sperling offers a lengthy defense of the theory of effluvia, effectively introducing the corpuscularian model in German philosophy.

[97] Phys. II.ix.q1a3; DM 23 10.10.

the harmony of the whole. The precise character of the mechanism by which nature institutes this order, whether through laws of Cartesian matter, goal-directed causal powers in substantial forms, or a complex ontology of sympathies and antipathies, remains an issue conceptually distinct both from the existence of functional relations, and from the theological commitment to the natural world as an expression of divine wisdom.[98]

Why did Descartes resist the compatibilist position? The answer in part lies in the claim expressed in the second part of the injunction in the Fourth Meditation, namely that "there is considerable rashness in thinking myself capable of investigating the impenetrable purposes of God."[99] Descartes repeats in various contexts that divine purposes are inaccessible to the human intellect. Indeed, not just some, but *all* of God's

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[98] The theory of sympathies as active powers in natural events has a rich history. Cultivated in the medical and alchemical traditions, mechanistic philosophers disparaged the theory in the seventeenth century, and Leibniz suspected Newton of having introduced a new kind of occult sympathetic power with his theory of gravitational attraction at a distance. Yet, remnants of the theory of sympathy survive in Leibniz's own notion of pre-established harmony. Jesuit Aristotelians as well draw on the idea of a natural affection between things as they saw fit, as does Suárez to explain the relation between intellect and will. "Sympathetic effects," as the seventeenth century Jesuit physicist Gaspar Schott explains, "arise from a friendly affection, or coordination and innate relation, of one thing to another… so that if one is acting, or reacting, or only just present, the other also acts or is acted upon" (*Thaumaturgus* (1659), cited in Heilbron, *Electricity*, 26, who also gives a colorful discussion of the state of physical research in the seventeenth century in Ch. 1). But for anyone suspicious of unanalyzable primitive affections that could be invoked to explain everything from magnetism to the swallow's nesting habits, the situation might have caused concern. Many a philosopher in the seventeenth century, even those such as Mersenne who hoped to purify Aristotelianism from such extravagant excrescences, ended up defecting from the Aristotelian program altogether in favor of the new mechanistic systems.

[99] AT VII 55; CSM II 39.

purposes are “equally hidden in the inscrutable abyss of his wisdom.”[100] Accordingly, Descartes responds to Gassendi that the proper attitude for the scientist to take toward the well-crafted forms of nature is one of admiration of God as their efficient cause. But she cannot on that basis infer what purposes God may have had in arranging the valves of the heart in such fashion. Descartes’ insistence on the hiddenness of divine intentions is clearly radical. His dogmatic reply to Gassendi counters the objection that, even while Descartes is correct to adopt a stance of epistemic humility with regard to investigating God’s purposes, such humility should not apply to those purposes of God that he “left on public display, as it were, and which can be discovered without much effort.”[101] In a similar vein, Robert Boyle urges that, while it would be presumptuous to claim to know all of God’s ends, it is a *duty* to take notice of some of them: “For, there are some things in Nature so curiously contrived, and so exquisitely fitted for certain Operations and Uses, that it seems little less than Blindness in Him, that acknowledge with the *Cartesians* a most wise Author of things, not to conclude, that, tho’ they *may* have been design’d for *other,* and perhaps higher Uses; yet they *were* design’d for *this* Use.”[102] Gassendi’s and Boyle’s objections amount to a charge of unwarranted dogmatism: given Descartes’ acceptance of God as the creator of animal bodies, his denial of divine wisdom in the functional arrangement of their parts is forced.

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[100] AT VII 374; VIIIA 81; V 158; CSM II 258; I 248; CSMK 341.

[101] AT VII 310; CSM II 215.

[102] Robert Boyle, *The Works of Robert Boyle,* Volume II, eds. Michael Hunter and Edward B. Davis (London: Pickering and Chatto, 2000), 89; in *A Disquisition about the Final Causes of Natural Things* (1688). It is noteworthy that Boyle’s defense of teleological reasoning takes place in the context of its legitimate employment in experimental work by a committed mechanist.

While Descartes nowhere offers an explicit argument for the hiddenness of divine purposes, the thesis has a deeper source in his metaphysics and theology.[103] Specifically, Descartes' notorious doctrine of God's free creation of the eternal truths[104] undercuts the validity of inferring divine intentions from knowledge of the structure of natural beings. Descartes, in effect, severs the relation between knowledge of nature and knowledge of the divine mind that allows Suárez to attribute the ends of natural agents to God. For Suárez, knowledge of the essence of any natural kind implies knowledge of the conceptually necessary entailments among the essential predications of that kind. Discovery of the real essence of sheephood, for Suárez, would amount to nothing less than insight into God's knowledge of the necessary connections among the conceptual elements. On that picture, the eternal and necessary truths of natural kinds that philosophers aspire to know through scientific demonstration are independent of God's intellect and choice. In knowing the essence of any natural being, Suárez can claim to know the very same essence that God's intellect grasps when God chooses to create an individual of a certain kind. Thus, knowledge of natural kinds entails knowledge of divine intentions and, on the assumption that God always wills the best outcome, licences inferences to the reasons behind God's creative acts. Descartes' doctrine that the truths of nature are a product of God's free choice dramatically alters the modal status of physical knowledge. The essences of created beings no longer occupy an independent realm of

[103] In this paragraph I follow Gary Hatfield, "Reason, Nature, and God in Descartes," in *Essays on the Philosophy and Science of René Descartes,* ed. Stephen Voss (New York: Oxford University Press, 1993), 269-75.
[104] For example, "[T]he mathematical truths which you [Mersenne] call eternal have been established by God and depend entirely on him no less than do the rest of his creatures" (AT I 145; CSMK 23).

necessary conceptual truths, which God and human beings alike access in their acts of knowing, but instead are radically contingent on God's choice and purposes. Consequently, Descartes' epistemology excludes the possibility of moving from knowledge of necessary truths as instantiated in natural beings to God's purposes, for the sake of which God creates individuals in accordance with those truths. God's purposes lie hidden in the inscrutable abyss of his wisdom, inaccessible through rational inquiry into nature, which can only yield knowledge *that* God has made things a certain way, and *how* they are constructed, but never extends to God's reasons for having created things with those particular forms rather than others. As Hatfield remarks, Descartes' doctrine of the creation of the eternal truths "divests claims to knowledge of natural essences from the implication that such claims presuppose knowledge of God's creative power."[105] Descartes at once elevates God's creative power beyond the pale of human comprehension and embraces a conception of natural philosophy as independent of theology.[106]

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[105] Hatfield, "Reason, Nature, and God," 275.

[106] To be sure, the tie between theology and natural philosophy had already started to loosen in the previous century; see Lohr, "Metaphysics," 604-5. The vocation of the Jesuit philosophers demanded a restoration of the earlier, closer connection between the two disciplines. Thus, the first rule prescribed for the Jesuit professor of philosophy in the *Ratio Studiorum* of 1599 reads: "Since the humanities or natural sciences prepare the intellectual powers for theology and assist in the perfect understanding and practical application of religious truth and by virtue of their content contribute to the attainment of this goal, the teacher whose heart is set on advancing the honor and glory of God, should teach these secular subjects in a spirit which will prepare his students, and especially his Jesuit students, for the study of theology. He should above all lead them to a knowledge of their Creator"; Allan P. Farrell, S.J., *The Jesuit Ratio Studiorum* (Washington, DC: Catholic University of America Press, 1970), 40. In sharp contrast, Descartes insists on the irrelevance of philosophy for theology (and vice versa), and in fact on the dangers of rational scholastic theology: "certainly theology must not be subjected to our human

Seen in this light, Descartes' opposition to inferring design in the functional arrangement of animal parts stems from his deeper suspicion of the traditional relation between philosophy and theology and a concern to delimit their respective claims. While some functionally adaptive structures of creatures indeed appear so well contrived that it is difficult to resist inferring on that basis a designer's intentions, such inferences turn out to be unwarranted. Descartes' discovery of the new metaphysics in which mind and matter constitute distinct substances with non-overlapping attributes, the former characterized by thought and volition, the latter by pure extension, creates a fundamental incommensurability with the Aristotelian picture. For Descartes, any purpose and design in material substance must either be the product of human craft, in which case it would be knowable to human beings, or of divine intentions and, thus, in principle unknowable. But without Descartes' sharp division between the mental and the physical, the Aristotelians can readily deny rational thought and volition to stones and sheep, while admitting God's designing intentions in their orderly movements and functions.

It is here that the late-scholastic linkage of finality and cognition receives an unfair objection from Descartes, namely, that the ascription of goal-directed tendencies to motion entails the capacity for thought, or the existence of "little souls" in every natural

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reasoning, which we use for mathematics and for other truths, since it is something we cannot fully grasp; and the simpler we keep it, the better theology we shall have… Why do we need to spend all this effort on theology, when we see that simple country folk have just as much chance as we have of getting to heaven? This should certainly be a warning to us that it is much more satisfactory to have a theology as simple as that of country folk than one which is plagued by countless controversies" (AT V 176; CSMK 351).

agent.[107] Descartes confesses to being unable to conceive of the motion of a falling body as end-directed without ascribing to it knowledge of the center of the earth, thus the capacity for thought. For Descartes, his account of the real distinction between mind and body in the Sixth Meditations reveals a fundamental confusion in the Aristotelian theory of change, sufficient to warrant its rejection on metaphysical grounds. No matter how daunting the explanatory task, changes in complex, non-rational parts of matter that exhibit purposive organization, like cats, trees, and the cooperating oxpeckers and zebras, must ultimately be explained by bodily rather than mental features.

Descartes' charge in the Sixth Replies rests on a questionable Cartesianization of the Aristotelian concepts of form and quality, as Daniel Garber notes.[108] Given Descartes' dualistic ontology, if a property of body, namely, its tendency to change, cannot be attributed to the Cartesian concept of matter, it must belong to the only other kind of substance, namely, mind. But such a dilemma should arise only if one has already accepted Descartes' dualism. Neither Suárez nor the Coimbrans worry about the specter of panpsychism—of ratiocinating stones and rocks—as a consequence of their analysis of change. As we have seen, the later Aristotelians stood at the end of a long and sophisticated movement of thought that drew a careful distinction between the actions of rational as opposed to non-rational creatures, such that the tendencies of rocks and birds do not, whereas those of human beings do, require mentality in the agents themselves. Indeed, Descartes and Suárez are in agreement in identifying intentionality as the only

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[107] AT VII 442; CSM II 298.

[108] Daniel Garber, *Descartes Embodied* (Cambridge: Cambridge University Press, 2001), 267.

relation with which the natures of distinct substances can be connected, as a clockmaker relates to the clock, or the doctor to her patient. Descartes' view of human agency remains, on this point, largely consistent with the Aristotelians'. The difference lies in the fact that the Cartesian ontology excludes such connections from the physical domain, whereas the Aristotelian is designed with just such a relation of tending, or intending, at its core. The dispute between Descartes and the scholastics, thus, does not boil down to the traditionalists merely finding the modern perspective *unheimlich*.[109] Rather, on this matter, the Cartesian and Aristotelian worldviews represent an intransigent opposition, a moment of genuine rupture in the history of science and philosophy, the intellectual consequences of which would reverberate over the next several centuries.

We return to the first question raised at the start of this section: even if final causation, upon which normativity and natural order depend, requires mentality, as the Aristotelians maintain, why must it require a *rational* intellect and will, rather than merely sub-personal sensations and appetites? Why must an agent have to be able to recognize its ends as its own in order to be said to act on their account? As in Descartes' fable of a human body operating on the blind pushes and pulls of its animal spirits, why could it not suffice for purposive motion that an animal's natural inclinations cause its action upon receiving external stimuli? Leibniz, as we shall see in the next chapter, forges a metaphysics in which the distinctions between human, animal, vegetable, and mineral motions become a matter of degree rather than of kind. Leibniz erases the sharp distinction, still present in the later Aristotelian and Cartesian systems, between the

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[109] As Dennis Des Chene, *Physiologia*, 398, concludes.

rational and non-rational. But his approach to such unification leads in a direction exactly opposed to the Cartesian spirit: far from mechanizing the nutritive and sensitive functions of the soul, Leibniz instead models the physical world on the idea he has of mind. From the tiniest bugs discovered by Leeuwenhoek's microscopes to the angels described in Scripture, Leibniz's world is populated by perceptive and appetitive substances, each bearing in itself a goal-directed principle of change. Setting out to close the gap between faith and reason opened by Descartes and, at the same time, embracing the new, mathematical physics, Leibniz discovers in idealism a path toward reconciling the ancient and the modern, the teleological and the mechanical philosophies.

CHAPTER 3: Teleology in Leibniz's Foundations for Natural Science

1. Introduction

A long-standing narrative about the fate of teleology in modern philosophy has Leibniz in the role of trying to reconcile the ancients and the moderns, and the new science with religion. While Descartes famously called for the banishment of final causes in physics, and Spinoza condemned the appeal to purposes as a sanctuary of ignorance, Leibniz strove instead to reinstate final causes in natural philosophy as indispensable explanatory principles.[1] Indeed, Leibniz repeatedly emphasizes that the principles of mechanics themselves "depend on more sublime principles," namely, God's purposes in creating the best or most orderly world.[2] Why did he turn against one of the central tenets of the new, mechanistic conception of nature? And what did he take to be the ontological ground and epistemic status of teleological principles that would justify their employment in natural science?

In order to understand Leibniz's answers to these questions, this chapter takes both a genetic and a critical approach to his corpus. Briefly, the account proceeds as follows. An important motif in Leibniz's early development—roughly from the early

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[1] Recent times have, no doubt, witnessed a reevaluation against this traditional picture. Garrett, "Teleology," for instance, makes the important point that, along certain dimensions, Spinoza retains more elements of Aristotelian immanent teleology than does Leibniz, and finds greater affinity between Leibniz and Descartes than had previously been recognized. Jorati, "Monadic Teleology," calls into question the normativity of Leibniz's teleology, or its goodness-directedness. Nevertheless, the old story retains plausibility in broad outlines. McDonough, "Heyday," pushes back against Garrett's revisionist interpretation.

[2] GP VII 272; L 478.

1660s to the late 1670s—is a concern to elaborate the foundations of mechanics and, in particular, the possibility of the application of mathematics to nature. Following this thread, Sections Two and Three trace the arc of Leibniz's thinking about the presuppositions of the new science of nature to argue that many of the signature theses of the later monadological metaphysics—the active nature of substance, the ontology of mind-like monads, and the conception of matter as well-founded phenomenon—emerge in this period. Toward the late 1670s, Leibniz's reflections lead him to a conception of physics as a science that secures its value and its success by aiming only at moral rather than absolute certainty, by seeking greater coherence among phenomena and, therewith, greater stability in experience. Principles of order, or architectonic principles as Leibniz often calls them, gain their legitimacy by facilitating such coherence and stability. Section Four elaborates the coordinate status of architectonic and mechanical principles in Leibniz's method in natural philosophy, such that each kind occupies an indispensable role in the task of increasing moral certainty in knowledge of nature. Finally, Section Five turns to the cognitive foundations of architectonic principles in Leibniz's metaphysics to propose a crucial role for a hitherto neglected principle of his mature philosophy. Leibniz's principle of uniformity, that "everywhere, at every time, and in every place things are just as they are here," emerges in the first decade of the eighteenth century and expresses, I argue, a central demand of the unity of knowledge. All perceptions, and all empirical regularities among them, for Leibniz, must be unifiable in a thoroughgoing system of knowledge. The ontological bedrock that supports the application of architectonic principles in natural science consists ultimately in the nature of the knowing subject as a living mirror expressing, however confusedly, the entire universe. Architectonic principles can be regarded, in the end, as laws of thought that guide rational inquirers toward a maximally intelligible system of empirical laws and concepts. On Leibniz's reconstruction, the new science of the seventeenth century has its metaphysical foundations in the nature of thinking beings.

While it is common in Leibniz studies to approach the eclectic from Hannover as a metaphysician first and foremost, the present interpretation is oriented toward an epistemological thread that runs through his long career.[3] This path is marked by an attitude of caution in claims about the metaphysics of nature. This attitude is not isolated in one or another period of his career but recurs from the late 1660s onward, through the development of his mature metaphysics in the 1680s and 1690s, and until the end of his life.[4] Nor is it opportunistic. Leibniz's scattered cautionary notes are not get-out-of-jail cards played in moments of dialectical trouble. Rather, they reflect a coherent and well-motivated position on the limits and justification of metaphysical knowledge.

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[3] To take just one example, Robert Adams introduces his excellent *Leibniz: Determinist, Theist, Idealist* with the following remark: "Of the great early modern philosophers… Leibniz was probably the least preoccupied with epistemology. He was typically willing to begin an argument with whatever seemed true to him and might seem true to his audience, without worrying too much about whether epistemology would present it as something we really know"; *Leibniz: Determinist, Theist, Idealist* (New York: Oxford University Press, 1994), 3.

[4] The account here deliberately aims to avoid the periodization of Leibniz's complicated philosophical output. In this respect it is in the spirit of, among others, Mercer, *Leibniz*, Pauline Phemister, *Leibniz and the Natural World: Activity, Passivity, and Corporeal Substances* (Dordrecht: Springer, 2005), and Vincenzo De Risi, *Geometry and Monadology: Leibniz's Analysis Situs and Philosophy of Space* (Basel: Birkhäuser 2007), whose monographs articulate the larger continuities at work in the Leibnizian corpus, albeit with very different emphases.

The present interpretation of Leibniz's metaphysics of nature is oriented around the following question: what must the world be like in order for it to be knowable by us? For Leibniz, the answer begins with perception, and is captured in the following statement from "On Universal Synthesis and Analysis", ca. 1679: "we know hardly anything adequately, few things *a priori*, and most things through experience."[5] We know certain first principles, such as that there is nothing without a reason, or that *A* is not not-*A*, *a priori*. We also know adequately, for instance, the eternal truths of geometry, since these can be reduced to identities. But the bulk of our knowledge arises through experience, thus requires the contribution of the senses. As Leibniz writes to Sophie Charlotte in 1702: "in our present state the external senses are necessary for our thinking and that if we had none, we would not think."[6] Distinct sensory knowledge, furthermore, is limited to events or objects as grasped under the common sensibles of magnitude, figure and motion. In other words, our knowledge of what is perceived, hence of the physical world, is restricted for the most part to the primary qualities of the new mechanical philosophy. Leibniz expresses a similar adherence to the order of perception in the study of nature as early as 1671: "By the word *thing* we mean that which appears, hence that which can be understood."[7] Even though reality is not reducible to appearances, or constructible from the contents of perception, the path to intelligibility proceeds through their analysis. Reflection on the new mechanical science of appearances reveals its ontological commitments, from which Leibniz is then able to synthesize a bold

[5] GP VII 296; L 232. Leibniz uses *a priori* here in the modern sense of "independent of experience," rather than in the older sense of "proofs from causes" (rather than effects).
[6] GP VI 506; L 551.
[7] L 142.

new metaphysics. This chapter orients itself to this procedure of Leibniz's epistemology, of analyzing appearances to uncover first principles which then serve as the basis for a deductive system of truths. The approach serves as a lens through which we can view the development of his metaphysics, that part of it in particular which is intended to ground the order of created beings, or nature.

A second interpretive locus comes from a constraint on explanation Leibniz recognizes from his early years: that of the autonomy of nature, or that everything that is to be known in the natural world can be explained with reference to created beings themselves. Even though creatures depend for their existence on the creating and sustaining power of God, natural change must be able to be explained adequately without reference to special dispensations or arbitrary decrees. An interpretive standpoint on Leibniz's system that proceeds from the order of experience foregrounds the significance of his scientific work for his metaphysics. Far from being two disconnected domains of inquiry, metaphysics concerned with reality, and physics with mere appearances, a compelling case can be made for the emergence of Leibniz's mature metaphysics as a consequence of his efforts to solve conceptual problems in the foundations of the new science of mechanics, hence, to ground mechanics in metaphysics.[8] As Maria Rosa

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[8] As maintained explicitly by, e.g., Martial Gueroult, *Leibniz: Dynamique et métaphysique* (Paris: Aubiers-Montaigne, 1967), 210ff, and implicitly by numerous authors, e.g., Adams, *Leibniz*, Pt. III; Donald Rutherford, *Leibniz and the Rational Order of Nature* (Cambridge: Cambridge University Press, 1995); Mercer, *Leibniz*. In an earlier time, Louis Couturat, *La logique du Leibniz* (Paris: Alcan, 1901), and Bertrand Russell, *A Critical Exposition of the Philosophy of Leibniz.* 2nd ed. (London: George Allen and Unwin, 1937), made influential a view of Leibniz as a logician who derived his metaphysical principles from his subject-predicate logic. Leibniz's natural philosophy was ignored entirely. In recent times, Leibniz's scientific work has started to be taken

Antognazza remarks, while Leibniz could be seen as carving out a kind of autonomy for science familiar to us today, he nonetheless "inherits from the Aristotelian tradition the view that physics needs metaphysical roots or a metaphysical grounding."[9] Leibniz's metaphysics can be seen, not as a fantastic fairytale spun from the armchair, but as an account of reality as demanded by the new science to which he remains, in its methodological fundamentals, committed. Leibniz's solutions to these problems set him on course to rehabilitate in creative and influential ways teleological notions in his philosophy and, ultimately, to anchor the methods and metaphysics of science in reason's legitimate demand for order and coherence.

2. Scholasticism rejected, Aristotle renovated

In an oft-quoted passage from a letter to Remond toward the end of his life, Leibniz recounts his youthful rejection of scholasticism:

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more seriously as a guide to his metaphysics. Kathleen Okruhlik and James Robert Brown, eds. *The Natural Philosophy of Leibniz* (Dordrecht: Reidel, 1985) marks an important stage in this shift. Phemister, *Leibniz,* and Daniel Garber, *Leibniz: Body, Substance, Monad* (Oxford: Oxford University Press, 2008), offer monograph-length studies of Leibniz's natural philosophy in relation to his metaphysics. Already a century earlier, however, Ernst Cassirer, *Leibniz' System in seinen wissenschaftlichen Grundlagen* (Marburg: N.G. Elwert'sche Verlagsbuchhandlung, 1902), had completed an extensive study of Leibniz's metaphysics in light of his scientific work, emphasizing the experiential starting point for Leibniz's metaphysical thinking, i.e., that Leibniz typically begins with the phenomena and arrives at the conceptual grounds that must be presupposed for their intelligibility.

[9] Maria Rosa Antognazza, "Philosophy and Science in Leibniz," in *Tercentenary Essays on the Philosophy and Science of Leibniz*, eds. Lloyd Strickland, Erik Vynckier, and Julia Weckend (Palgrave MacMillan, 2017), 21.

> After finishing the *Ecoles Triviales* I fell upon the moderns, and I recall walking in a grove on the outskirts of Leipzig called Rosental, at the age of fifteen, and deliberating whether I should keep the substantial forms. Mechanism finally prevailed and led me to apply myself to mathematics.[10]

Having rejected the framework of goal-directed powers and forms in favor of a model of explanation in terms of sizes, shapes, and motions of material parts, Leibniz indeed devoted considerable attention over the next decade to problems in mathematical physics. Yet, his conversion to mechanism and concurrent rejection of final causal powers was more complex than the letter to Remond suggests. While Leibniz may have adopted in his youth the Cartesian injunction to banish from natural philosophy the search for final causes,[11] he soon turned to a more conciliatory approach. Of especial significance for Leibniz in this vein was a determination to reconcile the new mechanical philosophy with the true teachings of Aristotle, cleansed of its scholastic encrustations.[12] In a letter of

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[10] GP III 606; L 655, translation emended. Given the remove in time, and Leibniz's deteriorating health in 1714 when he wrote this letter, scholars have disagreed about the actual date of the event as recollected by Leibniz. On Leibniz's own word, the rejection of substantial forms should have occurred in 1661-2. Kabitz, *Die Philosophie des jungen Leibniz. Untersuchungen zur Entwicklungsgeschichte seines Systems* (Heidelberg: Winter, 1909), 50-1, pushes the date forward to 1665. Mercer, *Leibniz,* 39, accepts Leibniz's testimony. In either case, it is several years before the texts to which I turn next.

[11] PP, I.28 AT VIIIA 15; CSM I 202; *Meditations* IV, AT VII 55; CSM II 39.

[12] For the Renaissance humanist roots of the eclecticist approach to ancient texts that Leibniz likely absorbed in Leipzig, and the variety of Aristotelianisms on offer, see Brian P. Copenhaver and Charles B. Schmitt, *Renaissance Philosophy (A History of Western Philosophy, 3)* (Oxford: Oxford University Press, 1992), Ch. 2. See Wundt, *Schulmetaphysik*, 48ff, for a survey of Aristotelianism in German universities in the seventeenth century; also, Petersen, *Geschichte*, esp. 118-127. Leibniz's familiarity with reformed Aristotelianism through the instruction and writings of Scherzer and Thomasius is documented in Wundt, *Schulmetaphysik*, 141-4.

1669 to his teacher Jacob Thomasius, Leibniz boldly declares: “I do not hesitate to say that I approve of more things in Aristotle’s books on physics than in the meditations of Descartes; so far am I from being a Cartesian! In fact, I venture to add that the whole of Aristotle’s eight books can be accepted without injury to the reformed philosophy.” Pronouncements of reconciling Descartes and Aristotle in this period are far from original with Leibniz. One finds the hermeneutical strategy in a slew of German authors in the seventeenth century familiar to Leibniz, such as Johann Clauberg, Erhard Weigel, and Johann Christoph Sturm.[13] And, like these contemporaries, even as Leibniz endorses the notions of substantial forms and prime matter, he is careful to highlight the “perversion” of Aristotle’s natural philosophy at the hands of the schoolmen. Significantly, he suggests that part of the perversion of Aristotle’s philosophy consists in the insufficiency of the scholastic approach to physics. For in natural philosophy, “aid must be sought from the senses, from experience, and from mathematics, which Leibniz, again in the spirit of corpuscularian propaganda, charges the schools with having neglected or deemphasized in their qualitative studies.[14] The emerging picture is one on which a correct appreciation of Aristotelian metaphysical principles reveals their compatibility with the epistemological orientation of the mechanical one. Similarly, a correct understanding of the mechanist scheme of restricting explanation to what can be grasped distinctly in

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[13] Weigel, one of Leibniz’s teachers, proposed a harmony of the method of demonstration in *Posterior Analytics* with the Euclidean method popular among mechanical philosophers; Ar. ex Eucl., 4. And Clauberg, who represented Cartesianism for Leibniz in the 1660s, distinguishes Aristotle from the medieval scholastics to declare that Aristotle’s own philosophy “in many basic respects agrees more with the Cartesian than with the school philosophy” (Unterschied, 65). The young Leibniz follows this feature of the post-war *Zeitgeist*.

[14] GP IV 164; L 94-95

bodies—namely, magnitude, figure, and motion—should lead to the conclusion that incorporeal principles are required to ground mechanism. At this early stage, however, the requirement of such principles remains a demand, the fulfillment of which has been promised but not given.

These concerns are the topic of Leibniz's 1669 "Confession of Nature against the Atheists." Leibniz's agreement with the corpuscularian philosophers that "we must not unnecessarily resort to God or to any other incorporeal thing, form, or quality" in explaining corporeal phenomena, and that "everything should be derived from the nature of body and its primary qualities—magnitude, figure, and motion" is tempered by his insistence that these primary *explanantia* themselves cannot be found in the essence of body, but require an incorporeal principle. Leibniz's ensuing arguments assume the Principle of Sufficient Reason (PSR): every determination of a body must have a reason for its existence, which must derive either from itself or from something acting upon it. That is,

> why it [a body] should be three feet long rather than two, or why square rather than round. This cannot be explained by the nature of bodies themselves, since the same matter is indeterminate as to any definite figure, whether square or round. Therefore, only two replies are possible. Either the body in question must be assumed to have been square from all eternity, or it has been made square by the impact of another body – if, that is, you refuse to resort to an incorporeal cause. If you say it has been square from all eternity, you give no reason for it, for why should it not have been spherical from all eternity?... But if you say that it was

> made square by the motion of another body, there remains the question of why it should have had any determinate figure before such motion acted upon it.[15]

Assuming that eternity cannot be a cause of anything, the mechanical philosopher who steadfastly refuses to reach beyond the primary qualities of bodies for her explanations falls into an infinite regress of bodies acting upon bodies. Such a predicament not only amounts to a failure to identify principled limits on intelligibility, it also has the graver theological consequence of implying the eternity of the world. To avoid such consequences, Leibniz directs his criticism at the self-sufficiency of the Cartesian concepts of motion, firmness, and cohesion, in each case raising the specter of an infinite regress. The conclusion from the inadequacy of explanations restricted to these concepts is that "nature cannot dispense with the help of God," and an incorporeal being must be assumed, which must be "one for all because of the harmony of things."[16] A conception of physical objects as magnitudes needs to be supported by incorporeal notions.

Yet, despite the charges of explanatory inadequacy that Leibniz raises here for the mechanical worldview, he is not fundamentally at odds with the Cartesian picture he had endorsed on his walk in the Rosental woods. Leibniz's aim in this tract, intended as part of an ambitious project in Christian apologetics, the "Catholic Demonstrations," is to

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[15] GP IV 106-7; L 110-1.

[16] GP IV 109; L 112. As Descartes himself recognizes inasmuch as he implicates God as the giver and conserver of motion in the universe. Leibniz, of course, later conceives created substances as bearers of force, thus situating the principle of motion within the created order itself. The explanation for the series of changes in nature could therefore dispense with the assistance of God, once God's role as creator and sustainer has been granted.

argue that the mechanical philosophy itself leads to recognition of the existence of God.[17] But, to that end, Leibniz's argument for God's role in explaining nature establishes only that God must be the ontological ground of the geometrical properties of matter. For his arguments depend on introducing a first cause, which could terminate the conceptual regress, without specifying what kind of cause it must be. A Cartesian response to Leibniz's argument could very well answer the challenge by invoking the true and immutable geometrical natures as formal causes originating in God's intellect, and which constitute the essence of matter, together with God's power as the first moving cause of the world.[18] God, on the Cartesian picture, imparts motion to matter, which immanently bears formal natures (the principles of geometry in terms of which the primary qualities of bodies are defined) and from which its further determinations follow. The Cartesians withhold any appeal to divine choice in explaining particular corporeal changes, and nothing in Leibniz's arguments seems to lead ineluctably to that conclusion.[19] Indeed, nowhere in this text does Leibniz invoke God's will as an explanatory principle.

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[17] While, over the course of his life, Leibniz offers a variety of proofs of God, it is the proofs from experience—design arguments, cosmological proofs—that take increasing prominence in his later thought. Indeed, in a 1704 letter to Damaris Masham, he writes that "it is also only by his [i.e. God's] effects that we come to know of his existence" (G III 357; WF 215).

[18] Garber, *Leibniz*, 12-3, 228-9, argues for a reading of "Confessio naturae" such that God's choice plays no role in Leibniz's thinking at this stage. This reading will be complicated somewhat in the following discussion.

[19] The issue is, to be sure, far more complicated, for Descartes maintains that geometrical natures themselves, indeed all eternal truths about created things, depend on God's will. For Leibniz, by contrast, logical and mathematical truths are grounded only in the Principle of Contradiction, which is the very essence of God's intellect. If, as the Cartesians insist, material changes can be explained exclusively by mathematical principles, the divine will should have no role whatsoever. A fundamental demand of the Cartesians' mechanics, consequently, conflicts with a central demand of their theology, namely, God's complete freedom, a point that is not lost on Leibniz.

Noteworthy as well is the absence at this stage of any concern with the necessitarian implications of the Cartesian scheme—already given expression by Descartes himself—that are a consequence of grounding nature in God's intellect alone.[20] It would take Spinoza to impress upon Leibniz the full significance of the exclusion of God's will from the order of nature.

Nevertheless, Leibniz has here stumbled upon an important ambivalence in the Cartesian system, but to which he gives only an indirect expression in this early text. While the appeal to divine providence in nature is not foregrounded, Leibniz nonetheless concludes that,

> no reason can be given why this incorporeal being chooses one magnitude, figure, and motion rather than another, unless he is intelligent and wise with regard to the beauty of things and powerful with regard to their obedience to his command. Therefore such an incorporeal being will be a mind ruling the whole world, that is, God.[21]

Leibniz's leap from the infinite regress generated by a chain of efficient material causes to a *wise* incorporeal being that *chooses* the series of changes in nature depends on an assumption about the nature of ideas. As Leibniz would reiterate over the course of his life, ideas are, by themselves, causally inert. A system of nature considered only as a system of ideas in God's intellect, which constituted its essence or possibility, would not

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[20] Cf: "For by the operation of these laws [of nature] matter must successively assume all the forms of which it is capable" (AT IXB 103; CSM I 258).

[21] GP IV 109; L 112.

be a domain of actuality, for action requires that a will incline toward represented good, or to act upon the content of an idea.[22] Although God's intellect represents in an idea the particular series of changes in the created world, what is needed for that sequence to be actualized is the inclination of God's will toward the good represented in the idea, and for his power to produce the effects through causal agency. Insofar as the existence of material bodies depends on God's will in addition to his intellect, consequently, it is not possible to eliminate God's will, hence, his purposes, from a complete explanation of the natural world. Leibniz's earliest explorations toward reconciling the mechanical and final causal worldviews lead him to recognize a tension in the metaphysical foundations of the new natural philosophy, overcoming which appears at this stage to require mentality in a fuller sense than is recognized by the Cartesians. Specifically, it requires genuine mental causation in addition to representations in a mind of a series of states.

Two key texts in the idealistic progress of Leibniz's thought in the project of articulating the foundations of the mechanical philosophy date from 1671, the "Theory of Abstract Motion" and the "New Physical Hypothesis," or "Theory of Concrete Motion." The former text was prompted by his encounter in 1669 with Wallis', Huygens', and Wren's correction of Cartesian laws of motion published in *Philosophical Transactions*.[23] The treatise is divided into two parts, the "Theory of Abstract Motion," and the "Theory

[22] This basic Leibnizian tenet is never argued for, but is given concise expression in the later *Theodicy*: "The will is never prompted to action save by the representation of the good, which prevails over the opposite representations. This is admitted even in relation to God, the good angels and the souls in bliss" (GP VI 128; T 148)
[23] See François Duchesneau, *La dynamique de Leibniz* (Paris: Vrin, 1994), 35-8, for background to the "Theory of Abstract Motion," and Leibniz's preparatory studies that bear anticipations of his later dynamics in the "De rationibus motus."

of Concrete Motion," a division that anticipates the development of Leibniz's full-blown monadological solution to the problem of reconciling the ancient and modern philosophies. As Catherine Wilson explains, the division in the text has its origin in Descartes' work, as illustrated by his recognition of the distinction between the ideal laws of motion and the generalities obtained by observations of colliding bodies. The former refer to ideal conditions that do not obtain in the actual world, and are thus accessible through reason alone. The latter, by contrast, always contain discrepancies and distortions due to the fact that concrete bodies are never perfectly hard.[24] Accordingly, whereas the "Theory of Abstract Motion" contains clear indications of the direction toward Leibniz's idealist metaphysics of immaterial, striving substances as the ground of appearances, the "Theory of Concrete Motion" offers a speculative cosmology of an all-pervasive aether and spinning corpuscles lying at the basis of all phenomena.[25] The former, in other words, treats body conceptually under the attribute of extension alone, while the latter considers the magnitude, shape, and motion of the apparent body. Among the *praedemonstrabilia* of the "Theory of Abstract Motion" Leibniz includes actual division to infinity of the continuum, and the existence of unextended, incorporeal beings.

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[24] Catherine Wilson, *Leibniz's Metaphysics: A Historical and Comparative Study* (Princeton: Princeton University Press, 1989), 51-2. The division of physics into "experimental" and "rational" branches, thus, can be found even there. In Leibniz's case, moreover, Wilson traces the division to his distinction between the "poiographic" study of qualities, and the "eidographic" study of "the things into which these qualities coalesce" (L 90). Abstract philosophy, thus, treats *ens mentalia* under which are subsumed the historical results obtained in concrete philosophy.

[25] See Garber, *Leibniz*, 33ff; Wilson, *Leibniz*, 53ff, and Duchesneau, *La dynamique*, 43ff, for readings of the text that highlight the Hobbesian background in *De corpore*. While I certainly do not dispute their accounts, I take the text to contain, unlike Garber and Duchesneau, anticipations, perhaps unbeknownst to the young Leibniz, of his later metaphysics. In this I am in agreement with Mercer, *Leibniz*, 256ff.

Leibniz's proof for the latter thesis rests on the conceivability of a limit to motion or to extension:

> There is a beginning and an end to any given space, body, motion, and time. Let that whose beginning is sought be represented by line *ab*, whose middle point is *c*, and let the middle point of *ac* be *d*, that of *ad* be *e*, and so on. Let the beginning be sought at the left end, at *a*. I say that *ac* is not the beginning, because *cd* can be taken from it without destroying the beginning; nor is it *ad*, because *ed* can be taken away, and so forth. So nothing is a beginning from which something from the right can be removed. But that from which nothing extended can be removed is unextended. Therefore the beginning of body, space, motion, or time – namely, a point, conatus, or instant – is either nothing which is absurd, or unextended, which was to be demonstrated.[26]

A consideration of the conceptual presuppositions of limits to mathematical quantities, which are needed to explain initiation and termination of motion in bodies, leads Leibniz to postulate the existence of unextended beings. The essential attribute of these beings is "conatus," defined as being "to motion as a point to space, or as one to infinity, for it is the beginning and end of motion."[27] Conatus figures in the theory of motion as an infinitesimal element of motion out of which complex motions are composed. As an infinitesimal, of course, the notion of conatus enters Leibniz's natural philosophy as an idealization, for infinitesimal quantities can only be elements in the mathematical

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[26] GP IV 228-9; L 139-40.
[27] GP IV 229; L 140.

analysis of motions but not real magnitudes of bodies. It is in important respects the conceptual analogue to what would later become the notion of primitive force in Leibniz's dynamics.[28] These point-like, entities are in space, though non-extended, and in time, though instantaneous. More striking, however, is Leibniz's identification of the conatus of a body with a "momentary mind" (*mens momentanea*).[29] The connection of thought and conatus, an important part of the Hobbesian system, is not new with Leibniz. But, whereas Hobbes' identification of conatus with thought occurs in the context of a materialistic psychology in which thought itself is reduced to motions of matter in the brain, Leibniz here introduces immaterial minds in bodies, so that the active and passive corporeal forces are grounded in the actions and passions of minds immanent in bodies.[30] Indeed, he claims in the same passage to have uncovered a novel distinction between mind and body:

> *No conatus without motion lasts longer than a moment except in minds.* For what is conatus in a moment is the motion of a body in time. This opens the door to the true distinction between body and mind, which no one has explained heretofore.

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[28] See Philip Beeley, *Kontinuität und Mechanismus: zur Philosophie des Jungen Leibniz in ihren ideengeschichtlichen Kontext* (Stuttgart: Steiner, 1996), 313ff, for a treatment of the theory of conatus in its relation to the composition of the continuum, and Leibniz's concept of the mathematical point. Duchesneau, *La dynamique*, 48-57, offers a detailed account of the theory of conatus in the "Theory of Abstract Motion" and its significance for the development of Leibniz's later dynamics, in particular of the law of conservation of force. What is worth noting, in any event, is that even at this early stage the connection between the concept of force and the need to go beyond geometry for a metaphysically well-grounded physical science is evident in Leibniz's thinking.

[29] GP IV 230; L 141.

[30] Mercer, *Leibniz*, Ch. 7, musters further evidence from this period of Leibniz's "panorganic vitalism," and traces the monadological ontology of mind-like substances to this period.

> For every body is a momentary mind, or one lacking recollection, because it does not retain its own conatus and the other contrary one together for longer than a moment. For two things are necessary for *sensing pleasure* or pain—action and reaction, opposition and then *harmony*—and there is no sensation without them. Hence body lacks memory; it lacks the perception of its own actions and passions; it lacks thought.[31]

An important implication is that unified, extended bodies do not actually exist independently of minds that are capable of holding their transitory motions together in reflection or memory. More provocative still is Leibniz's suggestion that body just is a "momentary mind," one that lacks recollection, thus the capacity to establish the temporal continuity required for identity. For the elemental motions of bodies do not preserve their previous states and, since each body, being infinitely divisible, is composed of infinitely many such motions, its enduring, unified existence requires the presence of a power that can hold together the series of changes that occur in it. One such power, perhaps the only one that we are acquainted with, is thought. Hence, the temporally and spatially extended existence of material unities must depend on the cohesion supplied in thought by immaterial, perceptive beings. Leibniz reiterates this point in a letter to Arnauld later that same year: "Thought consists in conatus, as body consists in motion. Every body can be understood as a momentaneous mind, or mind without recollection."[32] The inference from conatus as an infinitesimal element of motion to the presence of mentalistic entities in bodies can be taken to have become Leibniz's considered position.

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[31] GP IV 230; L 141.
[32] A II.1B 279; L 149.

Leibniz's quest to reconcile the mechanical and Aristotelian world pictures, and with that his search for adequate metaphysical grounds for the new science leads him to postulate at an early stage of his intellectual development mind-like entities as the building blocks of nature. It is unclear yet, however, whether these minds are present *in* bodies, thus constituting corporeal substances, or instead whether minds are the only true beings in nature. Whether or not Leibniz held a realist view of corporeal substances at some point in his career has been the subject of lively debate ever since Daniel Garber first proposed the thesis.[33] While I remain in the skeptics' camp, and in general incline

[33] The issue of corporeal substances in Leibniz has become notoriously vexed. Long-standing scholarly agreement on the presence of the monad theory from Leibniz's early writings onward was shaken with Daniel Garber, "Leibniz and the Foundations of Physics: The Middle Years," in *The Natural Philosophy of Leibniz,* eds. Kathleen Okruhlik and James Robert Brown, 27–130 (Dordrecht: Reidel, 1985), who argued for an Aristotelian hylomorphic, "corporeal substance" theory, together with a realist theory of "prime matter", in Leibniz's crucial 1680s-90s period. On this account, in, while the active principle indeed rests in minds, the passive principle is constituted by extended force that excludes the penetration of one body by another and enters as a material principle for the explanation of cohesion. Since then, Adams, *Leibniz*, Ch. 10, has argued against Garber's account, as has R.C. Sleigh, Jr., *Leibniz and Arnauld: A Commentary on Their Correspondence* (New Haven: Yale University Press, 1990), Chs. 5-7. Wilson, *Leibniz*, Ch. 3, attributes a disjunctive view to Leibniz during this period, on which one formulation assumes, while the other denies, reality to matter. Rutherford, *Leibniz*, Pt. III, opposes Wilson's account. Beeley, *Kontinuität und Mechanismus*, largely from a study of earlier, pre-1680s texts, is of the opinion that Leibniz accepts the real extension of matter and that the mentalistic components of nature emerge later. Mercer, *Leibniz*, Ch. 7, rejects Garber's interpretation and, in fact, argues that Leibniz's monadological conception of substance, as well as the denial of reality of matter, is already in place by the early 1670s. Phemister, *Leibniz*, by contrast, rejects attributing idealism to Leibniz altogether, even into the last decade of his life. On her compatibilist reading neither corporeal substance nor simple substance is ontologically prior, thus resisting the idealist position that body results from, or can be explained away by, perception. Garber, *Leibniz*, partly in reply to critics, defends the attribution of the corporeal substance view as picking out a genuine and distinct period in Leibniz's career, even if it gets abandoned later on. Justin E.H. Smith, *Divine Machines,* (Princeton, NJ: Princeton University Press, 2011), defends not only Garber's reading, but also Phemister's more robust realism, and develops at length an account of Leibniz's organicist conception of body in the context of

against periodized readings of Leibniz, I do not wish to wade into the debate here. I only note that, even if Leibniz's mature conception of substance has not been fully articulated by 1671, the conceptual seeds of a monadological system are very much in place. In the same way, while Leibniz has not yet asserted that matter is nothing real in itself but a "well-founded phenomenon," the thesis of the unreality of extended, impenetrable matter is only thinly veiled. The crucial notion of *phenomenon bene fundata* is worth a brief comment.

With this locution, Leibniz aims to address the question of how an immaterial reality could give rise to appearances. Simple, indestructible substances that contain the entire series of their determinations in themselves, are, for Leibniz, the ultimately real beings. A phenomenon is that which appears to such a mind-like being and is represented, however confusedly, in its perceptions. Phenomena are *derived* from mind-like substances and *reducible* to their perceptions by resulting from their natures. With his notion of well-foundedness, Leibniz maintains that the stable, material, and moving objects of science and everyday perception that appear in space and time have a true basis in substantial natures. Illusions, by contrast, do not have such a basis, and are mere phenomena. In a later text, "On the Method of Distinguishing Real from Imaginary Phenomena", Leibniz would give several criteria with which to identify well-founded, or real phenomena. Among these he includes their congruity, complexity, coherence with

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his work in the life sciences. Among these commentators, my own interpretation is closest to Adams, *Leibniz*, and Rutherford, *Leibniz*. But outside the recent tradition, see Cassirer, *Leibniz' System*, Ch. 8, for a different treatment of the problem of individuation, in both the biological and non-biological realms, and Leibniz's idealistic solution to it in reference to his natural philosophy.

past, regular phenomena, and our ability to give explanations for them. But the most important criterion is the harmony of perceptions within a perceiver's experience, as well as intersubjective agreement among different perceivers. Harmony also grounds the predictive order of perceptions, and is highlighted as the most important mark that secures reality for phenomena: "the most powerful criterion, sufficient even by itself, is success in predicting future phenomena from past and present ones, whether that prediction is based upon a reason, upon a hypothesis that was previously successful, or upon the customary consistency of things as observed previously."[34] As Robert Adams comments on this important text: "Real phenomena are those that form part of a coherent, *scientifically* adequate story that appears all or most of the time, at least in a confused way, to all or most perceivers. That is the story that would be told, or approximated, by a perfected physical science. Imaginary phenomena are those that do not fit in this story."[35]

These early traces of Leibniz's idealism are not transitory. In a letter to Foucher from 1675, Leibniz appears even more committed to the thesis that matter and bodies depend on inherently active and mentalistic substances:

> [w]e think and… there is a great variety in our thoughts. This variety cannot come from that which thinks, since one thing by itself cannot be the cause of the changes occurring in it. For everything remains in the state in which it is, unless

[34] GP VII 320; L 364.
[35] Adams, *Leibniz*, 257. For further discussions of this important notion, see Nicholas Rescher, *The Philosophy of Leibniz* (Englewood Cliffs, NJ: Prentice-Hall, 1967), Ch. 7; Ian Hacking, "Why Motion Is Only a Well-Founded Phenomenon," in *The Natural Philosophy of Leibniz,* eds. Kathleen Okruhlik and James Robert Brown, 131–50. (Dordrecht: Reidel, 1985).

> there is something which changes it… Thus there is some cause outside of us for the variety of our thoughts. And since we agree that there are some subordinate causes of this variety which themselves still need a cause, we have established particular beings or substances to whom we ascribe some action, that is, from whose change we think that some change follows in us. So we make great strides toward fabricating what we call matter and body.[36]

We "fabricate" matter and body insofar as we, in the mode of the corpuscularian natural philosophers, take material appearances to be independently subsisting beings constituting a mind-independent world. But the orderliness of perceived changes which physics explicates does not require the existence of matter or body specifically, but only that there be "something which gives us appearances in good sequence." Limited to its quantitative concepts, physics can only stake a claim on a regular order of appearances, but remains in ignorance of that which underlies that order. Leibniz's point in this discussion is that the systematic study of moving bodies in space, insofar as it aims merely to predict future occurrences from past regularities, can proceed without any metaphysical commitments about the reality or unreality of matter. All the same propositions of a physical theory would follow equally whether one admits or denies Cartesian material substance. Such a physics, thus, turns out to have only moral, rather than absolute certainty, insofar as its claims extend only to the coherence of perceptions:

> The more consistency we see in what happens to us, it is true, the more our belief is confirmed that what appears to us is reality… This permanent consistency gives

[36] A II.1B 390; L 153.

> us great assurance, but after all, it will be only moral until somebody discovers *a priori* the origin of the world which we see and pursues the question of why things are as they appear back to its foundations in essence.[37]

Absolute certainty for the laws of motion, for instance, would require showing its "foundations in essence," which Leibniz immediately proceeds to rule out as a possibility in our present state, since that would "very nearly approach the beatific vision." In its current, unreconstructed state, consequently, physics must remain content with increasing moral certainty gained with greater coherence among well-founded phenomena. The methods for positing and approaching such ideals would, as we will see later, involve extensive use of principles of order, which will return physics to its deeper ground in a metaphysics of incorporeal beings.

Tracing the arc to this stage of Leibniz's development toward idealism in the context of physics reveals the epistemological underpinnings of the progression. The movement toward idealism has been motivated so far by Leibniz's concern to support the kind of knowledge which alone for the most part we comprehend, namely, appearances of bodies under the common sensibles of magnitude, figure, and motion, or the objects of physics. A stronger urge toward the reintroduction of final causes in physics, however, would result from a fateful encounter with Spinoza.

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[37] A II.1B 391; L 154.

3. Spinoza's challenge, and seeking a middle path

Three other episodes in Leibniz's early development need to be in place before we can properly appreciate the reconciliation of mechanism and finality he offers in his mature philosophy. The first of these is a momentous encounter in 1676 with Spinoza, which brought home with full force the implications of the rejection of final causes and spurred Leibniz on to a more urgent strategy for reintroducing finality in nature. The second episode unfolds rather seamlessly from the natural scientific path we have been pursuing, and relates to Leibniz's discovery of certain axiomatic principles required by the new physics, such as the principle of equality of cause and effect, together with a failure to demonstrate them "geometrically." The third arises from his work in optics, and his derivation, following Fermat, of proofs of the laws of dioptrics and catoptrics from one such principle alone, namely, that of maxima and minima. It is an open question what the respective roles are of these three factors in the emergence of Leibniz's mature position on final causes in natural philosophy. Leibniz engages in all three projects contemporaneously, and never offers a statement of priority to aid his interpreters. One conjecture, defended by Garber, is that he may simply have viewed the concurrence of the three episodes as serendipitous for the true reconciliation of mechanism and finality, and the ancient and the modern philosophies.[38] A different, though compatible, explanation, defended in this section, finds striking continuity with the proto-idealistic conclusion present in the "Theory of Abstract Motion."

[38] Garber, *Leibniz*, 244-5.

In late 1676, en route from Paris to Hannover to take up a new appointment as librarian to Duke Johann Friedrich of Braunschweig, Leibniz sojourned in Amsterdam for several weeks. Although he had been corresponding with Spinoza since at least 1671, and admired the *Tractatus theologico-politicus*, it was only now for the first time that he gained access to the as-yet unpublished *Ethics*. To cap off a successful trip to Holland, Leibniz had the occasion to meet Spinoza between November 18 and 21, barely three months before the latter's death. From his voluminous notes on the *Ethics* between 1676-78, as well as repeated mentions of Spinoza throughout the rest of his life, the encounter undeniably left a deep impression on Leibniz.[39]

An aspect of Spinoza's impact on Leibniz that has garnered much attention from commentators has been the issue of necessitarianism. Spinoza argued in the *Ethics* that "there must follow, from the necessity of the divine nature, infinite things in infinite ways,"[40] so that "in Nature there exists nothing contingent, but all things have been determined by the necessity of the divine nature to exist and operate in a certain way."[41] Spinoza takes it to be a consequence of divine omnipotence that everything that is conceivable in God's intellect must be actualized. He denies, at least as Leibniz reads him, any role to God's will, or even to his intellect, as the will and intellect are commonly understood, in the determination of what exists.[42] Thus, necessarily, there are no

[39] A selection of Leibniz's notes on the *Ethics* is collected in GP I 139-52.
[40] E Ip16.
[41] Ibid. Ip29.
[42] Ibid. Ip17s.

unactualized possibles, and the opinion that some things are contingent is merely due to a defect in our knowledge.[43]

Much ink has been spilled on Leibniz's lifelong struggle to overcome the specter of Spinozist necessitarianism, and we shall not rehearse the matter here in detail.[44] It suffices to note that, whether or not Leibniz ever succeeded in refuting Spinoza, he never wavered from his commitment to the contingency of the created world. In an oft-quoted passage from the late-1680s, he recounts his initial enticement toward, and subsequent disavowal of, the Spinozist position: "When I considered that nothing happens by chance or by accident… that fortune distinguished from fate is an empty name, and that no thing exists unless its own particular conditions are present… I was very close to the view of those who think that everything is absolutely necessary." The text continues: "But the consideration of possibles, which are not, were not, and will not be, brought me back from this precipice. For if there are certain possibles that never exist, then the things that exist, at any rate, are not always necessary."[45] The task of substantiating the claim—one in which he perhaps ultimately failed—that the world of nature is contingent rather than necessary becomes, for Leibniz, philosophical bedrock in the decades following his brush with Spinoza.[46]

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[43] Ibid. Ip33s1.

[44] For influential treatments of Leibniz's engagement with the problem of contingency, at least partly arising out of his struggle with Spinoza, see Adams, *Leibniz*, Pt. I, and Sleigh *Leibniz and Arnauld*, Ch. 4. By contrast, see Mercer, *Leibniz*, 451-59, for a deflationary position on Spinoza's impact on Leibniz.

[45] A VI.4 1653; AG 94.

[46] Leibniz's critique of Spinoza regarding contingency and necessity recurs throughout his corpus from the mid-1670s onward. See, e.g. T 173, for a late discussion.

Closely related to Spinoza's necessitarianism, however, is a second position, substance monism, that Leibniz also emphatically rejects. For Spinoza, God is the only substance that can exist or be conceived, and everything that exists does so in God, who is the immanent cause of all things.[47] Together with his notorious identification of God and Nature and the denial of real contingency, it is easy to draw the inference, as Leibniz did, that Spinoza's world of nature is one, unified, divine substance that unfolds its variegated forms from brute necessity. Indeed, Leibniz labels Spinoza a naturalist in the fashion of the "new Stoics," and it is positions such as Spinoza's that he regards as particularly egregious transgressions of the "bounds of reason."[48]

More relevant to our purposes, however, is Spinoza's rejection of final causes in nature which follows from his necessitarianism and monism. In the Appendix to Part I of the *Ethics*, Spinoza notoriously characterizes God's will as a "sanctuary of ignorance," appeals to which betray only superstition, declaring "that Nature has no end which is pre-established for it, and that all final causes are nothing but human inventions."[49] Given Spinoza's denial of any role to either God's will or intellect in the determination of existence, the question of whether modifications of God are for the sake of any particular order becomes meaningless. However, it is noteworthy that, although for Spinoza the three positions are closely connected, Leibniz appears at first to have kept them apart.[50] Commenting on a copy of a letter from Spinoza to Oldenburg in which Spinoza had written that, "I conceive that everything follows from the nature of God with an

[47] E Ip14; Ip15; Ip18.
[48] GP VII 334; AG 282; GP VI 531; L 555.
[49] E Iapp.
[50] See Garber, *Leibniz*, 232-3.

inevitable necessity," Leibniz writes: "The world could not have been produced otherwise, since God couldn't have worked in a way that is not the most perfect. For since He is most wise, He chooses the best. It is hardly to be thought that everything follows from the nature of God without any intervention of will."[51] Leibniz agrees with Spinoza that the order of nature could not have been otherwise, and so exists of necessity. At the same time, though, he does not regard this conclusion as logically excluding from nature God's will, hence his purposes.

The precise articulation of this position becomes a significant theme in Leibniz's thinking over the following decade, culminating in a distinction between absolute and hypothetical necessity. Absolute, or metaphysical, necessity, briefly, belongs to that whose opposite is a contradiction. That is, metaphysics should be based entirely on the Principle of Contradiction, and thus consider only necessary truths. Something is only hypothetically necessary, by contrast, just in case its opposite does not entail a contradiction, but only a contrary or subcontrary opposition. The determinacy of truths not grounded, or at least not explicable by the Principle of Contradiction, depends instead on the PSR, and God's rational freedom to choose to create the best.[52] In a paper from ca. 1680, Leibniz explains this distinction:

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[51] A VI.3 364; trans. in Garber, *Leibniz*, 232.

[52] As we will see shortly, Leibniz's position in this period regarding the status of metaphysical truths—whether they are grounded in the Principle of Contradiction or the Principle of Sufficient Reason, or both—is unstable. Here, he suggests a clear distinction between the domains of application of the two principles. Yet, in a few years' time, he will assert that a great part of metaphysics depends on the PSR. The tension between the priority, if any, between the two principles remains through much of his career, though it appears to have achieved some kind of resolution, or at least a clearer outline for one, by

> All truths of metaphysics, or all truths that are absolutely necessary, such as those of logic, arithmetic, geometry, and the like, rest on the former principle [i.e., *that whatever implies a contradiction is false*]… All truths contingent by their nature, which are necessary only on the hypothesis of the volition of God or of some other being, rest on the latter principle [i.e., *that whatever is more perfect or has more reason is true*].[53]

With regard to the existence of the world of nature, Leibniz attributes to laws of nature the latter kind of necessity, which derives from God's choice of greatest perfection, or the inclination of his will toward the best reasons: "All truths of physics are of this sort; for example, when we say that some body persists in the speed with which it begins, we mean it does so if nothing prevents it."[54] Thus, the existence of the actual world is necessary on the hypothesis that God chooses to create a world in accordance with the principle of perfection, or the principle to maximize the greatest quantity of essence. Yet, God is not necessitated to choose this principle, but does so freely from his moral determination to choose the best. The laws that govern the course of nature, and which are the result of God's choice are, consequently, rational but only hypothetically necessary. Coordinately, from the point of view of knowledge—the standpoint of physics as revealed in the 1675 letter to Foucher—such laws aspire only to moral, rather than

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1711. In §14 of the review essay, "Observations on the book concerning the origins of evil", published alongside the *Theodicy*, he declares: "Both principles must hold not only in necessary but also in contingent truths; and it is even necessary that that which has no sufficient reason should not exist. For one may say in a sense that these two principles are contained in the definition of the true and the false" (GP VI 414; T *Obs*. 14).

[53] A VI.4 1445; AG 19.

[54] A VI.4 1446-7; AG 20.

absolute or metaphysical certainty. This position on the rational but contingent status of laws of nature, and the proper epistemic attitude they demand, then remains constant through the end of his life, and is nicely summarized in the *Theodicy*:

> [T]he laws of Nature regulating movements are neither entirely necessary nor entirely arbitrary. The middle course to be taken is that they are a choice of the most perfect wisdom. And this great example of the laws of motion shows with the utmost clarity how much difference there is between these three cases, to wit, firstly an *absolute necessity*, metaphysical or geometrical, which may be called blind, and which does not depend upon any but efficient causes; in the second place, *a moral necessity*, which comes from the free choice of wisdom in relation to final causes; and finally in the third place, *something absolutely arbitrary*, depending upon an indifference of equipoise, which is imagined, but which cannot exist, where there is no sufficient reason either in the efficient or the final cause.[55]

In the context of natural philosophy, the relevant point is that Leibniz wants to steer a middle course between, on the one hand, the necessitarian position according to which

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[55] GP VI 321; T 349. One may rightly wonder whether hypothetical necessity is sufficient for *contingency*. This is difficult question that requires penetrating into the details of Leibniz's theory of predication, his conceptual containment theory of truth, and the modal status of the PSR—whether it is itself a necessary or a contingent truth—and I do not pretend to be able to answer it here. However, as a dialectical matter of Leibniz's struggle against Spinoza, it is enough to appreciate that Leibniz takes himself to have undercut the strict necessitarianism that he finds so problematic. The articulation of a precise and satisfactory account of contingency is a further development that finds its most sustained treatment in Leibniz's correspondence with Arnauld. Sleigh, *Leibniz and Arnauld*, provides an extensive commentary on this debate. See also Adams (1994), ch.1.

the order of nature and the laws of motion that govern it follow from a logical determination of God's intellect alone; and, on the other, between an unreasoned arbitrariness in the choice of what exists. The former position Leibniz associates with Descartes and Spinoza, whereas Newton may have been guilty of the latter.[56] Leibniz's own efforts are directed at explicating the position on which the most perfect wisdom freely—thus, contingently—chooses the most effective means with which to create the best possible world.

Interlude – The Principle of Contradiction and the Principle of Sufficient Reason

Although a full treatment of Leibniz's complex struggles in the metaphysics of necessity and contingency is well beyond the scope of the present chapter, a brief comment on the topic is necessary.[57]

Leibniz's proposals to save contingency are constrained by two commitments of his metaphysics: first, the Principle of Sufficient Reason: "there can be found no fact that is true or existent, or any true proposition, without there being a sufficient reason for its

[56] See Kathleen Okruhlik, "The Status of Scientific Laws in the Leibnizian System," in *The Natural Philosophy of Leibniz,* eds. Kathleen Okruhlik and James Robert Brown (Dordrecht: Reidel, 1985), 183-6.
[57] The literature on modality in Leibniz is vast, and we need not concern ourselves with its details. For representative discussions, see Rescher*, Philosophy of Leibniz*, Ch. 3; Edwin Curley, "The Root of Contingency," in *Leibniz: A Collection of Critical Essays,* ed. Harry Frankfurt, 69–97 (Garden City, NY: Doubleday Anchor, 1972); Margaret Dauler Wilson, "Leibniz's Dynamics and Contingency in Nature," in *Motion and Time, Space and Matter,* eds. Peter Machamer and Robert Turnbull, 264–89 (Columbus: Ohio State University Press, 1976); Okruhlik, "Scientific Laws"; Benson Mates, *The Philosophy of Leibniz: Metaphysics and Language* (New York: Oxford University Press, 1986), Ch. 6; Sleigh, *Leibniz and Arnauld*, Ch. 5; Adams, *Leibniz*, Ch. 1.

being so and not otherwise, although we cannot know these reasons in most cases;"[58] and, second, the Principle of Contradiction, which underwrites the further principle that, for any necessary truth, the predicate-concepts is analytically contained in the subject-concepts: "in all true, affirmative propositions, whether universal or singular, necessary or contingent, the predicate inheres in the subject or that concept of the predicate is in some way involved in the concept of the subject."[59] Each of these commitments causes trouble. The PSR expresses the demand that there is nothing without a reason, which God, at least, knows and upon which he acts. In creating this world, God wisely chooses the uniquely best from among an infinite number of possible worlds. On the face of it, it seems that God's knowledge of the uniquely best world to actualize leaves little room for the facts about this world to be deemed contingent. The second principle, of predicate-in-subject containment, also creates difficulty. For if every true proposition is analytic, and God creates all subjects (individuals) fully determined, then again every fact about the world seems to be a necessary truth. With these in mind, we can review Leibniz's two leading theories of contingency.

The first theory, call it the material theory, conceives the contingent as that whose non-existence is possible. To say that a proposition such as, "Alexander is a student of Aristotle," is contingent amounts to saying that it is not necessary that Aristotle taught Alexander because the truth of the proposition depends on the contingent existence of the subjects, that is, on God's choice to create the world in which such a relation between Aristotle and Alexander obtains. Nothing in the idea of any logically possible world

[58] Monadology, §32; L 646.
[59] "On Freedom" (ca. 1689), A VI.4 1654; L 264.

determines its actual existence without the involvement of God's free will. Thus, "Alexander is a student of Aristotle," is contingent upon God's decision to create. The root of contingency, as Leibniz puts it, lies in the one un-necessitated feature of God, namely his will, which is the ultimate reason for why anything exists, and thus for why thoughts about any objects correspond to facts about real beings.[60]

Despite Leibniz's frequent appeal to this source of contingency, there are well-known objections to his view. For one thing, one might worry that genuine contingency cannot be equeated with mere hypothetical necessity in the initial act of creation. Given that this world exists with my completely determined concept, on Leibniz's picture, it doesn't seem contingent in any meaningful sense that I could have chosen to wear something different today. In fact, since Leibniz denies trans-world identity, there is no sense at all in which I (rather than a more-or-less resembling but numerically different individual) could have done anything otherwise. More pressing is a problem for moral responsibility. For if the only way for Brutus not to have stabbed Caesar is for him not to have existed, then it is hardly plausible to hold him morally responsible for Caesar's death. Contingency as hypothetical necessity has seemed to many readers a dissatisfying solution. For another thing, given Leibniz's strong commitment to PSR, which governs even God's wisdom, one wonders if God really could have created a different world. Against defenders of radical divine voluntarism, Leibniz contends that a pure indifference to motives is not only unbefitting of divine wisdom, but also would never lead any agent,

[60] We find this account of the root of contingency in, for example, Rescher, *Philosophy of Leibniz*, 39, and Curley, "Root of Contingency." This theory of contingency effectively weakens the force of the predicate-in-subject principle, by making predicate containment a necessary but not sufficient criterion for truth.

finite or infinite, to act. But since God knows the objective good, and knows which world best accords with that good, it seems he could not really have chosen to create a world even minimally different from this one.

A second account, call it the formal theory, proceeds via a distinction between finite and infinite analysis of true propositions.[61] Since nothing is without a sufficient reason, and every true, affirmative proposition, necessary or contingent, is analytic, Leibniz holds that the reason for the truth of any proposition is the containment of the predicate in the subject. Every truth of the form S is P is logically such that it can be reduced to an identity statement by the substitution of terms with their definitions. The logical demand from PSR that every truth have such an analysis holds even if the analysis requires an infinite number of substitutions—as for the proposition, "Alexander is a student of Aristotle," which must resolve concepts, ofAlexander and Aristotle, that contain infinitely many true predications. Finite analysis depends on applying the Principle of Contradiction (PC). A proposition that can be reduced to an explicit identity in a finite number of steps using PC, as is the case with mathematical and geometrical propositions, is such that its denial would be a contradiction, for the analysis in question would demonstrate that the predicate does indeed belong to the subject term. Such a demonstration, a reduction to identity, is the criterion of necessity, and PC is the principle that governs necessary and eternal truths.[62]

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[61] E.g. "The Source of Contingent Truths," (ca. 1685-89?), AG 98-101.
[62] I resist glossing necessary and eternal truths as "true in all possible worlds". While necessary truths are indeed true in all possible worlds, Leibniz does not define necessity as truth in all possible worlds. Some propositions might be true in all possible worlds, yet

The PSR expresses, in its most general form that, “there is nothing without a reason,” the demand that every true, affirmative proposition have a reason or ground “in the nature of things.” The nature of things, in Leibniz’s metaphysics, refers to the substances whose complete concepts contain all the predicates that are true of them; i.e., predicates are contained in the concepts of individual substances that populate reality. Thus, a true proposition, S is P, is such that the predicate P is contained in the concept of substance S. The PSR demands that every true proposition must be such that its analysis would reveal that the predicate is part of the subject term to which it is ascribed. In other words, every true proposition is analytic, where analysis is understood as the reduction of a proposition to an identity by the substition of terms with their definitions. Every truth has an *a priori* proof that depends only on an analysis of concepts.

The PSR, so understood, applies to all truths, regardless of whether the analysis can be completed in a finite number of steps—such as for the proposition that the sum of the squares of the base and height of a right-angled triangle is equal to the square of its hypotenuse; or would require an infinite number of substitutions—as for the proposition, “Napoleon invaded Russia,” in which reduction to identity requires analyzing a subject concept (Napoleon) that contains infinitely many true predications. Finite analysis depends on the application of the Principle of Contradiction (PC). A proposition that can

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not have a finite analysis based on the PC, a circumstance that Leibniz would identify as contingency. For instance, that an impelled [?] particle should move in a straight line from point A to point B should be true in all possible worlds, for Leibniz. But its proof rests, not on the PC, but the Principle of Least Time, which in turn depends on the PSR. There is no contradiction in thinking that a particle could take any one of an infinite number of other paths from A to B, but all except one would be suboptimal, and thus ruled out by the PSR.

be reduced to an explicit identity in a finite number of steps using the PC, as is the case with mathematical and geometrical propositions, is such that its denial would be a contradiction, for the analysis in question would have sufficiently demonstrated that the predicate in question does indeed belong to the subject term. The PC, thus, is the principle that governs necessary and eternal truths.

Infinite analysis, by contrast, falls outside the scope of the PC. Since the proof of an infinitely complex proposition can never be completed, or the predicate can never be shown to inhere in the subject, its denial can never constitute a contradiction, but only an opposition. In fact, the situation is such that not even God can carry out the required proof, for even God cannot execute the absurd task of completing a proof that requires an infinite number of steps. However, God can, unlike humans, know such truths by "an infallible vision."[63] Since such truths resist demonstration, Leibniz contends that they are contingent, rather than necessary, for their truth "arises in part from his [i.e., God's] intellect and in part from his will and so expresses his infinite perfection and the harmony of the entire series of things." That is, Leibniz locates the contingency of infinitely analyzable propositions in the circumstance that, in addition to God's intellect that generates the internally consistent concepts of substances, the inclination of God's will toward the most harmonious order is required to establish their truth. Since the truth of contingent propositions rests on the infinitely complex interconnection of all things considered as part of a world, God's having chosen by an act of will the actual series of things in which, for example, Napoleon does in fact invade Russia, constitutes a reason

[63] A VI.4 1658; L 266.

for the truth of the proposition. In other words, God's choice in actualizing a world constitutes a reason for the truth of any event that occurs in it, in virtue of its role in producing "the connection of the terms or the containment of the predicate in the subject" in this particular series of things.[64]

In the case of contingent truths, such as events in the natural world or even the existence of the world taken as a whole, consequently, the PSR expresses not only the general demand for determinacy, but also serves as a principle for inquiry.[65] For this latter role, Leibniz specifies the PSR further as the Principle of Perfection, or of the Best.[66] Leibniz offers many characterizations of this principle, of which the following

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[64] A VI.4 1656; AG 96; cf. GP IV 436-8; L 310-1.

[65] Robert McRae, *Leibniz: Perception, Apperception, and Thought* (Toronto: University of Toronto Press, 1976), 104-108, usefully identifies three formulations of the PSR in Leibniz. The first is the most general one in which the PSR is a straightforwardly consequence of the conceptual containment theory of truth. The second and third distinguish the PSR as an efficient causal principle—that every event must have a physical cause—and as a final causal principle, or the principle of the best. My discussion here owes much to McRae's analysis, though I resist his sharp separation of the PSR as an efficient causal principle (his second formulation), and the PSR as a final causal principle, which he explicitly identifies as the Principle of Perfection. The latter principle enters equally into the particular, efficient causal order of phenomena, as Leibniz emphasizes in, for example, the *Tentamen anagogicum* (GP VII 272-3; L 478).

[66] Rescher, *Philosophy of Leibniz*, 33-4, argues against identifying the PSR with the Principle of Perfection (PP). He proposes to interpret the PSR only as expressing the demand for analyticity of all true propositions, and that the PC and the PP satisfy that demand in the case of finite and infinite propositions respectively. But I see no conflict in treating the PP as a specification of the PSR in those instances in which a logical proof is not available. Textually, it is worth emphasizing that Leibniz widely refers to the two great principles of the PSR and PC together, but never includes the PP as a third great principle. And in several texts, such as "On the Radical Origination of Things," he seems to identify the PSR with the PP. But the decisive evidence comes, perhaps, from the *Monadology*, §§36-42. There, Leibniz begins with the demand for a sufficient reason for contingent truths, and observes the infinity of physical causes that enter into the analysis of even a mundane event like Leibniz's act of writing. Since the entire series must have a sufficient reason, such a reason must lie outside the sequence itself, i.e., in God. This

may serve our needs: the greatest amount of perfection or essence should be admitted in nature. A perfection, for Leibniz, is any simple, positive quality. The "quantity" of perfection, thus can be understood as "nothing but the magnitude of positive reality considered as such."[67] In the case of finite beings, the perfection of a substance in any given state is the degree of clarity with which it represents, or perceives, every other substance in the universe (or how clear a mirror of the world it is). The total amount of perfection of a substance is then just the sum of the perfections of all its states. The total perfection of a world, likewise, is the sum of the perfections, or the magnitude of reality, of all the substances that belong to it. The determination in God's choice of what to create is guided by the desideratum of maximizing the quantity of perfection in the universe. Already in the early 1680s, Leibniz suggests a close connection between the principle of perfection and the PSR: "*whatever is more perfect or has more reason is true*."[68] Perfection supplies a standard of goodness according to which God's will enters as part of the determining reason for a contingent truth. Observing this principle, God chooses from an infinite number of possible worlds the one that maximizes the total quantity of created essence in the most harmonious way, or the maximum of diversity in

reason, Leibniz then concludes, must be a necessary substance, and a reason unto itself, unlimited, and therefore containing maximum reality, or absolute perfection, from which created substances receive their own, limited perfection. That is, Leibniz here appears to *derive* the PP from the PSR.

[67] GP VI 613; AG 218. On the principle of perfection and its relation to existence see Rescher, *Philosophy of Leibniz*, 27-31; Mates *Leibniz*, 166-9; Martin Lin, "Leibniz's Philosophical Theology," in *The Continuum Companion to Leibniz,* ed. Brandon Look, (London and New York: Continuum, 2011), 192-207. On the notion of perfection with respect to sensible qualities in particular, see Adams, *Leibniz*, 119-123.

[68] A VI.4 1445; AG 19.

unity. The actuality of this world, thus, is contingent on God's choice to maximize existence, and not just a logical conclusion of his intellect.

One consequence of Leibniz's view is that investigation of the actual world cannot proceed only on the basis of the PC and mathematical axioms. Rather, principles of goodness, which depend on the PSR, and which provide reasons for explanatory choices in situations where demonstrative certainty is not possible, become essential. The PSR can thus be regarded as the first principle of contingent truths, with the Principle of Perfection as its most general expression. Under these fall a further array of principles of order, such as continuity, equality of cause and effect, least action, and maxima and minima.

Returning to our narrative, the important lesson is that Leibniz's encounter with Spinoza's particular version of the denial of final causes focuses his attention to the problem of contingency in securing a role for ends and purposes in nature. Whereas in his 1660s project of reconciling the Cartesian and Aristotelian philosophies, Leibniz had emphasized God's intellect as the formal ground of concepts of magnitude, figure, and motion, and only subsequent to the argument had he asserted a role for God's will, by the late 1670s the goals of reconciliation have decisively shifted toward introducing ends within the created order. In a text from this period, titled "Sentiments de Socrate opposes aux nouveaux Stoiciens et Epicureens" by the *Akademie* editors, Leibniz first criticizes Spinoza for rejecting the search for final causes, and, by way of response, paraphrases extensively from the *Phaedo*, specifically Socrates' recounting of his discovery of Anaxagoras' books, in which was maintained that an intelligent being had not only caused all things but had arranged them in the most perfect way possible.[69] Using his favorite Platonic dialogue as a mouthpiece, Leibniz announces the revised project of reinstating God not only as the ontological ground of nature, but as its wise, purposive cause as well.

With the Spinozist challenge in place, we can turn now to the second piece of the story. As we have seen, Leibniz's mature conception of the laws of physics regards them as the result of divine wisdom. That is, he regards them as physically necessary on the hypothesis of God's choice of the best, but not absolutely necessary insofar as it is not logically contradictory to conceive the laws of motion as having been otherwise. In numerous texts Leibniz identifies the kind of truth that belongs to laws of nature as having its source in principles of final causes, or in considerations of the fitness of things.[70] These principles include the principle of continuity, the principle of the equality of cause and effect, the principle of maxima and minima, and other such principles of order. Leibniz frequently calls these "architectonic" principles, and we can treat them collectively as specifications of the Principle of Perfection, which, as we have seen, Leibniz derives from the Principle of Sufficient Reason, and unambiguously identifies

[69] A VI.4 1386; AG 283.
[70] E.g. GP VII 272, L 478; GP III 645; T 345.

with divine wisdom.[71] The question now has to do with the origin and epistemic status of these principles, and the manner in which they ground the laws of physics.

In mid-1676 Leibniz's physics underwent a radical shift when he was led to the law of conservation of *vis viva* by way of the discovery of the principle of the equality of cause and effect—that the power of the effect and of the cause are equal to each other.[72] Although by 1679 Leibniz had come to regard the equality principle as contingent, thus not demonstrable by reduction to identity, at first he strove repeatedly to prove the principle "geometrically" from the definitions of the terms involved. The earliest statement of the principle, in fact, treats it analogously to the problem of the relation of parts to wholes in geometry. That is, just as the principle of the equality of the whole and its parts is axiomatic in geometry, so is the equality of the whole cause and its effects in mechanics. Leibniz insists at this stage that the axiom can be demonstrated by resolving it into an identity, and thus can be shown to hold of absolute necessity. He reiterates the demonstrability of the equality principle in several further texts and letters in the period 1676 to 1678.[73] Yet, in none of these is a satisfactory demonstration to be found. Perhaps the clearest statement of what Leibniz has in mind occurs in a piece from 1677-8 titled "De aequipollentia causae et effectus":

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[71] E.g. *Monadology* §32-9; AG 217-8, although anticipations of this explicit statement are present as far back as 1679 (e.g. GP VII 301; L 227).
[72] I am indebted to Garber, *Leibniz*, 237ff, for the discussion in this paragraph. See as well, Duchesneau, *La dynamique*, Ch. II, for an account of Leibniz's project for the reform of mechanics. Duchesneau identifies Leibniz's concern to refute the relativistic formulations of the laws of motion given by Huygens, Wallis, and Mariotte, and to set mechanics back on a "geometrical" framework by using the equality principle to reconcile the empirical laws of motion with the *a priori* law of conservation.
[73] A VI.4 1963; A III.2 235.

> Since the whole effect envelops the entire cause, and in turn, the entire cause envelops the whole effect, that is, one could come to know the cause from the knowledge of the effect alone, and know the effect from the knowledge of the cause alone, it follows that no cause can produce an effect that is altogether similar but differs only in magnitude.[74]

Leibniz's thought that the concept of the effect is contained in the concept of the cause, and vice versa, so that all theorems of mechanics can in principle be proven analytically, is clear enough. Yet, a proof by reduction to identity of the equality principle, hence of its *finite* demonstrability, is lacking. A second argument from the same text, however, reveals an altogether different, and more promising, strategy:

> Also, the same thing can be proved in a different way from the fact that no reason can be given why *a* produces *b* rather than *c*. For everything is similar, and differs only in magnitude, and so either *a* produces nothing at all, or it produces something infinite, which two [outcomes] differ maximally from its own magnitude; or else *a* produces what differs minimally from itself, that is, what is equal [to it]. From this it can now further be demonstrated that the cause and the effect are altogether equipollent.[75]

This latter proof of the equality principle, clearly, is not a reduction of the proposition to an identity. Rather, it is a proof based on the PSR, which, as we have noted, Leibniz ascribes to the divine will, and which figures in contingent as well as necessary truths.

[74] A VI.4 1963.
[75] A VI.4 1963-4.

Leibniz's ambivalence about the correct proof of the crucial equality principle appears to have been resolved the following year. In "On the Universal Characteristic," from ca. 1679, Leibniz subsumes under the applications of the PSR the possibility of arguing from effects to causes, and vice versa:

> This axiom, however, *that there is nothing without a reason*, must be considered one of the greatest and most fruitful of all human knowledge, for upon it is built a great part of metaphysics, physics, and moral science; without it, indeed, the existence of God cannot be proved from his creatures, nor can an argument be carried from causes to effects or from effects to causes… So true is this that whatever is not of mathematical necessity, as for instance are logical forms and numerical truths, must be sought here entirely.[76]

Why did Leibniz change his mind about the status of the equality principle? One explanation for the shift could be that the struggle to find a geometrical proof of the equality principle coincided with a period in Leibniz's thought in which he was also concerned with the threat to piety posed by Spinoza's rejection of final causes in nature.

[76] GP VII 301; L 227. Compare A VI.4 1445; AG 19 on p.19 above. Whereas there, Leibniz flatly identifies the PC as the foundation of metaphysics, here he seems to rest a "great part of metaphysics" on the PSR. According to Paul Lodge, "The Empirical Grounds for Leibniz' Real Metaphysics," *The Leibniz Review* 20 (2010): 13–36, this instability resolves in his later period into two kinds of metaphysical inquiries, one that deals with eternal and necessary essences considered as possible, the other with those essences under conditions of actuality, i.e., in the orders of space, time, and coexistence. The latter is what he terms "real metaphysics", or the metaphysics of the actualized order of beings. Appealing as this strategy is, here I refrain from endorsing the proposal. My own suspicion is that the precise relation between the PC and the PSR is one that occupied Leibniz throughout his career, but one for which he never arrived at a solution satisfactory to his own estimation.

Seeing in the confluence of these separate problems an opportunity to solve both with one stroke, he altered his strategy accordingly. His disavowal of the absolute necessity of a fundamental principle of mechanics should converge serendipitously with his desire to reinstate a role for God's will in nature.[77]

I resist an appeal to serendipity. A different explanation of Leibniz's introduction of the PSR into his physics is available, one that secures a remarkable continuity in his thinking through the 1670s. On this alternative, Leibniz ends the decade in a very similar theoretical position as the one from which he began, namely, with an ontology of unextended, mind-like entities, whose perceptive and appetitive powers ground the fundamental principles of nature. In "Conspectus libelli" from 1678-9, a programmatic outline for natural science, Leibniz writes that, "certain things take place in a body which cannot be explained from the necessity of matter alone. Such are the laws of motion, which depend upon the metaphysical principle of the equality of cause and effect."[78] It is clear from the context that by 'metaphysical,' Leibniz here does not mean 'geometrical' in the sense of being demonstrable in a finite number of steps from the definitions of terms. The suggestion appears to be that the metaphysical principle of equality of cause and effect cannot be reduced to an identity, hence proven to be an eternal and necessary truth by the PC. We can infer, on the basis of the passage from "On the Universal Characteristic" above, that its proof must, therefore, rest on the other great principle of Leibniz's system, the PSR. But the PSR depends on God's will, rather than his intellect, hence the equality principle brings into the explanatory domain of physics an expression

[77] This is roughly Garber's conjecture, *Leibniz*, 244-5.
[78] A VI.4 1988; L 278.

of the divine will. More striking, however, is the manner in which Leibniz suggests this principle is implicated in the domain of corporeal phenomena. For he continues:

> Therefore we must deal here with the soul and show that all things are animated. Without soul or form of some kind, body would have no being, because no part of it can be designated which does not in turn consist of more parts. Thus, nothing could be designated in a body which could be called 'this thing' or a unity.[79]

As in the 1671 "Theory of Abstract Motion," Leibniz's solution at the end of the decade to the question of the ontological bedrock of the laws of motion leads him to postulate immaterial, mind-like beings as the fundamental elements of nature. But, in a further advance along the idealist path that would receive its full presentation half a decade later in the "Discourse on Metaphysics," Leibniz characterizes these souls not only as endowed with perceptions and appetites, which correspond to their actions and passions, but also as being imitations of God's ideas, or mirrors of the universe, each of which perceives the whole universe confusedly.[80] The application of the equality principle in the phenomenal domain (as well as of other such principles as depend on the PSR) finds its ontological ground in the soul-like units that make up the created world, insofar as these are ordered, individually and with respect to one another, in a likeness to the divine mind. In other words, the perceptions and appetites of soul-like substances created in the divine image are governed by ordering principles, such as the equality of cause and effect,

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[79] A VI.4 1988; L 278.
[80] A VI.4 1988-9; L 279.

which ensure the coherence and persistence of appearances, such that the latter can be explained with the laws of mechanics.[81]

As we saw in §2, the introduction of immaterial, mind-like entities marked the culmination of Leibniz's earlier attempt to secure adequate metaphysical foundations for the mechanical philosophy, in particular to explain how constantly moving material parts cohere as enduring unities. It is perhaps unsurprising that a second train of reasoning, stemming on this occasion from Spinoza's powerful challenge to divine purposes in nature, and proceeding through important discoveries in the foundations of mechanics, leads Leibniz once again to immaterial, perceiving substances that underlie the phenomenal world. Indeed, the fateful brush with Spinoza turns Leibniz toward a more sophisticated articulation of the solution he had stumbled upon earlier.

Such an articulation occurs in a contemporaneous piece dated from 1678–80. In notes titled "Definitiones cogitationesque metaphysicae" by the Academy editors, Leibniz works through a variety of concepts in logic and metaphysics, including analyses of the concepts of body and substance. In one chain of reasoning, he begins by defining body as "movable extension [*Extensum mobile*], or extended substance."[82] The basis of this identification depends on his definition of substance as that which is active.[83] Thus, the movability of extension is its activity, hence, its substantiality. The assumption, of

[81] As we shall see in §5, Leibniz's account, in the last decade of his life, of the ontological foundation of these principles appeals to the demand for systematicity expressed by reflective, apperceptive inquirers into nature.
[82] A VI.4B 1398.
[83] This claim at the heart of Leibniz's mature conception of substance, which remains fixed until the end of his life, is unambiguously present by this stage, if not earlier. Mercer, *Leibniz*, 2, finds this view much earlier in Leibniz.

course, is that no body is in a perfect state of rest, so all its parts are actually in motion at all times. Consequently, a principle of activity is required to explain the unity through the series of changes of the "corporeal substance." However, instead of attributing to body itself an active principle, Leibniz identifies having actions and passions with being animated, thus with the power of perception and appetite: "All bodies are animated or are perceiving [*sentit*] and appetitive [*appetit*]."[84] The explanation for this position is reminiscent of the one in "Theory of Abstract Motion": since bodies are altered through interaction with other bodies, a body could not endure (*stat*) without a soul, or appetite and perception in equal measures to its active and passive forces. Leibniz draws the conclusion that, "substantial form or Soul is the principle of unity and duration, matter however [*vero*] of multiplicity and change."[85] Material parts cannot cohere among themselves without a goal-directed, soul-like substance to unify their changes in thought. Yet, once the principles of unity are in place, the further determinations of the parts of the bodies represented in souls follow the laws of mechanics.[86] Thus, Leibniz concludes: "I maintain that both the efficient cause and the final cause ought to be conjoined [*conjungendas*], for all things come to be for the sake of the enjoyment of souls, and indeed souls are moved by willing, but in turn their force is forever going to be determined by mechanical laws."[87] This expression of the unity of final causes, those that explain purposive change, and efficient causes that govern the series of physical

[84] A VI.4B 1398.
[85] A VI.4B 1399.
[86] A VI.4B 1400. Admittedly, in this collection of notes, Leibniz's thinking on the issue of the reality of matter is deeply ambivalent. The text should not be read as definitive, but as a waystage in the development of Leibniz's mature conception of the relation between minds and material appearances.
[87] A VI.4B 1402.

interactions, receives an even stronger form shortly thereafter: "All natural phenomena can be explained by final causes alone, just as if there were no efficient cause; and all natural phenomena can be explained by efficient causes alone, as if there were no final [cause]."[88]

The illustration, rather than elaboration, of this bold claim, is briefly sketched in the remaining pages of "Definitiones…" and conveys us to our final episode in the development of Leibniz's reconciliation of mechanism and teleology. In the late 1670s and early 1680s Leibniz busied himself as well with studies in optics. Following the tradition of Descartes, Snell, and Fermat, Leibniz published his own derivations of the laws of reflection and refraction in a 1682 paper in *Acta eruditorum* entitled "Unicum opticae, catoptricae et dioptricae principium." In brief, Leibniz's presentation follows that of Fermat's, employing as a first hypothesis (*hypothesis primaria*) that "light irradiating from a point reaches an illuminated point by the easiest path."[89] Leibniz's strategy in this paper is derive the basic law of reflection—the equality of the angle of incidence and the angle of reflection—and the basic law of refraction—that the ratio of the sines of the angles of incidence and refraction is equivalent to the reciprocal of the ratio of the resistances of the media through which light passes—using this principle alone. In the latter case, to illustrate, Leibniz hypothesizes that, given an infinite number of possible paths that a ray of light could travel from a light source from one medium to another and enter a light sink (e.g., an eye), it would follow that path which is unique "with respect to ease" (*facilitate*), where 'ease' is a quantity obtained by multiplying the distance of the

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[88] A VI.4B 1403.
[89] Acta erud. 1682, 185.

path from the source to the sink with the resistance of the medium. Leibniz first constructs an equation that describes an infinite family of bent paths that a ray of light could travel, and solves it using the method of maxima and minima to determine the path which is locally determinate with respect to ease. That is, he identifies from among a series of candidate curves that one which minimizes the quantity of time taken, or ease of propagation. He applies the same method to the case of reflection as well, thus basing catoptrics and dioptrics upon a unified principle, namely, that of the easiest or most determined path.[90]

Setting aside the mathematical details, the crucial point is that Leibniz claims to derive the laws of optics from consideration of an optimization principle alone, which is drawn, he writes, "from final causes, if you consider the matter correctly: indeed a ray setting out from C neither considers how it could most easily reach point E or D or G, nor is it directed through itself to these, but the Creator of things created light so that from its nature that most beautiful event would arise."[91] Leibniz is clearly very impressed with this result, and recounts it in numerous texts subsequently.[92] He sees in it not only a more

[90] The "most determined path" principle, in fact, is a specific formulation of the more general "least action principle," widely associated with Maupertuis, but to the development and application of which Leibniz contributed considerably. See Jeffrey McDonough, "Leibniz's Optics and Contingency in Nature," *Perspectives on Science* 18, no. 4 (2010): 432–55, for further exposition of Leibniz's optical works and their significance for Leibniz's thesis of the contingency of the laws of nature. Without wishing to undervalue his work, in my estimation McDonough overplays the significance of optics in the development of Leibniz's thought. Rather, I propose to treat the relevance in Leibniz's natural philosophy of the optical writings as illustrative, or confirmatory, of the positions he has arrived at through his physics, metaphysics, and theology.
[91] Acta erud. 1682, 186.
[92] E.g. GM VI 243, L 442; GP VII 274ff, L 480ff.

elegant method of proof, but also an illustration of the presence of divine purposes in the construction of nature, hence as justifying the appeal to final causes in explanation.[93]

Following the thread of Leibniz's struggles through the 1660s and 1670s, we now have in view the multiple streams of thought that led him to his considered position on the unity of mechanical and final causal explanations in the natural world. Our next task is to articulate the content of this position, or the precise manner in which the two explanatory schemes are said to constitute "two kingdoms in corporeal nature, which interpenetrate without confusing or interfering with each other."[94]

4. The two kingdoms of nature

In the "Tentamen Anagogicum" of ca. 1696, Leibniz expresses the unity of mechanism and finality as follows:

> I usually say that there are, so to speak, two kingdoms even in corporeal nature, which interpenetrate without confusing or interfering with each other – the realm of power, according to which everything can be explained *mechanically* by efficient causes when we have sufficiently penetrated into its interior, and the

[93] The result also flatly targets Descartes, whose alleged explanation of the laws of optics by "efficient causes or by the composition of directions in imitation of the reflection of bullets… is extremely forced and not intelligible enough" (GP VII 274; L 480). Leibniz has almost certainly failed to appreciate Descartes' optical works, though here is not the place to provide a thorough assessment of that misreading. More to the point is the polemical use to which Leibniz deploys his derivations, charging "those who reject final causes in physics with Descartes" as having erred greatly (Acta erud. 1682, 186).
[94] GP VII 273; L 479.

> realm of wisdom, according to which everything can be explained architectonically, so to speak, or by final causes when we understand its ways sufficiently.[95]

One interpretation of this passage, as well as those from "Definitiones…", attributes to Leibniz a thesis of explanatory overdetermination,[96] such that each event can in principle be explained by either of two kinds of causal laws. On this view, natural occurrences are fully over-determined; everything that happens in nature, be it the refraction of light, or the boiling of water, is governed by two independently sufficient sets of laws, the one providential and the other mechanical, that have been established in perfect harmony by God.[97]

We ought to resist leaning on the popular image of Leibniz as a flamboyant metaphysician. A less extravagant position concerning the relation between the realms of power and wisdom in the context of Leibniz's natural philosophy can indeed be uncovered from the texts. The Leibnizian structure of natural explanation is one in which final causal laws and efficient causal laws are integrated and complement one another,

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[95] GP VII 273; L 479.

[96] Overdetermination, here, is not to be understood in the usual sense of two causal events simultaneously producing an effect, as when two stones strike a window simultaneously causing it to shatter. That kind of overdetermination remains within the domain of efficient causes. The view being attributed to Leibniz here holds that all events are determined by two different *kinds* of cause, namely, efficient and final.

[97] This interpretation has been defended in recent times by Jeffrey McDonough, "Leibniz's Two Realms Revisited" *Nous* 42, no. 4 (2008): 673–96; and "Leibniz on Natural Teleology and the Laws of Optics," *Philosophy and Phenomenological Research* 78, no. 3 (2009): 505–44. In defending the attribution of this position to Leibniz, McDonough calls it "an example of the sort of harmony within harmony that Leibniz not only delights in, but takes as a mark of profound truth" ("Two Realms Revisited", 687).

rather than describing parallel orders. For Leibniz, in keeping with his epistemological scruples in the domain of actuality, the discovery of mechanical-efficient laws occupies the fixed core of the enterprise of explaining the phenomena. What he calls the laws of final causes, meanwhile, serve a variety of functions. Some of these appear to be heuristical and include, for instance, recommending the choice of simpler hypotheses, facilitating greater theoretical unification among particular empirical laws, and providing a route to the discovery of new laws. Such principles also posit ideal structures in the natural order, at increasing levels of generality, under which particular empirical laws are to be organized. But Leibniz's heuristics are not optional or dispensable. Rather, their role in recommending simpler theories arises from a consideration of what would be required for human inquirers to formulate determinate truth conditions about phenomena. Simplicity or intelligibility, for Leibniz, enters into a notion of truth that goes beyond mere correspondence with phenomena. With these theoretical means, Leibniz aims to arrive at the desired reconciliation of the ancient and modern philosophies, mechanism and finality, faith and reason:

> The true middle term for satisfying both truth and piety is this: all natural phenomena could be explained mechanically if we understood them well enough, but the principles of mechanics themselves cannot be explained geometrically, since they depend on more sublime principles which show the wisdom of the Author in the order and perfection of his work.[98]

[98] GP VII 272; L 478.

Leibniz's goal in this reconciliation, in fact, is to emphasize the *interconnection* between the two kinds of explanatory principle, as opposed to securing their harmonious but separate coexistence. Knowledge of the mechanisms by which bodies operate and are produced is crucial for understanding natural events, insofar as material phenomena must have a mechanical description.[99] Moreover, in line with a prominent theme in seventeenth century defenses of the mechanical philosophy, such knowledge gives us the means for "conserving life, and it even provides us with many conveniences."[100] But mechanistic explanation, Leibniz thinks, is incomplete, for the intelligibility of motion and change requires principles of the good that depend on God's volition to bring about an orderly rather than a chaotic course in nature, an order of law-governed rather than arbitrary arrangements of matter. Thus, Leibniz is critical in the "Tentamen," not only of the corpuscularian philosophers who deny any role to God's will, but equally of the "zealous theologians who, shocked at the corpuscular philosophy and not content with checking its misuse, have felt obliged to maintain there are phenomena in nature which cannot be explained by mechanical principles."[101] Leibniz worries that, by replying in a dogmatic manner to the excesses of the mechanical philosophy, the defenders of piety "injure religion in trying to render it a service." The moral of the story that Leibniz wishes to impress is that neither a purely mechanistic approach, nor an exclusively final causal

[99] Leibniz insists on this virtually throughout his career. An unambiguous statement of it comes from the De Volder correspondence: "in phenomena… everything is explained mechanically" (GP II 250; LDV 261). And to Damaris Masham he identifies the "natural" with the mechanically explicable: "It is helpful to think of 'God's ways' as being of two kinds, one natural, the other extraordinary or miraculous… magnetism is natural, being completely mechanical or explicable, although, lacking information, we are perhaps not yet ready to explain it perfectly in detail" (GP III 353; WF 211).
[100] GP VII 270; L 477.
[101] GP VII 272; L 478.

approach, suffices for a proper reconciliation of faith and reason. The “middle term” must be such as to form a link between the two, so that each kind of cause occupies a legitimate and ineliminable place in the structure of explanation. Leibniz, in the end, is interested in placing *stronger* constraints on what constitutes an adequate explanation of natural phenomena than either the mechanists or the theists. A parallelism of two equipotent sets of laws, conversely, would weaken those constraints by allowing each method of explanation to stand on its own as sufficient for inquiry into nature.

Before turning to the positive task of explicating the relation of mechanism and finality, it would be useful to have in view the scope and content of Leibniz’s use of ‘final cause’ and ‘efficient cause.’ To take the latter first, Leibniz typically equates efficient causality in nature with mechanical causation, understood as causal explanation that invokes laws of motion and impact.[102] In this mode of explanation, paradigmatically, an explanation of an event requires specifying initial conditions of speed and direction of a pair of bodies, together with general laws of motion, to yield a subsequent state of those bodies with respect to their speed and direction. The laws of motion explain the change in speed and direction of the bodies as observed before and after collision.

The status of final causation in Leibniz’s system is rather trickier. As we have seen, the sense most proximate to the domain of physics identifies what Leibniz calls "architectonic principles,” under which he collects such principles as the principle of the equality of cause and effect, the principle of the most determined path, and the principle of continuity. In general, a Leibnizian final causal explanation in nature can be conceived

[102] e.g. GM VI 242; L 441.

as pairing a set of initial conditions of bodies (as in the case of mechanical explanation) with an architectonic principle (such as the principle of least time), to deduce a subsequent condition of those bodies. But as we have also seen in multiple texts from the 1670s, Leibniz is not content to regard such principles of order as free-floating propositions unanchored in the nature of things. Consequently, he grounds architectonic principles in immaterial substantial forms, or souls, or entelechies that populate his world at its fundamental level of ontology. The employment of these principles in the practice of physics finds its justification ultimately in Leibniz's monadology.[103]

Our approach into Leibniz's vision for natural philosophy returns us to "Conspectus libelli" from 1678–9. There, he writes:

> [T]he way in which a body operates cannot be explained distinctly unless we explain what its parts contribute. This cannot be understood, however, unless we understand their relation to each other and to the whole in a mechanical sense, that is, their figure and position, the change of this position or motion, their magnitude, their pores, and other things of this mechanical kind, for these always vary the operation.[104]

Leibniz emphasizes here the indispensibility of mechanical explanations for the operations of bodies, implying that an explanation cast solely in terms of architectonic principles could not displace an explanation of bodies in terms of the causal contributions

[103] A fuller discussion of Leibniz's justification of the use of architectonic principles as organizing principles of substances, in particular of minds, will be taken up in §5.
[104] A VI.4 2008; L 288.

of their moving parts. The claim here is not that one has the *option* of explaining bodies through laws of motion and impact. Rather, natural philosophers must seek quantitative expressions of regularities among phenomena and their material bases.

Similarly, Leibniz frequently emphasizes the way in which mechanical laws of bodies depend on architectonic principles. Of especial significance in this respect is the principle of continuity, which he labels the touchstone of truth in physical matters. Criticizing Malebranche's laws of motion, Leibniz writes in July 1687 that the Cartesians' laws "violate a general principle of order," namely, the principle of continuity, that "*when two instances or data approach each other continuously, so that one at last passes over into the other, it is necessary for their consequences or results (or the unknown) to do so also*."[105] The principle of continuity,

> has its origin in the *infinite* and is absolutely necessary in geometry but it is effective in physics as well, because the sovereign wisdom, the source of all things, acts as a perfect geometrician, observing a harmony to which nothing can be added. This is why the principle serves me as a test or criterion by which to reveal the error of an ill-conceived opinion at once and from the outside.[106]

The principle of continuity is obviously not a law of motion expressible as a mathematical relation between masses and velocities, but one of order that is due to "sovereign wisdom," a characteristic that is hallmarks of the kind of law for which Leibniz wants to claim a legitimate explanatory role in natural philosophy. Yet, he insists

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[105] GP III 52, L 351; cf. GP IV 374-5, L 397; GM VI 249, L 447-8.
[106] GP III 52; L 351.

that the principle is "found in physics," and that the laws of mechanics depend on such principles of nature.[107] In these passages, Leibniz proposes a tightly integrated explanatory scheme, one that demands grasping both, the architectonic first principles, and the physical mechanisms of events.

The ultimate goal of knowledge would be to know the inner constitutions of things, or the resolution by analysis of their parts to their simple constituents. Since this task is in principle unachievable on account of the infinite complexity of objects, because bodies are actually divided to infinity, knowledge of nature is to be pursued by setting up idealizations that can be grasped distinctly. One important kind of idealization posits species essences, which contain necessary or eternal truths. Leibniz, of course, uses "essences" both for individuals as well as species. Individual essences include all necessary and contingent truths about an actual individual. Species essences, by contrast, "contain only necessary or eternal truths which do not at all depend on the decrees of God." That is, species essences are a matter of the formal relations of similarity and difference among ideas of possible individuals in God's mind, prior to God's decree to actualize a world. Thus, they are true in all possible worlds (though not, for that reason, absolutely necessary).[108] Given the principle of perfection, that the greatest quantity of being or essence ought to be admitted in nature, the procedure recommends organizing

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[107] GP III 52; L 352; GP VII 272; L 478. Indeed, in the correspondence with Arnauld, Leibniz declares that he reduced all of mechanics to a single architectonic principle, namely that of the equality of cause and effect (GP II 62).

[108] GP II 49; L 332. As Brandon Look, "Leibniz and Locke on Natural Kinds," in *Branching Off: The Early Moderns in Quest for the Unity of Knowledge,* ed. Vlad Alexandrescu (Bucharest: Zeta Books, 2009), 398, puts it, "an essence of a species is accessible from any possible world."

the sought-after species essences in a hierarchical, maximally dense system of concepts. To be sure, the notion of a dense order is weaker than that of a continuous order. The difference between them is that the former allows minimal gaps among forms under certain conditions of actuality, such as the spatial structure of this world, whereas in the latter the logical space on the continuum of forms is completely filled. The principle of continuity, logically, orders all possible species essences, so that the smallest difference between two forms constitutes a new species. However, given Leibniz's insistence that not all possibles are actualized, not all possible species are actual in this world, but only as many as God's wisdom saw fit to actualize so as to yield the maximum diversity with minimum outlay. In the actual world, consequently, the ordering of kinds is the densest possible under conditions of actuality, but does not exhaust logical space.

At the same time, knowledge of the operations of bodies demands an analysis of phenomena of figure, size, and motion as conceptualized in mechanistic science. How members of a kind are structured so as to produce their characteristic behaviors and dispositions require a functional articulation of their mechanical parts, and descriptions of the conditions under which their dispositions produce certain regular effects. A proper explanation of phenomena, consequently, requires knowledge of both kinds of conceptual structure. Whereas the method of efficient causes penetrates into the details of the part-whole relations and functional organizations in things, architectonic principles underwrite the construction of formal classifications of those objects.

Leibniz expresses his picture of the architectonic system of natural kinds in the 1697 essay, "On the Radical Origination of Things." The larger purpose of the piece is to provide an *a posteriori* argument for the existence of God as an extramundane cause for the actuality of the world. Accordingly, Leibniz undertakes to explain how contingent, physical truths arise from eternal ones. Assuming with the principle of perfection that, "out of the infinite combinations and series of possible things, one exists through which the greatest amount of essence or possibility is brought into existence," Leibniz is led to conclude that the order of things in the world is determined ultimately by "a kind of divine mathematics or metaphysical mechanism."[109] With this admittedly obscure locution, Leibniz intends to express the method through which the determination of the maximum amount of essence to be actualized proceeds. Faced with an infinite number of possible worlds, God chooses to create only the most perfect. The determination of the most perfect is governed by the demand that the largest number of compossible essences be actualized. This principle is none other than that of maxima and minima, which states that, "a maximum effect should be achieved with a minimum outlay." In the case of the constitution of the order of nature, this demand has the effect of creating a system of forms that occupies the conceptual space in the most "commodious" way possible. Leibniz compares the task to the construction of a building on a given piece of land, such that usable space is maximized. For instance, given a finite amount of fencing material and a piece of land, the optimal solution for maximizing the fenced area would be to build a circular fence. The problem, in other words, is one of optimization, or of determining the maximum variety of kinds that can coexist in a harmonious way; i.e., a

[109] GP VII 303-4; L 487-8.

world that is “simplest in hypotheses and richest in phenomena.”[110] The outcome of God’s use of this principle for the order of nature yields the densest possible order of essences. However, this dense ordering, one with minimal gaps between kinds, is also one that produces the greatest diversity, so that the result is a well-ordered hierarchy of genera (principles of unity) and species (or principles of diversity), with the principle of continuity guaranteeing minimal differences between each form.

While the principle of perfection is the highest principle of the “metaphysical mechanism” that underwrites the existence of the actual order of nature, it can nonetheless be unpacked to reveal its various subordinate principles. For instance, the application of the principle for the choice of the greatest quantity of essences involves

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[110] e.g., GP IV 431; AG 39. See, e.g., Curley, “Root of Contingency,” and Jeffrey McDonough, “Leibniz and the Puzzle of Incompossibility: The Packing Strategy,” *Philosophical Review* 119, no. 2 (2010): 135–63, for detailed treatments of the problem of compossibility that proceed along these lines. To be sure, the problem of compossibility is among the thorniest in Leibniz’s metaphysics, and leaves open questions that appear to undermine the appeal to the principle of perfection. For instance, given God’s omnipotence and the goal of maximizing essence, one may wonder why God does not actualize multiple, causally isolated possible worlds, a logical possibility that Leibniz explicitly rejects. But here is not the place for an exhaustive examination of such issues. Traditionally, two broad approaches to the problem of compossibility are the “lawful” and the “logical”; the labels are due to Margaret Wilson, “Compossibility and Law,” in *Causation in Early Modern Philosophy,* ed. Steven Nadler, 119–33 (State College: Penn State, 1993). The “logical” approach proceeds from the doctrine that all substances in a universe express one another fully, and analyzes compossibility as a logical relation between the expressions of complete individual concepts. It is most prominently due to Rescher, *Philosophy of Leibniz*, and to Mates, *Leibniz*. Mates, for example, argues that two possible individuals, *A* and *B*, are compossible just in case no contradiction follows from the supposition of the existence of both *A* and *B*. The “lawful” approach takes the thesis of causal independence of substances at face value, and allows *per se* compossibility between any two substances, but then analyzes incompossibility as resulting from the supposition of their co-existence under some particular set of laws or hypotheses. It is defended, e.g., by J.A. Cover and John O’Leary-Hawthorne, *Substance and Individuation in Leibniz* (Cambridge: Cambridge University Press, 1999). Wilson, “Compossibility and Law,” prefers a hybrid approach.

two separate considerations. A principle of "minimal outlay" can be interpreted as the principle that the fewest genera be found in which to classify the variety of specific kinds. Corresponding to it, a principle of "maximum effect" demands that the greatest possible number of divisions of any genus be found, hence the greatest number of *differentiae*. Conjointly, the two subprinciples entail a more basic one, the principle of continuity. Taken together, the principles describe the formal structure of nature that contains the conditions for maximum diversity together with the simplest means for its realization, and whose complete description constitutes part of the task of natural philosophy.

Knowledge of this formal structure, on Leibniz's view, amounts to knowledge of the purposeful order of nature. Specifically, it constitutes knowledge of God's reasons in the created world—precisely what Descartes and Spinoza had exhorted we must not pretend to be able to know—and licenses the use of such principles in physics and optics. At the same time, Leibniz cautions against excessive reliance on the use of this method:

> The *a priori* method [i.e., of final causes] is certain if we can demonstrate from the known nature of God that structure of the world which is in agreement with the divine reasons and from this structure, can finally arrive at the principles of sensible things. This method is of all the most excellent and hence does not seem to be entirely impossible… I admit, however, that, though this way is not hopeless, it is certainly difficult and that not everyone should undertake it. Besides, it is perhaps too long to be covered by men. For sensible effects are too greatly compounded to be readily reduced to their first causes. Yet superior

> geniuses should enter upon this way, even without the hope of arriving at particulars by means of it….[111]

Leibniz's cautionary note with regard to the use of architectonic principles is rooted in his recognition of human epistemic limitations. The method of final causes is, to be sure, a superior method insofar as it is not just more elegant, but also delivers more certainty in virtue of having its explanatory grounds in the first principles of metaphysics. However, it is too difficult through this method for finite minds to uncover the particulars of figure, magnitude, and motion, which, as he writes in the same text, is ultimately the goal of investigation in nature. Morever, Leibniz nowhere indicates that the epistemic limitations that he identifies here and in other pieces, such as the roughly contemporaneous "Meditations on Knowledge, Truth, and Ideas," are even in principle surmountable. Our epistemic situation is not such as to be remedied in the fullness of time through better telescopes and microscopes but, instead, is at least partly due to our finite discursivity encountering the infinitely complex natures of things. Insofar as the goal of scientific inquiry is to arrive at the details, the method of final causes, while justly pursued and in some cases very useful, appears on its own to be unsuited to the task.

Yet, architectonic principles do have their legitimate place in inquiry, and Leibniz applies them in at several different ways. In the first place, the assumption of a maximally dense order of natural kinds provides a guideline for discovery by recommending a search for laws with certain formal characteristics. One product of this approach is Leibniz's mathematical formulations of curves representing the dynamical

[111] A VI.4 1998-9; L 283.

formation of brachistochrone curves. For example, assuming the principle of maxima and minima, Leibniz proves the conjecture that "when many heavy bodies pull upon each other, the resulting motion is such that the maximum possible total descent is secured." Similarly, assuming the principle of least action, he demonstrates the result, remarked upon by the Coimbra commentators as an example of wisdom in nature, that "liquids placed in a different medium compose themselves in the most spacious figure, a sphere," by minimizing the quantity of aggregate surface tension in a system of liquid particles, a use of what later physics would know as Laplace's law.[112]

In a similar vein, knowledge of optimality principles sometimes supplies an alternate method of proof. Leibniz's prime example of this application of teleology comes from the domain of optics, in which he provides an equivalent derivation of the laws of reflection and refraction through his most determined path principle. This method of proof is "*a priori*" in the sense of requiring only a non-empirical principle of order, without requiring knowledge any particular relations or proportions of figure or magnitude. The laws of optics concern only relations among the angles described by rays

[112] GP VII 304; L 488. The same style of reasoning is frequently employed still for explaining phenomena such as the distances between the rings of Saturn, or the hexagonal structure of honeycombs, or why cicadas have prime number life cycles. See, e.g., Baker, "Mathematical Explanation"; Bueno and Colyvan, "Inferential Conception." Indeed, Leibniz's creative use of variational principles in his natural philosophical studies marked the beginning of a successful research enterprise that was carried into the eighteenth century and beyond.

of light and the resistances of the media through which they travel, and are indifferent with respect to the specific speeds, directions, or shapes of light rays or particles.[113]

Further, architectonic principles enter as premises in arguments to unify empirical laws, thus to increase their generality. A signal instance of this use occurs in Leibniz's unification of the laws of motion and rest by applying the principle of continuity. In effect, by conceiving motion as a continuous quantity Leibniz is able to treat rest as a limit case of motion. Assuming the motion of body A to remain constant, we vary continuously the quantity of motion of a second body B as it collides with A until the motion of B approaches zero at the moment of collision. This state is defined as rest, after which the motion of B increases continuously in the opposite direction as it rebounds. Likewise, in the case when B is at rest, the motion of A is described as a continuously changing quantity that merges with the quantity of motion of B as the bodies collide. Applying the law of continuity to colliding bodies thus allows Leibniz to treat rest as "the limit of the cases of directed motion, or the common limit of linear or continuous motion, and so, as it were, a special case of both."[114] In other words, the same law that governs velocity can be shown to apply to its absence, or rest. The principle of continuity enables greater unification among laws of nature by supporting idealizations—in this case,

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[113] Unfortunately, in the absence of any assistance from Leibniz in specifying the conditions under which the method of final causes can be legitimately employed in the context of justification, we can only conjecture that indifference to the common sensibles (i.e, magnitude, figure, motion, duration) in the specification of the law is one such constraint. The basic laws of both catoptrics (i.e., the law of reflection) and dioptrics (i.e., the law of refraction), Leibniz's only examples of derivation from the method of final causes, satisfy at least this constraint.

[114] "Specimen dynamicum", GM VI 250, L 447-8; cf. "Reply to Malebranche", G III 52-3, L 352.

treating rest as infinitesimal or vanishing motion—under which discrete rules receive a common analysis. Leibniz, in this way, provides deeper foundations for an assumption already present in Galileo and Descartes, that motion and rest are simply different modes of material substance, related to one another directly as a body's transference and non-transference, respectively.[115] As a foundational project, Leibniz takes this kind of unification to be not simply for the sake of cognitive economy but rather as a guide to truth. While separate rules might adequately subsume unknown cases to known ones to facilitate prediction, their sufficiency for explanation remains an open question. The discovery of lawful connection of the phenomena of motion and rest under a single, more general rule now serves as a constraint on future theorizing. Subsequent analysis of the special cases should not lead to rules that violate the unity (or harmony) known to hold among them.

How, then, do efficient causal explanations enter the picture? This question requires turning from the eternal truths of nature to our phenomenal access to magnitudes of bodies. It requires examining in more detail Leibniz's theory of perceptual knowledge.

In the very fertile period from the 1670s to the 1680s, Leibniz's dissent from Cartesian philosophy in the metaphysics of matter was paralleled in his epistemology. The most important document for this development is perhaps "Meditations on Knowledge, Truth, and Ideas," which Leibniz published in *Acta eruditorum* in 1684, and to which he thenceforth frequently referred. The core of Leibniz's criticism is that

[115] Galileo Galilei, *Dialogues Concerning the Two Chief World Systems* (Berkeley and Los Angeles: University of California Press, 1953) 20-1; Descartes, PP II.27.

Descartes' fundamental epistemological principle—that "whatever I perceive very clearly and distinctly is true"—is inadequate.[116] Before Descartes' principle can be applied fruitfully, Leibniz contends, criteria of clearness and distinctness must be established. To that end, Leibniz introduces the further distinction of adequacy among clear and distinct ideas. Adequate ideas are ones that express real definitions, or those propositions through which the possibility of the thing is known. Inadequate ideas, by contrast, provide merely nominal definitions, or are only sufficient to recognize instances of a general truth, but do not explain why the truth obtains in the world.[117] The aim of natural philosophy, for Leibniz, is not recognitional knowledge, but rather knowledge of real definitions that pick out essences, so that knowledge could be deemed adequate. To illustrate: knowledge of the surface properties of gold—its color, ductility and so on—suffices to distinguish it from other metals. But knowledge of the essence of gold requires knowledge of its inner structure in virtue of which it exhibits those surface properties.[118]

Leibniz's criterion for adequate clear and distinct ideas, to be sure, is a very stringent one: every primitive predicate that is contained in the concept of a thing must itself be distinctly known, or, what is the same, when "analysis is carried through to the end."[119] A consequence of this criterion is that we rarely have adequate, clear and distinct knowledge of anything physical, which typically requires analyzing infinite propositions, or contingent truths. As a result, we know most things through experience, rather than through an analysis of concepts: "For the most part we are content to learn the reality of

[116] AT VII 35; CSM II 24.
[117] GP IV 425; L 293-4.
[118] GP IV 423, L 292; cf. A VI.6 294-5; NE 294-5.
[119] GP IV 423; L 292.

certain concepts by experience and then to compose other concepts from them after the pattern of nature." What Leibniz means is that our access to the possibility of most things or events, thus, our ability to arrive at real definitions, depends on experience, for "we know an idea *a posteriori* when we experience the actual existence of the thing, for what actually exists or has existed is in any case possible."[120] Given our general inability to arrive at real definitions *a priori*, we are compelled to reason toward the essences of things from experience, or, in another formulation, to reason from effects to causes.[121] Since we can be sure that what is encountered in experience exists, and is therefore possible, we can work our way back to the inner ground of this possibility. This view of our epistemic condition remains a consistent feature of Leibniz's philosophy from its early statement ca. 1679, that "we know hardly anything adequately, few things *a priori*, and most things through experience."[122]

According to Leibniz, then, we have access to metaphysical first principles through the natural light of the intellect, with which we posit a true order of essences to be discovered. However, the discovery of particular kinds of law-governedness that would yield real or causal definitions of things, those through which we "understand the method by which the thing can be produced," must be carried further with the method from experience, which involves reasoning from effects to causes constrained by formal

[120] GP IV 425; L 293
[121] It should be noted that such is our epistemic situation, according to Leibniz, only with respect to empirical matters. In mathematics, by contrast, the certainty of real definitions is demanded, for which reasoning from effects to causes does not suffice.
[122] GP VII 296; L 232.

principles grounded in the PSR such as that of the equality of cause and effect. As Leibniz explains in the "Conspectus libelli":

> The true method of reasoning from experiments is this – we must resolve every phenomenon into all its circumstances by considering separately color, odor, taste, heat, and cold, and all other tactile qualities, and finally, the common attributes of magnitude, figure, and motion. Now if we have discovered the cause of each of these attributes in itself we will certainly have the cause of the whole phenomenon.[123]

The method of reasoning from effects to causes requires resolving confused perceptions into the simpler, more distinct ones from which they are composed. The most distinct attributes of perceptions are the mathematical ones of magnitude, figure, motion, and duration, and the legitimate application of mathematics to physics depends on the resolution of complex phenomena into these.[124] By proceeding analytically, we aim to arrive at the attributes through which the cause of the whole effect can be demonstrated. With this method, progress can be made toward real definitions of natural kinds and the regularities among them. While such progress, as Leibniz realizes from the late 1670s onward, always depends on architectonic principles, the ultimate explanandum, nevertheless, remains the specific constitutions of things, which, he maintains, have mechanical descriptions:

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[123] A VI.4 2001; L 284.
[124] A VI.4 2006; L 287.

> Imagine that some angel wished to explain to us how bodies are made heavy; he could achieve nothing by speaking, however beautifully, about a substantial form, or sympathy, or other things of this kind. Rather, he would only then satisfy our curious understanding when he gave us an explanation, sufficiently understood, which, when we have comprehended it, will enable us to demonstrate with geometric certainty that gravity must necessarily arise from it. This angel must therefore necessarily present only such things as we can perceive distinctly. But we perceive nothing distinctly in matter save magnitude, figure, and motion.[125]

Material phenomena demand an explanation in terms of mathematical quantities, hence, with mechanical laws, even though such laws themselves depend on final causes. Indeed, even in this programmatic work on method in natural philosophy, Leibniz's mature position on the relation between final and efficient causes, in the larger context of reconciling science and piety, is forcefully articulated:

> If those who oppose mechanical laws had known that these laws themselves are finally resolved into metaphysical reasons and that these metaphysical reasons arise from the divine will or wisdom, they would not have so strongly opposed mechanistic explanation. In fact, I have contended that the reasons for physical motion cannot be found in mathematical rules alone but that metaphysical propositions must necessarily be added.[126]

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[125] A VI.4 2007; L 288.
[126] A VI.4 2008; L 288-9

Leibniz's reconciliation, thus, entrusts to architectonic principles the task of enabling the construction of a theoretical framework for the classification of mechanical laws in order to remedy a situation that he had already identified in the late 1670s in "On Universal Synthesis and Analysis": "Our human knowledge of nature seems to me at present like a shop well provided with all kinds of wares but without any order or inventory."[127] Not only does knowledge of providential design reveal the deep ontological foundations of the laws of nature, the *a priori*, teleological method serves to impose order, coherence, and systematicity among the inductively discovered results of the new science. The epistemological security of such order and systematicity lies further in his metaphysics of mental substance, the subject of the appearances of nature.

5. Mirrors of nature: uniformity, simplicity, and the knowing subject

One may justly wonder whether Leibniz's principles of order in natural philosophy should not, by his own lights, be relegated to a secondary status, to be treated as stepping stones toward true mechanical descriptions, but not constitutive of nature itself. Specifically, one might ask Leibniz for an account of the ontological ground of architectonic principles, such that the discoveries to which they lead could be taken to track the truth about nature. For Leibnizian reality resolves into an infinity of complete substances, each of which bears its true predicates as its own. A central tenet of Leibniz's system, after all, is that there are "no purely extrinsic denominations," or no real external,

[127] GP VII 296; L 232.

causal relations among created substances.[128] External relations among substances—such as Adam's being the father of Cain—have the status of phenomena which have their real ground in the internal predicates of each relatum. Well-founded external relations, however, are not causal, hence not explanatory, of the qualities truly predicable of Adam or Cain. This view is rooted in what Massimo Mugnai has called the "metaphysical intuition" underlying Leibniz's theory of relations: that, for Leibniz, the world is basically a gathering of individuals, each containing its own internal principle of change. The derivative status of external relations, in an important sense, is a consequence of Leibniz's monadic picture of what ultimately constitutes reality.[129] How then do architectonic principles figure in Leibniz's ontology?

As we have seen, the transcendent justification of principles of order lies in Leibniz's cosmological argument for the existence of the world. In creating the world, God acts according to the Principle of Perfection to bring about a world in which the

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[128] C 520; AG 32; GP VII 321; L 365.

[129] Massimo Mugnai, *Leibniz's Theory of Relations*, in *Studia Leibnitiana Supplementa* 28 (Stuttgart: Franz Steiner, 1992), 111. On Mugnai's interpretation, which I endorse, propositions containing containing predicates of extrinsic properties reduce to propositions containing only predicates of intrinsic properties. For Mugnai, reduction in terms of a change in extrinsic denomination "implies" a change in the denominated thing (49). Other reductionist readings of Leibniz on relations include Rescher, *Philosophy of Leibniz*, 55-57; Mates, *Leibniz*, 215-218. Stated generally, reductionism entails, positively, that there are no relations that obtain between individuals without some corresponding change in their internal states; negatively, it means that nothing besides the internal properties of two substances is required to explain their relatedness. For contrary views, see Jaakko Hintikka, "Leibniz on Plenitude, Relations, and the 'Reign of Law'", in *Leibniz: A Collection of Critical Essays,* ed. Harry Frankfurt (New York, NY: Doubleday Anchor, 1972): 155-190; Hidé Ishiguro, *Leibniz's Philosophy of Logic and Language* (Cambridge: Cambridge University Press, 1990), Ch. VII; Dennis Plaisted, *Leibniz on Purely Extrinsic Denominations,* (Rochester, NY: University of Rochester Press, 2002); Anja Jauernig, "Disentangling Leibniz's Views on Relations and Extrinsic Denominations," *Journal of the History of Philosophy*, 48, no. 2 (2010): 171-205.

maximum of existence is actualized using the simplest of means. God's preference for simplicity and his use of optimization principles in his choice of this world over infinitely many others underwrites confidence in our use of principles of simplicity and order in investigating nature. But is there also an immanent basis in creation that legitimates the use of teleology in natural philosophy?

Leibniz's answer to this question has a metaphysical and a theological dimension, the common foundation of which gets expressed in the Mirroring Thesis:

> every substance is like a complete world and like a mirror of God or of the whole universe, which each one expresses in its own way, somewhat as the same city is variously represented depending upon the different positions from which it is viewed… It can even be said that every substance bears in some way the character of God's infinite wisdom and omnipotence and imitates him as much as it is capable. For it expresses, however confusedly, everything that happens in the universe, whether past, present, or future – this has some resemblance to an infinite perception or knowledge.[130]

The thesis that a created substance mirrors in all detail the world to which it belongs ties together several central tenets of Leibniz's metaphysics. We shall begin with the central notion of substance.

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[130] GP IV 434; AG 42. The quote is from the "Discourse on Metaphysics" §9. The mirroring thesis is repeated widely. Cf. Letter to des Billettes (GP VII 452; WF 55); Letter to Sophie Charlotte (GP III 348; WF 347); the *Principles of Nature and of Grace* §3 (GP VI 599; AG 207); *Monadology* §56 (GP VI 616; AG 220). See Nicholas Jolley, *Leibniz* (New York: Routledge, 2005), for a study of Leibniz's philosophy as a whole that takes the thesis as a point of departure and organizing theme.

Leibniz defines substance as an entelechy, a term laden with teleological significance. As an intrinsically active being, even a principle of activity, Leibniz characterizes his unitary notion of substance with the dynamical attribute of force.[131] Substances, the bearers of force, are the true unities that must exist in nature, for the existence of composites, Leibniz frequently argues, depends on the existence of unities from which they can be composed. He affirms the traditional equation of being and unity to Arnauld: "*what is not truly* one *being is not truly one* being *either*."[132] In addition to their nature as unified bearers of force, substances are simple—in the sense of lacking spatial parts[133]—immaterial,[134] and causally closed.[135] The activity of any substance, consequently, does not influence the states of any other substance, either by physically impacting another, or by transferring its properties to another. Rather, its activity consists in its own internal transitions from one state to the next. These states, or modifications, of a substance resolve into its perceptions and appetites; these are conceived more generically as representational states and tendencies toward future representations.

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[131] GP VI 598; AG 207; A VI.4B 1398; GP III 339; WF 205.
[132] GP II 97; AG 86.
[133] But not logically simple; whether or not Leibniz regards God as a logically simple substance, in the sense of being identical with each of his simple, positive predicates is an interpretive question that we need not enter into here. God, of course, is distinguished in other respects from created substances, e.g., as the only necessary substance, and as non-spatial (not just lacking spatial parts).
[134] To be sure, Leibniz frequently discusses "corporeal substances" as well, which appear, at least in his so-called "middle period" to have a distinct place in his ontology. Yet, whether or not true substances are joined to bodies is independent of their immaterial nature, as he notes to Sophie Charlotte: "For this [the doctrine of immaterial substances] does not require these souls to be free from matter but only to be something more than matter and not produced or destroyed by the change which matter undergoes or subject to dissolution since they are not composed of parts" (GP VI 506; L 552).
[135] E.g.: "It is quite true that, speaking with metaphysical rigor, there is no real influence of one created substance upon another" (GP IV 483; L 457).

Leibnizian substances, thus, are intrinsically mind-like, unified active principles, and Leibnizian reality is fundamentally mentalistic: "there is nothing in things except simple substances, and in them perception and appetite."[136]

The theory of substance is closely linked to that of truth. For, besides being simple, active unities, substances also serve the traditional function of being the subjects of true predications. In fact, Leibniz characterizes the nature of an individual substance, from the "Discourse on Metaphysics" onward, as having "a notion so complete that it is sufficient to contain and to allow us to deduce from it all the predicates of the subject to which this notion is attributed."[137] Thus, Leibnizian substances are not only the fundamental entities populating the world, but also the logical subjects of true propositions in that world. And it is not just any subset of its predicates that constitutes a substance, but, Leibniz insists, *everything* that is truly predicated of it. Alexander the Great's complete concept contains not only the qualities of being a student of Aristotle, the general of an army, and the victor in the battle of Arbela, but also every other detail of his meals, clothing, the physical changes in his body, and even of those qualities that he bears in virtue of his connection, no matter how distant in space or time, to every other individual in the universe. Every truth has, as we saw earlier, an *a priori* proof from the analysis of the subject term:

> An affirmation is true if its predicate is in its subject; thus, in every true affirmative proposition, necessary or contingent, universal or singular, the concept

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[136] GP II 270; L 537.
[137] GP IV 433; AG 41.

> of the predicate is somehow contained in the concept of the subject in such a way that anyone who understood the two concepts as God understands them would *eo ipso* perceive that the predicate is in the subject.[138]

Even though in infinitely complex propositions, a reductive analysis to identity is not possible, it is still the case that all true propositions are grounded in the natures of things, or, what is the same, in the concepts of individual substances.[139]

Created substances constitute the actual world, or what Leibniz also calls the "aggregate of finite things."[140] Leibniz's notion of a world is, in the first place, that of a gathering of individuals, each one of which contains in its complete notion all its true predicates. That is, a world is not a structure existing independently of the substances populating it but a collection of substances that contingently happen to belong to it as members of a set. As a spatio-temporal and causally closed structure, the sense in which we might ordinarily think of the universe as a structure, is here dependent on the perceptual contents of the states of substances. It is an intelligible structure insofar as the rules of succession of the states of a self-conscious substance, what Leibniz will sometimes call a mind or spirit, can be elucidated by analysis of experience. The notion

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[138] C 16-17, trans. in Mates, *Leibniz*, 84.

[139] The literature on Leibniz's theory of substance is vast, and I have here provided only a bare outline. For detailed treatments, see, Mates, *Leibniz*, Chs. 5 and 9, especially in relation to his account of Leibniz's theory of truth; Garber, *Leibniz*, Ch. 5, situates Leibniz's theory of substance and the conceptual containment theory within the context of his projects in natural philosophy; Cover and O'Leary Hawthorne, *Substance and Individuation*, approach the mature theory of substance primarily as a solution to the problem of individuation; Sleigh, *Leibniz and Arnauld*, provides a classic commentary on Leibniz's theory of substance and truth as it unfolds in the Arnauld correspondence.

[140] GP VII 302; L 486.

of a world, thus, appears here to be mere phenomenon, dependent for its being and its intelligibility on the changing series of experiential states of psychological, perspectivally limited substances.

But, as Donald Rutherford argues, a Leibnizian world is not just any collection of individuals, but a collection ordered through a determinate spatio-temporal framework.[141] While the being of substances is ontologically prior to the being of the physical world, inasmuch as the latter is sustained in the states of the former, the notion of a world as an abstract relational structure is, in a different respect, prior to the notion of a substance.[142] For any compossible set of individuals that is a candidate for actualization is one in which the individuals must be situated in a common order of coexistence (space) and of succession (time); while it may have been in God's absolute power to create a world containing a single individual, Leibniz concedes that it was not in God's ordained power to have done so. The demand of a certain formal order places constraints on the possible individuals that could belong together in a world. Specifically, only those individuals may be part of a world that could stand in a spatio-temporal relation to other individuals in that world such that the representations of all world-members would be coordinated. A world containing individuals that were in principle hidden from one another would,

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[141] Donald Rutherford, "The Actual World," in *The Oxford Handbook of Leibniz*, ed. Maria Rosa Antognazza (Oxford/New York: Oxford University Press, 2015).

[142] De Risi, *Geometry and Monadology*, 321-2, shares a similar thought, but approaches it from the doctrine of perception and expression, to which we will turn shortly: "what a monad perceives is the world, that is the set of all monads (including itself) and the relations between them. In a sense, this consideration already leads us to recognize ontological priority to the conception of the world over that of an individual substance. In no way, in fact, could we deduce a world from single substances, because to all effects there would only be one identical substance occurring again and again."

presumably, violate a condition of world-making as well of its intelligibility. Put another way, only those individuals that God could conceive as related in a common order of coexistence and succession are candidates for membership in a possible world.[143] As Leibniz writes to Bayle: "Space and time taken together constitute the order of possibilities of one entire world, so that these orders—space and time, that is—relate not only to what actually is but also to anything that could be put in its place."[144] This condition of harmony in space and time is crucial not only for Leibniz's metaphysics but also for his physics.

A consequence of Leibniz's conception of the world as a unified spatio-temporal structure is that every substance is connected to every other in its universe:

> For it must be known that all things are connected in each one of the possible worlds: the universe, whatever it may be, is all of one piece, like an ocean: the least movement extends its effect there to any distance whatsoever, even though this effect becomes less perceptible in proportion to the distance.[145]

The connection of substances, to be sure, is not causal—substances are windowless, and do not convey their effects by real or physical impact. Rather, the connectedness of a world consists in the coordination among the perceptions of its inhabitants, its expressive relations, so that the total state of the world at any moment is univocally represented in

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[143] In fact, it would follow from the Principle of Perfection, that essence be maximized, that every possible individual that satisfies this condition of membership in a given world will be a member of that world, and that any world structure will be "full".
[144] GP IV 568; L 583.
[145] GP VI 107; T 128.

the state of each substance: "it is very true that the perceptions or expressions of all substances mutually correspond in such a way that each one, carefully following certain reasons or laws it has observed, coincides with others doing the same."[146]

The perceptual state of a substance expresses the total state of the universe at any moment. Perception, for Leibniz, is one species of expression, which includes sensation and intellection in the case of the cognitive faculties and, more generally, models of machines, projective drawings of solids in a plane, speech acts, and algebraic equations of geometrical figures.[147] A relation of expression holds between two things when the relations among the elements of one, such as a scale model of a machine, correspond to the relations in the other, the machine itself: "One thing expresses another, in my usage, when there is a constant and regular relation between what can be said about one and about the other."[148] In other words, expression can be construed in terms of the modern notion of an isomorphism, or a function that preserves the relational structure between its relata. Its epistemic significance lies in the fact that one can move from knowledge of relations in one thing to at least partial knowledge of those in another, whether that involves interpreting sentences in natural language, visualizing the layout of a territory

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[146] GP IV 439; AG 47.
[147] GP II 112; L 339; GP VII 263; L 207.
[148] GP II 112; L 339. As commentators have noted, Leibniz develops the doctrine of expression in the context of his ambitious and lifelong project of devising an *ars characteristica*, a universal language for thinking and reasoning, whether in geometry and algebra, or natural language, or music, or astronomy. The theory of perception is but one application of the general doctrine of expression. See, e.g., McRae, *Leibniz*, 20.

from a map, or understanding another person's perspective from one's own.[149]

Perception is distinguished as a species of expression in virtue of resulting from the activity of substances, or true unities. Leibniz defines perception as the expression of the "multitude in the unity or in the simple substance," or "of the composite, or what is external in the simple."[150] Perception is a species of expression characteristic of a simple, active being and results in a representation of the whole universe determined from the unique point of view of the perceiver. In the case of finite perceivers, as opposed to God, Leibnizian expression may be construed as a set of partial isomorphisms, such that not only the total structure of relations, but also the mutual relations of degrees of clarity and distinctness are implicated in the determination of the expression. That is, the conscious expression of a set of relations in the state of any created substance is always partial, so that a substance only represents distinctly some of the relations that obtain in the universe at a time. The expressions of my distinct perceptions allow me only limited knowledge of, or reflective access to, the set of relations that obtain in the entire universe, even though, in metaphysical rigor, the totality of my perceptions, conscious and unconscious, express the entire universe. As a consequence, it is only by way of the degree of distinctness among the relations among perceptions that substances can be distinguished from one another. That is, substances, in virtue of expressing the entire world to which

[149] Chris Swoyer, "Leibnizian Expression," *Journal of the History of Philosophy* 33, no. 1 (1995): 65–99, resists attributing a strong reading of Leibnizian expression as isomorphism, which he finds and criticizes in McRae, *Leibniz*. More recently, De Risi, *Geometry and Monadology*, 318-20, offers an account of expression as a relation of partial isomorphisms, or homomorphisms. That is, it is not only the structural relations that are preserved, but also different degrees of adequacy in the representations.
[150] GP VI 608; AG 214; cf. GP II 112; L 339; GP VI 598; AG 207.

they belong, do not differ with respect to the contents of their representations, but only in their relational properties, specifically in their spatio-temporal perspectives on the world. Using his favored geometrical analogies, Leibniz explains that, just as one and the same circle may be represented by an ellipse, a parabola, and a hyperbola while preserving an exact relation between each point and every other point, "one must allow that each soul represents the universe to itself according to its point of view, and through a relation which is peculiar to it; but a perfect harmony always subsists therein."[151] The harmony that preserves the relational structure of the world as expressed by its inhabitants ensures that a transition in the expressive state of one substance is accompanied by a corresponding change in that of every other substance.[152] Thus, the course of nature is strictly determined. In the extreme, the complete concept of any one substance, together with the general structural laws of its world, entails that of every other individual in that world. As Leibniz writes to Arnauld: "I therefore think that there are only a few primitive decrees that regulate the course of things, decrees that can be called the laws of the universe, and which, joined to the free decree to create Adam, bring about the consequence."[153]

While all substances—whether Adam or the substances in the aggregate that makes up a rock—are equally faithful mirrors of the universe insofar as each expresses

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[151] GP VI 327; T §357.
[152] Indeed, in the *Monadology,* §56, Leibniz suggests that the mirroring thesis *follows* from universal expression: "This interconnection or accommodation of all created things to each other, and each to all the others, brings it about that each simple substance has relations that express all the others, and consequently, that each simple substance is a perpetual, living mirror of the universe" (GP VI 616; AG 220).
[153] GP II 40; AG 71.

the same content, Leibniz accords a priviliged epistemic status to rational substances, or minds. One respect in which minds differ from non-minds lies in their capacity for reflective knowledge of their perceptual states. Whereas the perceptions of substances aggregated into rocks remain entirely confused, and dogs have some clarity that arises from sensation, which in turn results from the capacity for memory, rational substances have the unique ability to reflect on their own representations. Apperception enables minds not only to have memories of past effects, but also to reason about the causes of those occurrences. Whereas the capacity for memory allows the dog to run away from the stick when it has been beaten with it on past occasions, an apperceptive being has the further ability to inquire into the causes of the pain inflicted by the beating, whether those attributable to the physical qualities of the stick, or to the motives of the one who wields it. The capacity for reasoning about necessary and eternal truths, and of recognizing oneself as a subject of experiences, makes possible not only demonstrative knowledge of mathematics, but also physical knowledge of the actual world.[154] Whereas the basic capacity for perception, shared with every other being in the universe, provides definite representations of a changeable external multitude, reflection enables minds to uncover some of that determinate order, thus to discover God's reasons in nature. Leibniz conveys the distinct status of apperceptive monads to Des Billettes: "[E]ach soul is a mirror of the entire world, from its own point of view. But minds are souls of the first order or of the highest class, which represent not only the world but also God in the world.[155]

Minds, unlike other substances, enjoy not only causal independence, but are also

[154] GP VI 599-600; AG 208-9.
[155] GP VII 452; WF 56.

cognitively self-sufficient. Although of the same ontological kind as every other created substance, minds are distinguished epistemically in virtue of their capacity to know logical and mathematical truths, the laws of nature, and moral truths. To that extent, minds are more properly mirrors of God, in addition to being mirrors of the universe, for they not only manifest the order of created nature, but also have access to knowledge of that order. Knowledge of nature, thus, elevates minds to god-like status:

> souls, in general, are living mirrors or images of the universe of creatures, but… minds are also images of the divinity itself, or of the author of nature, capable of knowing the system of the universe, and imitating something of it through their schematic representations of it, each mind being like a little divinity in its own realm.[156]

Created minds certainly lack the same degree of clarity and distinctness that is the unique prerogative of God's perspective. Thus, they are divinities only within their own spheres, or that domain of perceptions that each expresses more adequately than does any other. Put another way, to the extent that a mind partially expresses a domain of phenomena clearly and distinctly, or, what is the same, has adequate knowledge of a section of the phenomenal realm, it may be regarded as ruling over it, analogously to the way that God rules over all of nature in virtue of having perfect knowledge, as creator, of its most general principles. The difference between God's knowledge of nature and human knowledge of nature turns out to be, for Leibniz, a difference in their degrees of adequacy, rather than a difference in kind.

[156] GP VI 621; AG 223.

Leibniz's optimism about the possibility of adequate knowledge of nature, even if partial and isolated to certain cross-sections of space and time, has its ontological basis in the conception of created substance itself as causally self-sufficient. From the mid-1680s onward, at least, it is a fundamental tenet of Leibniz's thought that nature is to be conceived as an autonomous domain of explanation, even while granting its ontological dependence on God's creative and sustaining power. That is to say, even though nature exists as a result of God's free decree to create the world, God has, at the same time, supplied nature with all the requisites for it to take its subsequent course in a definite, law-governed manner. As Leibniz emphasizes in "On Nature Itself," (1698) the divinely ordained laws of nature must be conceived as being impressed upon created substances, so that God's decrees have "left behind some subsistent effect at the time [of creation], an effect which even now endures and is now at work." In particular, no appeal must be made in explanations of the natural order to occult qualities such as action-at-a-distance, as with Newton, or to perpetual miracles through God's constant involvement in ordering the course of nature, as entailed by the Cartesians' doctrine of occasionalism. Indeed, Leibniz continues that, "whoever thinks otherwise, in my judgment, renounces all distinct explanation of things; anything could equally well be said to follow from anything else if something absent in place or time could be at work here and now."[157] Despite its

[157] GP IV 507; AG 158. Leibniz's idea of a "distinct explanation" is in fact closely connected to that of naturalistic explanation, understood minimally as an explanation that eschews appeal to the supernatural. Defending his system of pre-established harmony against occasionalism, Leibniz writes to Tournemine: "My aim was to explain naturally what they [the occasionalists] explain by perpetual miracles, and in doing so I attempted only to give an explanation of the phenomena, that is to say, of the relation we perceive between the soul and the body". The pre-established harmony excludes God's intervention in the ordinary course of events, and therefore is preferable to occasionalism.

dependence for its existence and its laws on God's will and intellect, the natural world as it unfolds in space and time, and is graspable under the primary qualities of size, shape, and motion, is, for Leibniz, a closed explanatory domain amenable to human knowledge.

From a different angle, however, the autonomy of nature is a simple consequence of the causal independence of substance. For one thing, Leibniz's conception of substance as expressing, no matter how confusedly, every state of the universe entails that nature taken as the totality of phenomena is simply the sum of the contents of perceptions of any substance belonging to a world, and accessible to minds as the intentional contents of their experience. In the second place, nature taken as a principle of activity, as "a form or force… from which the series of phenomena follow," is simply that which Leibniz identifies as the fundamental quality of substance, namely, its primitive active and passive force, its power to act and to be acted upon.[158] And the investigation of the fundamental laws of nature, conceived through the activity of forces to bring about changes in the qualities of size, shape, and motion, just is the province of the science of dynamics. Indeed, dynamics and the metaphysics of substance are intimately linked: "the concept of *forces* or *powers*… for whose explanation I have set up a distinct science of *dynamics*, brings the strongest light to bear upon our understanding of the true concept of *substance*."[159] The investigation of the central notion of traditional

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Yet, Leibniz does not claim to have a naturalistic explanation of the pre-established harmony itself, for he continues: "But since this metaphysical union, which is added on to that [i.e., the relation we perceive between the soul and the body], is not a phenomenon, and as we have not even been given any intelligible notion of it, I have not taken it upon myself to look for an explanation of it" (WF 250)

[158] GP IV 507; AG 159.

[159] Acta erud. 1694; GP IV 469; L 433.

metaphysics, that of substance, should henceforth proceed from the dynamical concept of force. Force is responsible for the changes in the state of a substance, or its series of perceptions and appetitions. It is thus that which gives rise to phenomenal nature as knowable under the conditions of perception. Quite apart from any other consideration, Leibniz' conception of the substance as a "world apart" guarantees the autonomous character of nature as a domain of explanation, one that excludes occasionalist miracles and Newtonian occult powers. At the same time, it implicates the capacities of the human mind in the generation of any adequate knowledge of nature, for the sources of knowledge of phenomena are wholly contained in the perceptions of self-active beings. Indeed, it is not just the content of phenomenal knowledge, but also its form—its spatial structure and the laws that govern the order of appearances—which depends on the activity of the cognitive faculties.

From the explanatory autonomy of nature follows a "great principle of natural things,"[160] namely, that nature forms a uniform domain of effects, the fundamental laws of which remain invariant across times and places. The principle of uniformity, that "things are everywhere and always just as they are in us now," takes on increasing prominence in the last decade of Leibniz' life.[161] On one interpretation, it can be treated as a principle that legitimates analogical reasoning in natural philosophy.[162] In

[160] GP III 343; WF 220.
[161] To Damaris Masham, G III 340; WF 205. Cf. GP III 343; WF 221; GP VI 546; L 590; GP VII 394; L 699.
[162] This is primarily the lesson that Pauline Phemister, "'All the Time and Everywhere Everything's the Same as Here': The Principle of Uniformity in the Correspondence between Leibniz and Lady Masham," in *Leibniz and His Correspondents,* ed. Paul Lodge (Cambridge: Cambridge University Press, 2004), 200-4, draws with regard to the

correspondence with Damaris Masham, Leibniz employs the principle of uniformity to generalize from the proximate, observable events in nature to those that are distant or not directly observable. He infers on the basis of the principle, that mechanical laws govern all bodily interactions, that there are active substances everywhere in nature, that all active, perceiving substances are joined to an organic body, and even that all perceptive beings retain at all times an organic body appropriate to the degree of distinctness of their perception. Crucially, analogical reasoning is involved in Leibniz's justification of the application of mathematics to physics. For the possibility of the use of infinitesimals, which are not physical quantities in themselves, in the analysis of observable and measurable motions, wholly depends on analogizing from the continuity of infinite isomorphic relations involved in the mathematical analysis of a physical magnitude. Given this circumstance, it is not surprising to a find Leibniz advocating a principle which would support such a mode of inference.

But, while, Leibniz does indeed take the uniformity of nature to underwrite analogical reasoning, the ground of the principle lies further in his metaphysics. At the most fundamental level, God's creative act endowed the natural world with the required initial conditions, forces, and laws such that its subsequent course constitutes an

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principle of uniformity in the Leibniz-Masham correspondence. François Duchesneau, "Rule of Continuity and Infinitesimals in Leibniz's Physics," in *Infinitesimal Differences: Controversies between Leibniz and His Contemporaries,* eds. Ursula Goldenbaum and Douglas Jesseph (Berlin: Walter de Gruyter, 2008), 252, interprets the epistemological status of infinitesimals in Leibniz's physics as "symbolic analogues" for continuously developing metrical relations. For a broader discussion of the place of analogy in Leibniz's philosophical method, see Nicholas Rescher, "Analogy and Philosophical Method in Leibniz," in *Studies in Leibniz's Cosmology,* ed. Nicholas Rescher, 155–70. (Heusenstamm: Ontos, 2006).

autonomous domain of effects, and consequently, of inquiry. Put another way, a presupposition of the application of the principle of uniformity is the exclusion of miracles. Accordingly, Leibniz's introduction of the principle of uniformity to Damaris Masham is quickly followed by a defense of the doctrine of pre-established harmony against the doctrine of occasionalism. Leibniz objects that latter system, by requiring God to constantly adjust the soul's perceptions to the movements of bodies, amounts to a perpetual miracle in the course of nature, and *hence* "not very suitable for philosophy, which has to explain the ordinary course of nature."[163] He opposes the ordinary course of nature with the miraculous, and makes it a condition of an event's being counted as natural rather than miraculous that it should conform to the epistemic capacities of created minds. Thus,

> magnetism is natural, being completely mechanical or explicable, although, lacking information, we are perhaps not yet ready to explain it perfectly in detail. But if someone claims that the magnet doesn't work mechanically, and acts solely by pure attraction at a distance, with no means or medium, and with no intermediary, visible or invisible, then that would be something incomprehensible to any created mind, however penetrating and informed it might be. In a word, it would be something miraculous.[164]

In other words, the phenomena of magnetic attraction and repulsion, if they are to be viable objects of natural explanation, must be regarded as explicable under the conditions

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[163] GP III 341; WF 206.
[164] GP III 353; WF 211.

of human knowledge. Paradoxically, Leibniz's goal of reinstating God's will in nature leads him to rule out miracles from the natural world, precisely because "the reason and order of the divine wisdom demands we make no needless recourse to miracles."[165]

While the demand of divine reason and order is one basis for the principle of uniformity, its validity in explanation is grounded in the coordinate structure of human and divine knowledge. A consequence of the continuity of human and divine knowledge is that, just as the divine mind aims for maximal order and simplicity, human inquirers can legitimately adopt similar principles in their investigation of nature:

> [S]ince our understanding comes from God, and should be considered a ray of that sun, we should conclude that what best conforms with our understanding (when we proceed methodically, and in accordance with the nature of the understanding itself) will conform with the divine wisdom; and that by following that method, we are following the procedure which God has given us.[166]

In creating the actual world, God chooses the set of individuals that would maximize effects under the simplest set of laws. In addition, God's wisdom demands that, once created, the actual world should require no further correction or interruptions, or that the set of laws once decreed should hold in all times and places in the universe. In other words, God's understanding and will, which together constitute the reason for the existence of the natural world, are guided by the principles of uniformity and simplicity in the act of creation. The human mind, in virtue of its origin in the divine mind, can

[165] GP III 353-4; WF 211-2.
[166] GP III 353; WF 211.

therefore justifiably take these principles as tracking the truth about the natural world, not merely as heuristics.

The principle of uniformity can reasonably be treated as a variant of the principle of simplicity or intelligibility. In responding to Masham's concern that the system of pre-established harmony is merely a hypothesis, Leibniz calls it a "matter of some importance if one theory sees *possible* when all the others do not, and… that it is extremely *probable* that such a theory is the true one."[167] To illustrate, Leibniz offers his favorite astronomical and physical examples in which the simpler theories have proven true, such as heliocentrism, and the explanation of the air pump as due to the weight of the air rather than to nature's abhorrence of a vacuum. Simpler hypotheses, those involving fewer explanatory elements, and laws expressed in terms of primary qualities, are more likely to be true. For, on the one hand, the simpler hypothesis is in accord with God's wisdom, so that preferring the more complex hypotheses amounts to accusing "nature, or rather God, its author, of an "unfitting superfluity."[168] On the other, simpler hypotheses—which, in Leibniz's commitment to universal mechanism, are identified with hypotheses framed in the language of mathematical physics—are those that conform to the conditions of human knowledge. Specifically, these conditions are ones under which the imagination conceives ideas in which the spatial form that determines the unique perspective of each mind, hence the relational properties that individuate it, are preserved, while the details of

[167] GP III 352; WF 211.
[168] GP IV 158; L 128.

the secondary qualities received from the particular senses are omitted.[169] The clear and distinct ideas of the common sense ground the possibility not just of arithmetic and geometry, but also the application of these to the sciences of nature, above all mechanics.[170] Thus, one reason that hypotheses cast only in terms of the primary qualities of size, figure, and motion are simpler than ones invoking the activity of a world soul, or immediate action at a distance, is because it is possible to conceive, or even visualize, the former but not the latter from the perspective of any mind, since the hypotheses presuppose a common, mathematically determinate spatial framework. Given the autonomy of nature and the uniformity demanded in it by God's wisdom, the mechanical hypothesis has the greater possibility, and thus the better claim to truth in virtue of its distinct conceivability as an account of the natural world under the conditions of human understanding. Occasionalism and physical influence, on the contrary, are not even possible, for each requires a miracle or a violation of order, the one needing the intervention of God to accommodate the soul to the body, and the other a leap across space. For, as Leibniz remarks to Masham, "it is the understanding of possibilities, which determines the clarity of intellectual ideas."[171] The greater possibility of the mechanical conception of nature finds support in the increasing clarity of its theoretical expressions.

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[169] De Risi, *Geometry and Monadology*, 380-1, places the *sensus communis* at the heart of Leibniz's epistemology. It abstracts from the concrete matter of the five senses, but preserves spatial form received from the outer senses. Thus, it is sensible in virtue of preserving a situational representation of space, thereby individuating the unique perspective of any monad. At the same time, it is intellectual, in virtue of being identical in each monad insofar as it abstracts from the particulars of the body that each monad expresses most distinctly, thereby founding the intersubjectivity of spatial experience.
[170] GP VI 501; L 548.
[171] GP III 363; WF 219.

The demand of uniformity underwrites, moreover, the validity of specific architectonic principles. For instance, the principle of continuity, Leibniz's touchstone of truth in physical matters, has its basis in the principle of intelligibility. Writing to De Volder, Leibniz grounds the principle that "no transition is made through a leap," whether a leap from place to place, or from one state to another, in the general principle of order that "the more we analyze things, the more they satisfy our intellect."[172] While experience confirms that motion always requires that a body move through all intervening positions between two points, the general law of continuity follows from the demand for maximal intelligibility. Were leaps possible in nature, analysis would lead to mysteries, for the transcreation of a body from one place to another, for example, would require a miracle, thus something inexplicable by the human intellect. Writing to Remond late in life, Leibniz virtually identifies the principle of continuity with that of uniformity and intelligibility. In a vivid illustration, Leibniz rules out metempsychosis for the reason that,

> that the universal order does not permit it; it demands that everything should be explicable distinctly and that nothing should take place in a leap. But the passage of the soul from one body to another would be a strange and inexplicable leap. What happens in an animal at present happens in it always; that is, the body is in continuous change like a river, and what we call generation or death is only a greater or quicker change than ordinary, as would be a waterfall or cataract in a river. But these leaps are not absolute and of the kind which I reject, as would be

[172] GP II 168-9; L 515-6.

> that of a body which went from one position to another without passing through the intervening space. Such leaps are prohibited not only in motion but also in the whole order of things or of truths.[173]

Since the human mind is not only a mirror of nature, but is capable of the same kind of knowledge as the divine mind, the possibility of leaps in time, extension, qualities, or movement must be ruled out.

In the same way, the principle of least action has its deeper ground in the principle of uniformity. The observationally confirmed knowledge of the shape that a drop of oil takes when placed in water, or of the attraction of planets to the sun, follows from the general principle that any change, whether material or spiritual, occurs in the simplest way given the initial conditions: "The atom tends to change its place, the soul to change its thoughts; each changes by itself in the simplest and most uniform way which its state permits."[174] In its application to physics, Leibniz employs the principle of uniformity through the postulation of prime matter as a fluid plenum governed by the primitive passive force of substances. An ideal force, i.e., one that is not itself a physical magnitude, is conceived to have the effect that matter is "agitated in an infinity of ways from all sides, and with a uniform difformity[175], such that perhaps pressure is exerted equally in every direction."[176] A drop of oil placed in water composes itself into a sphere since that is the shape in which the fluid motions of both the oil and the surrounding

[173] GP III 635; L 658.
[174] GP IV 562; L 579.
[175] The notion of "difformity," or "diversity compensated by identity," is present from Leibniz's youth, and on occasion defines the notion of harmony (e.g. L 138).
[176] GM II 142; L 414.

water interfere least with one another, thus are most stable. A spherical shape ensures the smallest possible surface area of contact between the two fluids, or the greatest possible harmony in the system of fluid motions.[177] This kind of analysis is not restricted to drops of oil and water. In fact, since underlying all material phenomena is the same basic system of forces, Leibniz proposes to conceptualize planetary motions as essentially fluid motions in a common medium of bodies differing in densities; indeed, the planets themselves may have formed in the same manner as a drop immersed in a fluid medium forms into a sphere, the kind of speculative cosmogony that situates him in the middle of a movement of early modern thought leading from Giordano Bruno and Descartes, to the nebular hypothesis of Kant and Laplace.[178]

6. Conclusion

To sum up, architectonic principles have their common source in one of the two highest principles of Leibniz's metaphysics, the Principle of Sufficient Reason. While the PSR is present in Leibniz's thinking from very early on, it takes on especial significance as he enters his mature period in the 1680s, a fact reflected in his declaration in 1678 that "a great part of metaphysics" is founded upon it, whereas in some earlier texts, metaphysics is the exclusive province of the other great principle of Leibniz's philosophy, the Principle of Contradiction. Through a variety of specifications, the PSR enters as a

[177] In the more precise, later formulation of the principle of least action, the shape assumed by the drop is the one that minimizes the product of the average duration of motion in the system with the kinetic energy (Leibniz's *vis viva*) of the system.
[178] GM II 142-3; L 414-5.

necessary principle in the investigation of the actual world, both for its origin and for the explication of particular events within in. Cosmologically, the PSR, specified as the principle of perfection, determines God's choice of the best possible world, or the one in which the greatest quantity of essence is actualized through the simplest of means. This result, however, entails a variety of subprinciples, each of which ensures that the general goal of using the simplest laws to achieve the most diverse effects is realized. First among these, perhaps, are the principles of intelligibility and uniformity. These principles further lead to more specific subprinciples that include, for instance, the principle of continuity, and the principle of least action. Together, Leibniz's system of principles describes a formal order expressing the involvement of reason in nature.

On the epistemological side, Leibniz's thesis that minds are mirrors of God, with whom they share all the same principles of reason, locates the system of architectonic principles, and the PSR itself, in the nature of the human mind. Leibnizian principles, in this guise, may be regarded as laws of thought that furnish a means for uncovering metaphysical structures available for analysis in experience. In the case of their application to the actual world, the system of principles prepares the ground toward a metaphysics of nature as a system of concepts, which could express, in an intellect formed in the image of the divine mind, the series of natural events. Since the most perfect reason aims for greatest simplicity and uniformity, the ideal of natural explanation can be interpreted as a thesis of the unity of knowledge. Minds are simple substances, whose modifications are ordered exactly as the universe is ordered. The task of inquiry into the order of the universe is to realize that order in theories and models. While attainment of the ideal of uniformity, a grand unified theory of everything phenomenal, remains beyond the epistemic capacities of a finite intellect, the pursuit of the ideal of becoming the best possible living mirror of God or nature remains in place.

As mirrors, however, human inquirers express the world in its existence as a series of states in their own experience. Since the world as such is but a gathering of causally disconnected individuals, Leibnizian science remains essentially an exercise in conceptual analysis, of resolving perceptions from a condition of lesser to greater distinctness. Such epistemological internalism would be unacceptable to his neo-scholastic interpreters. While embracing Leibniz's optimism about the prospects of human reason, Christian Wolff, for one, would remain committed to the reality of external causal relations as a source of mental content. In a grand synthesis of the main currents of seventeenth-century thought, Wolff would reinterpret central Leibnizian doctrines—of substance, force, and harmony—into an essentially neo-Aristotelian framework as it had emerged in Iberian scholasticism and was transmitted to the new Protestant universities of Germany.

CHAPTER 4: Leibniz, Wolff, and the Birth of a New *Schulphilosophie*

1. Introduction

Despite the profound impact of Leibniz's thought on the subsequent history of European ideas, its immediate reception was mixed. Leibniz ended his life embroiled in an acrimonious dispute with the Newtonians on the priority of the discovery of the calculus. The distinctive theory of the monads, meanwhile, which Leibniz had only cautiously circulated among his confidantes and friends, appeared to a wider European audience as a fantastic fairy tale spun by an eccentric genius. A common assessment of Leibniz took root in the first half of the eighteenth century as a brilliant mind who squandered his energies on insoluble and irrelevant problems.[1] The extent to which Leibnizian ideas were transmitted to later generations owed in considerable measure to the selective reinterpretation they received in the nascent German Enlightenment, especially in the writings of Christian Wolff (1679-1754). Cassirer's remark, that "the influence of Leibnizian ideas [on the eighteenth century] is therefore indirect, namely, by way of the transformation they underwent in the system of Wolff," remains largely accurate.[2] The principal aim of this chapter and the next is to understand this transformation of Leibniz's philosophy; or rather, its assimilation into an ongoing project in German universities of synthesizing Aristotelianism and the new science.

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[1] This was, roughly, D'Alembert's characterization of Leibniz in the *Encyclopedia*; see W.H. Barber, *Leibniz in France: From Arnauld to Voltaire* (Oxford: Clarendon, 1955), 157-8. Equally noteworthy is the extensive article on Wolff in Zedler's *Philosophisches Lexicon* compared to the brief mention of Leibniz.

[2] Ernst Cassirer, *Philosophy of the Enlightenment* (Boston: Beacon Press, 1955), 33-4.

Wolff is today typically remembered as an epigone of his illustrious predecessor, a lesser imitation of the genuine Baroque philosophy of Hanover, the deep insights of which usually escaped him even as his voluminous and stultifying prose bore the superficial marks of Leibniz. From the later perspective of Kant's critical philosophy, meanwhile, Wolff's name signifies a temporary obstacle in the progress of the modern spirit, to be overcome decisively by the sage of Königsberg. Wolff thus occupies an unfortunate place between two heroes in the historiography of Western philosophy, neither equal to the brilliance of Leibniz, nor able to withstand Kant's assault on rationalist metaphysics.

Posterity has been almost uniformly unkind to one of the great academic celebrities of the eighteenth century. Roughly a century after his death, a consensus began to form which condemned Wolff as no more than a follower of Leibniz. In 1866, Benno Erdmann dismissed Wolff's efforts in his monumental, two-volume *Theologia naturalis* as those of a "slavish commentator" on Leibniz's *Theodicy*;[3] in Friedrich Ueberweg's narrative from the same year, Wolff's role was simply to undertake the "next task of philosophy in Germany," namely, the systematization of Leibnizian thought;[4] In his widely-read *History of Materialism*, F.A. Lange summarily declares Wolff to be an

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[3] Johann Eduard Erdmann, *Grundriss der Geschichte der Philosophie,* Bd. II (Berlin: W. Hertz, 1890), 228.

[4] Friedrich Ueberweg, *Grundriss der Geschichte der Philosophie, Dritter Teil: Die Philosophie der Neuzeit bis zum Ende des XVIII Jahrhunderts* (Leipzig: E.S. Mittler, 1866), 167: "Die nächste Aufgabe der Philosophie in Deutschland war die Systematisierung der Leibnizischen Gedanken."

"extremely mediocre philosopher."[5] The judgment of Wolff's lack of originality and his failure to grasp Leibniz' insights is repeated in these formative narratives in the modern historiography of philosophy, which bequeathed to the twentieth century its still-pervasive interpretive categories such as 'empiricism,' 'rationalism,' or 'neo-Platonism.' Challenges to the dominant narrative in the twentieth century have been few and far between, and the impression of Wolff's irrelevance to philosophical modernity remains firmly embedded in contemporary historiography.[6]

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[5] F.A. Lange, *Geschichte des Materialismus und Kritik seiner Bedeutung in der Gegenwart* (Leipzig: Baedeker, 1887), 339. See also, Eduard Zeller, *Geschichte der deutschen Philosophie seit Leibniz* (München: R. Oldenbourg, 1873), 213: "Dieses System war nun im wesentlichen kein anderes, als das Leibnizsche"; and Wilhelm Windelband, *Die Geschichte der neueren Philosophie in ihrem Zusammenhange mit der allgemeinen Kultur und den besonderen Wissenschaften dargestellt,* Bd. II (Leipzig, 1878), 496: "Der Gedankeninhalt dieses Schulsystems war in der Hauptsache von Leibniz abhängig. Wolff war weder ein Genie noch eine originelle Natur; er hat den Ideen Leibniz der Sache nach Nichts hinzugefügt, sondern vielmehr einige der feinsten und werthvollsten Gedanken seines Meisters, denen er nicht zu folgen vermochte, fortgelassen."

[6] Richard Blackwell, "Christian Wolff's Doctrine of the Soul," *Journal of the History of Ideas* 22, no. 3 (1961), 342n10, typifies the persistence of the late nineteenth-century opinion in twentieth-century Anglophone scholarship: "In fact, it is not too much of an oversimplification to say that a great deal of Wolff's philosophical energy was directed to the task of organizing the basic notions of Leibniz's thought into a systematic, deductive framework." There have been, of course exceptions to the historiographical rule. Ernst Kohlmeyer, *Kosmos und Kosmonomie bei Christian Wolff* (Göttingen: Hubert, 1911); Anton Bissinger, *Struktur der Gotteserkenntnis* (Bonn: H. Bouvier, 1970); Jean École, "Cosmologie wolffienne et dynamique leibnizienne: essai sur les rapports de Wolff avec Leibniz," *Les Études Philosophiques* 19, no. 1 (1964): 3–9; "En quels sens peut-on dire que Wolff est rationaliste?" *Studia Leibnitiana* 11 (1979): 45–61; "De la notion de philosophie expérimentale chez Wolff." *Les Études Philosophiques* 4 (1979): 397–406; "La definition de l'existence comme le complément de la possibilité et les rapports de l'essence et de l'existence selon Christian Wolff." *Les Études Philosophiques* 1/2 (1996): 261–73; John V. Burns, *Dynamisn in the Cosmology of Christian Wolff* (New York: Exposition Press, 1966); and Charles A. Corr, "Certitude and Utility in the Philosophy of Christian Wolff," *The Southwestern Journal of Philosophy* 1 (1970): 133–42; "Christian Wolff's Treatment of Scientific Discovery," *Journal of the History of Philosophy* 10, no.

Accordingly, before studying the relation between mechanism and teleology in Wolff's metaphysics and natural philosophy, this chapter assesses Wolff's intellectual situation at a critical juncture in the history of German thought. Section Two conveys the common background to both Leibniz and Wolff, focusing on two leading representatives of the Aristotelian and Cartesian philosophies in Germany, Christoph Scheibler and Johann Clauberg. Section Three then surveys some of the key figures in Wolff's early education at Jena and Leipzig, specifically Erhard Weigel, Johann Christoph Sturm, and Walther von Tschirnhaus, from whom Wolff inherited a syncretistic program of reconciling new and old philosophies of nature. Having received a mechanistic vision of nature already packaged within a neo-scholastic framework, Wolff conceives his task as the further elaboration of this synthesis, in particular by taking into account the methodological and metaphysical implications of Newtonianism. Wolff's intellectual biography up to the beginning of his correspondence with Leibniz in 1704, which would last until the latter's death twelve years later, reveals many of the commitments that Wolff brought to the discussion and retained in his mature system. Section Four then focuses on the correspondence. It locates the crux of the dispute between Leibniz and Wolff on the foundations of dynamics, and in Wolff's refusal to accept the theory of monads as a relevant ontological basis for a science of bodies. Section Five then turns to

3 (1972): 323–34, are some of the scholars who have studied Wolff's thought in its own right in the previous century. In recent Anglophone scholarship, a new generation of Kant scholars have begun to pay attention to Wolff in the process of excavating the background to Kant's philosophy: Martin Schönfeld, *The Philosophy of the Young Kant* (Oxford: Oxford University Press, 2000); Eric Watkins, *Kant and the Metaphysics of Causality* (New York: Cambridge University Press, 2005); Corey W. Dyck, *Kant and Rational Psychology* (Oxford: Oxford University Press, 2014); R. Lanier Anderson, *The Poverty of Conceptual Truth: Kant's Analytic/Synthetic Distinction and the Limits of Metaphysics* (Oxford: Oxford University Press, 2015).

Wolff's alternate doctrine of substance and force with which he draws a sharper wedge between metaphysics and natural philosophy than Leibniz. In his conception of the relationship between metaphysics and empirical physics, Wolff staunchly defends the autonomy of the latter. Physics, for Wolff, borrows from metaphysics certain logical principles common to all the sciences, but is free from any ontological commitments originating outside the doctrine of created material being (*ens creatum immateriale*). The normative standards of physical inquiry, for Wolff, in fact originate in the methods and practices of the physical sciences themselves, and acquire epistemic force on the basis of their empirical success. Metaphysical speculation, rather than contributing to the first-order project of physics, is instead undertaken for its own sake, namely, to address a natural disposition of the human intellect to seek ever greater certitude concerning the self, the world, and God. Finally, Section Six surveys the long shadow cast by Wolffianism over eighteenth-century German philosophy.

Together, these two chapters challenge several pervasive misperceptions of Wolff. In the first place, a picture of Wolff emerges here that is sharply at odds with a view of him an arch-rationalist, content to spin an elaborate metaphysical system from the armchair. From an early age, Wolff remains skeptical of both speculative theology and the metaphysical discipline of pneumatology, or the doctrine of spirits. Indeed, the secure path to theological knowledge as well as knowledge of the human soul, for Wolff, proceeds through a study of the physical world. As he declares in the introduction to the chapter on Cosmology in his *German Metaphysics*, "one can grasp neither the essence of a spirit (*Geist*) in general nor of the soul in particular before one understands what a world actually is and what kind of constitution it has."[7] The starting point for philosophy, accordingly, is experience of oneself and of external things. Philosophical knowledge is always knowledge of reasoned fact, a "marriage of reason and experience"[8] instituted through the application of the general principles of human knowledge (the subject of 'first philosophy' or Ontology) to data gathered through observation and experiment.

In the second place, far from being a mere expositor and promoter of Leibniz, Wolff appears in crucial respects to advance a fundamentally Cartesian program in natural philosophy. For instance, Wolff envisions a greater separation of the epistemological foundations of physics from the claims of general metaphysics. For Wolff, as for Descartes, the external world of moving bodies in space constitutes a domain of investigation independent of mentality, constituted by its own principles which are amenable to mathematical analysis. It is precisely for this reason that Wolff vehemently rejects the central thesis of Leibniz's system, the doctrine of perceptive and appetitive monads. While Wolff accepts the Leibnizian argument that whatever is composite must be made up of simples, he resists assimilating all simples into Leibniz's unified, psychological model of a simple, representational being. Physical simples must be conceived as distinct in kind from psychological simples. In the same vein, Wolff retains a contact model of causation in the corporeal world, where physical interactions consist in real transfer of force through a fluid plenum, rather than in internal modifications of elastic force coordinated through divinely established harmony. Physical causation, for Wolff, is a real relation between substances, rather than a mere expression

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[7] DMet. §540.

[8] "Connubium rationis et experientiae"; Psy. emp. §497; Log. §1232.

of regular patterns of change of perceptual state. Wolff adopts the Leibnizian hypothesis against physical influx only for the limited case of mind-body interaction for its heuristic role in supplying structurally analogous hypotheses to be tested in ontologically distinct domains. Rather than seeking vestiges of Leibniz in Wolff's texts, I believe we gain a better understanding of Wolff by situating him in the interaction of Cartesianism and Aristotelianism in seventeenth-century German universities.

2. Scholasticism and Cartesianism in seventeenth-century Germany

In popular narratives of eighteenth century philosophy, Wolff appears as an obstacle on the celebrated path from Leibniz to Kant. Beginning with Wolff, the universal genius of Leibniz becomes the subject of misunderstanding and mischaracterization by generations of humorless German academics and frivolous French *philosophes*. It finally takes a certain Scotsman's clear-headed diagnosis of the ills of rationalism to awaken Kant from his dogmatic slumber and, in a revolution of Copernican magnitude, recover the best insights of his illustrious predecessor to usher in a new age of philosophy. Wolff may indeed have been an obstacle to the arrival of the critical philosophy. But the validity of that judgment owes less to the possession of an allegedly "second-rate mind,"[9] and more to the fact that Wolff did not see his philosophical task as one of providing a stepping-stone toward transcendental idealism. Instead, Wolff found himself first of all in a Protestant scholastic tradition, traceable to Luther's educational reformer Philipp

[9] Jonathan Bennett, *Kant's Dialectic* (Cambridge: Cambridge University Press, 1974), 6.

Melanchthon (1497-1560), which conceived its task as that of constructing a philosophy for a new Protestant German identity, much as the Jesuit philosophers had sought to defend through reason the tenets of the Catholic faith against challenges from humanists, fideists, and skeptics.

Consequently, despite having acquired early in his youth a disaffection with scholasticism, Wolff's energies would not be directed at an overthrow but instead a reform of the tradition represented in Germany by such figures as Christoph Scheibler (1589-1653) and Johann Scharf (1595-1660). At the same time, Wolff was also concerned, like many of contemporaries, to incorporate into the scholastic framework the fruits of the new sciences. In particular, before ever coming into contact with Leibniz, Wolff was inspired by a Cartesian vision for philosophical certainty in all branches of learning through the use of the mathematical method as espoused in Germany by such figures as Erhard Weigel (1625-1699), Johann Christoph Sturm (1635-1703), and Ehrenfried Walther von Tschirnhaus (1651-1708). Later in life, Wolff would attest that, while his "primary intention was always directed toward Theology," mathematics held for him the promise "to sharpen my understanding and thereby to abstract rules with which to lead it to correct knowledge of truth."[10] Mathematics would provide the tools with which to eliminate theological discord. Already in his gymnasial days in Breslau, antagonism between Lutherans and Catholics led him to wonder "whether it would not be possible to show the truth in theology so distinctly that it would not bear any

[10] WeLb 127; Wolff's autobiographical notes (*Wolffs eigene Lebensbeschreibung*) date from the early 1740s.

contradictions."[11] A concern to overcome theological disputes is an especially prevalent feature of the milieu in which Wolff appears, with the savagery of the Thirty Years' War still vivid in collective Central European memory. Relatedly, a concern to reconcile the Aristotelian and Cartesian frameworks is present everywhere in Wolff's mature works, and most significantly in the primary discipline of Ontology. Wolff's understanding of the methods, goals, and subject matter of metaphysics and natural philosophy emerge from this confluence of intellectual currents.

2.1. Christoph Scheibler's new scholasticism

Even amid the virulently anti-scholastic atmosphere of the Magdalena gymnasium at Breslau, the young Wolff was introduced to some of the most prominent representatives of the scholastic tradition in Germany.[12] And, despite his later commitment to mathematical natural philosophy, Wolff would self-consciously view his work as a development of the legacy he inherited from the Protestant Aristotelian tradition, a fact reflected both in the scholastic language he adopted—and often redefined—and in his conception of the relations between metaphysics, logic, and theology. The most significant among the neo-Aristotelians Wolff recalls having read is Christoph Scheibler, known in seventeenth-century Germany as the "Protestant Suárez" or the "German

[11] WeLb 121. In his time in Breslau, Wolff reports reading a compendium of Aquinas' *Summa* in order to learn Catholic theology correctly, and not from their opponents (WeLb 117). See H.J. De Vleeschauwer, "La genèse de la méthode mathématique de Wolf. Contribution à l'histoire des idées au XVIIIè siècle." *Revue Belge de Philologie et D'histoire* 11 (1932), 659-64, for a more detailed account of Wolff's time at the Breslau gymnasium.
[12] WeLb 114-5; Bissinger, *Struktur*, 6-7.

Suárez." After an education at Marburg and Gießen, Scheibler conducted a short but highly productive career as professor of philosophy at Gießen (1610-1624), before abruptly suspending his philosophical activities and relocating to Dortmund to become head of the local gymnasium.[13] His epithets allude not only to the comprehensive character of his philosophical writings, but also to their avowed significance for theological disputation; indeed, Scheibler would devote the last three decades of his life to the strenuous defense of Lutheranism against Calvinist attacks. Scheibler's two-volume *Opus metaphysicum* (1617) is his main contribution to metaphysics and marks an important assertion of the value of metaphysics for theology on the one hand, and of the distinctness of metaphysics as a science of being from logic as the art of arguing as its instrument (*logica utens*) on the other.[14]

Whereas Reformed scholastics of the early seventeenth century typically developed metaphysics separately from theology, and both as part of a general encyclopedia of the sciences,[15] the situation was different for Lutheran scholars such as Scheibler. One challenge for Lutheran theologians lay in Luther's own polemical dismissal of Aristotle along with the medieval commentators whom he accused of having

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[13] See Wundt, *Schulmetaphysik*, 119-123, for a brief biography.

[14] Scheibler's impact extended beyond Germany. His shorter *Philosophia compendiosa*, in particular, was a popular undergraduate textbook at Oxford. Marco Sgarbi, *The Aristotelian Tradition and the Rise of British Empiricism* (Dordrecht: Springer, 2013), esp. Ch. 7, studies aspects of the impact of German neo-Aristotelianism in seventeenth-century England.

[15] Wundt, *Schulmetaphysik*, 121; Lohr, "Metaphysics," 631ff. Reformed (Calvinist) scholasticism, as it developed in Heidelberg and Herborn, leaned toward greater systematicity among the branches of learning as expressed in the encyclopedic projects of Bartholomaeus Keckermann (1572-1608) and, most ambitiously, of Keckermann's student, Johann Heinrich Alsted (1588-1638).

forged too intellectualist an interpretation of Scripture and a corrupt alliance with the church. Although Luther's principal educational reformer, the Wittenberg humanist Philipp Melanchthon, had gone a considerable way toward restoring the study of Aristotle's ethics for its utility in cultivating civic morals, and of Aristotle's physics for supporting a providentialist natural teleology, the status of metaphysics remained controversial.[16] Since metaphysics claimed to demonstrate eternal and necessary truths, it bore a latent challenge to the core Lutheran doctrine of the sufficiency of faith for knowledge of God, his attributes, his works and, ultimately, of the possibility of salvation. A strict adherence to the doctrine of *sola fide*, together with an anxiety about sliding back—as some alleged Melanchthon to have done—into the intellectualist excesses of high Catholic theology, took radical expression in the so-called *Hofmannstreit* around 1600. Reformation disputes over the respective roles of faith and reason reached fever pitch when the Helmstedt theologian Daniel Hofmann called for the philosophy faculty to be expunged from the university altogether. For philosophy, Hofmann charged, is not only unable to clarify theological doctrine, but is furthermore harmful for cultivating faith and morals.[17]

While Hofmann's extreme hostility toward philosophy, and metaphysics in particular, does not represent the mainstream opinion of the age, it does illustrate the

[16] See Kusukawa, *Transformation of Natural Philosophy,* for a study of Melanchthon's contributions to the restoration of Aristotelian natural philosophy in a Lutheran context. She credits Melanchthon with transforming philosophy as a university discipline that could be useful for and compatible with Lutheran theology.
[17] For details of the episode, see Maria Rosa Antognazza, "Hofmann-Streit: Il Dibattito Sul Rapporto Tra Filosofia E Teologia All'universita Di Helmstedt," *Rivista Di Filosofia Neo-Scolastica* 88, no. 3 (1996): 390–420.

greater challenge to the prospects of rational inquiry into matters of truth (as opposed to matters of civic morals or law) in Lutheran institutions. And, although Scheibler would not be the first author to compose systematic treatises on metaphysics in a Lutheran context—Daniel Cramer (1594), Jacob Martini (1603-4), and Cornelius Martini (1605) had already produced metaphysics textbooks in Germany—he would be among the first to thoroughly absorb the Suárezian conception of metaphysics as a science of the possible or the intelligible. The 1605 publication of Suárez's *Disputationes metaphysicae* in Mainz would be a significant event in the development of a new German rationalism. It introduced German academics to a new defense of metaphysics as a confessionally neutral science of the first principles of knowledge, and an explicit rejection of the notion of metaphysics as nothing other than natural theology, or of metaphysics as a science of divine things. It would lead to a conception of metaphysics in a different sense of the subject, namely, as ontology, or the science of being *qua* being.[18]

Scheibler begins his *Opus metaphysicum* in the manner of Suárez with a *Proemium* on the utility of metaphysics for clarifying key theological concepts such as substance, cause, or nature, and even for scriptural exegesis. Accordingly, he affirms the traditional status of philosophy as "handmaiden of theology" (*ancilla Theologiae*). Even

[18] Both meanings of 'metaphysics' can be found in the books of the *corpus aristotelicum* which have come down us bearing that title. In *Metaphysics* I.2 (Alpha) 982b29-983a12, Aristotle writes: "For the science which it would be most meet for God to have is a divine science, and so is any science that deals with divine objects; and this science [i.e. metaphysics] alone has both these qualities." And in *Metaphysics* IV.2 (Gamma) 1003b19-1003b22, Aristotle describes metaphysics in the second sense: "Now for every class of things, as there is one perception, so there is one science, as for instance grammar, being one science, investigates all articulate sounds. Therefore to investigate all the species of being *qua* being, is the work of a science which is generically one."

as an instrument, however, philosophy requires its own principles and a certain autonomy for developing them, in order to serve its theological function effectively.[19] Thus, Scheibler rejects deflationary characterizations of metaphysics as *prudentia* or *ars* or even *sapientia*, common among both anti-rationalist and broadly humanist streams of sixteenth-century thought.[20] Instead, he defends its status as a demonstrative and speculative science (*scientia speculativa*) with its own distinct subject matter.[21] Just as physics identifies its subject matter as natural body in general by abstracting from the matter of particular embodied beings, metaphysics also obtains its subject matter by abstraction. Specifically, metaphysics locates its distinct domain of inquiry, being insofar as it is being, by abstracting away from the common properties of any being whatsoever that could be the object of cognition.[22] Metaphysics emerges, for Scheibler as for Suárez, as a science of possible being, of anything that could become the object of thought and thus a candidate for existence, inasmuch as an omnipotent being could actualize any positively conceivable entity.

At the same time, however, Scheibler conceives metaphysics as distinct from logic. For the latter is an art focusing on procedures to clarify terms and formalize modes of inference without regard to confirmation from reality. Logic is excluded from the sciences, Scheibler writes elsewhere, because "all science concerns necessary things; and

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[19] Op. met. I.i *Proemium*, cII.
[20] Ibid., I.i.tit2.art1-3.
[21] Ibid., I.i.tit2.art4: "Imo nihil aliud intendit Metaphysica, quam ut demonstret affectiones varia de Ente, generatim vel speciatim, quoadusque Metaphysica descendit."
[22] Ibid., I.i.tit3.

logic deals neither with things nor with necessity."[23] That is, whereas logic deals with the correctness of operations concerning propositions about things, metaphysics concerns the truth about the things themselves, and specifically as they relate to the intellective powers. The goal of logic, unlike metaphysics, is argument, rather than knowing what exists and in what ways.[24] One consequence of the separation of logic and metaphysics is the impossibility of deriving ontology in a logicist manner, or to derive conclusions about what there is entirely from what is logically possible. The principle of contradiction alone cannot support a doctrine of being, but only serve as a method for its elucidation. While metaphysics as ontology is a science of being in general, the possibility of being itself stands under non-logical suppositions, and ultimately requires faith in the doctrine of God as an uncreated, immaterial being (*ens increatum immateriale*) as the cause of the existence of created immaterial (*ens creatum immateriale*) and created material being (*ens creatum materiale*). This understanding of metaphysics will be bequeathed to the later division familiar from Wolffian metaphysics between *metaphysica generalis*, or ontology, and *metaphysica specialis*, comprising cosmology, psychology, and natural theology.[25]

General metaphysics, the subject of Book I of the *Opus metaphysicum*, expounds the general or transcendental affections of being, or those predicates which are applicable

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[23] Op. log. 3.

[24] Ibid. 70: "Finis externus et internus simul indicantur si dicamus finem logicae esse bene disserendo cognoscere veritatem."

[25] Scheibler does not use the term *ontologia* (or *ontosophia*), which first occurs in Goclenius' *Lexicon* of 1613, where it is defined as "philosophia de ente." For a history of the origin of the term, see José Ferrater Mora, "On the Early History of 'Ontology,'" *Philosophy and Phenomenological Research* 24, no. 1 (1963): 36–47.

to any thing or state of affairs whatsoever. Scheibler understands the doctrine of transcendentals in a broader scope than Suárez to include not just being (*ens*) and its simple affections of truth (*verum*), goodness (*bonum*), unity (*unum*), thing (*res*), and something (*aliquid*), but also disjunctive predicates such as simple and composite, finite and infinite, necessary and contingent, act and potency, principle and the principled thing (*principiatum*), and cause and effect (*causatum*). Diverging from Suárez further, Scheibler includes in the subject matter of metaphysics the mere being of reason (*ens rationis*) as well, insofar as these have a relation to the intellect and thus are legitimate objects for judgment.[26] For Scheibler, all of metaphysics is concerned ultimately with *cognized* objects; or, it treats objects, insofar as they are, or could be, objects of cognition. Metaphysics as science of being *qua* being is better understood as the science of intelligible being. Special metaphysics, meanwhile, proceeds from a distinction between substance and accident (c.I), and successive divisions in the former as complete or incomplete, primary or secondary, and corporeal or spiritual (c.II), to mark the distinct science of natural theology (c.III): this theology is *natural* insofar as it considers possible objects of judgment under the natural operations of the intellect, as treated in general metaphysics; and it is *theology* insofar as its special object is God, or an infinite spirit (*spiritus infinitus*).[27] The remainder of special metaphysics then treats the other two species of intelligence, namely the angels (c.IV) and separated souls (c.V), accidents

[26] Op. met. I.xxvii.tit1.

[27] "Existimari potest, Dei doctrinam peculiarem esse debere in Philosophia, separatam ab aliis scientiis, quae dicatur *Theologia* vel *Theosophia naturalis*" (Op. met. II.iii.tit1.art.punc1).

(c.VI), and the traditional categories of quantity, quality, relation, action, passion, time, place, position, and habit (c.VII-XV).

Scheibler's conception of the task and organization of metaphysics reflects an influential current in seventeenth-century German philosophy. For one thing, his treatment of the transcendental part of metaphysics offers a model for the nascent science of ontology, both with respect to its structure as well as for its conception of its subject matter as possible cognition. Wolff's 1730 treatise, *Philosophia prima sive Ontologia,* can be usefully read in the light of Scheibler's construction of the first principles of cognition in Book I of *Opus metaphysicum.*[28] For another, Scheibler's insistence of the significance of metaphysics for theology, and the legitimate examination of theological claims at the independent court of philosophical reason, would give impetus to the gradual re-emergence of rational or natural theology, a discipline that would receive extensive treatment in the hands of Leibniz and Wolff.

2.2. Johann Clauberg and German Cartesianism

While Bouillier's assessment that, "Cartesianism did not have as great an influence in Germany as in Holland or France," may be statistically accurate, Cartesian ideas nevertheless made steady inroads in Germany throughout the seventeenth century.[29] No

[28] See Bissinger, *Struktur*, 130-1, for such an *Auseinandersetzung*.
[29] *Histoire de la philosophie cartésienne* (Paris: C. Delagrave, 1868), 405. To be sure, "Cartesianism" is as problematic a label as "Aristotelianism" by the late-seventeenth century. It is also just as divisive, being a term of abuse as well as pride, viewed with

single figure was more responsible for the propagation of Descartes' philosophy there than the Calvinist philosopher and first rector of the newly-founded University of Duisburg, Johann Clauberg. Clauberg's familiarity with Descartes' philosophy was acquired first hand. After studying at gymnasia in Solingen and Bremen, Clauberg moved to Groningen in 1644, where Cartesianism had recently won an important victory. The previous year, the Stadtholder of Groningen had ordered the Utrecht authorities to cease the suppression of Cartesian philosophy in the wake of Gisbert Voetius' efforts to have it condemned. Clauberg remained in Holland for several years and earned his place in Cartesian lore by drawing up a report of Descartes' conversation with Burman at Leiden in 1648. A professorship of philosophy at the notable Calvinist gymnasium of Herborn followed in 1649 (after Clauberg had declined the better-paid professorship of theology there). But his tenure there was an unhappy one. Besides the burden of a heavy teaching load and the annoyance of not having his salaries paid on time, Clauberg was dissatisfied with the intellectual climate at Herborn, where Aristotelian and Ramist logic remained the only approved methods of instruction.[30] He left only two years later for Duisburg, where he would devote his energies to systematizing Cartesian metaphysics and logic for

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deep suspicion by its detractors and religious zeal by its proponents. Sturm captures the contemporary sentiment in Germany in his *Philosophia eclectica* (1686).

[30] Günter von Roden, *Die Universität Duisburg* (Duisburg: Walter Braun, 1968), 159-60; Theo Verbeek, "Johannes Clauberg: A Bio-Bibliographical Sketch," in *Johannes Clauberg (1622-1665) and Cartesian Philosophy in the Seventeenth Century,* ed. Theo Verbeek (Dordrecht: Springer, 1999), 185-6.

instruction in a series of texts such as *Defensio cartesiani* (1652), *Logica vetus et nova* (1654), and *Metaphysica de ente, quae rectius Ontosophia* (1664).[31]

It is the last of these works—for which Clauberg coins the title 'Ontosophia'—that gives currency to a conception of general metaphysics as a science of the common predicates of being applied univocally to corporeal and incorporeal things.[32] Whereas Scheibler had developed ontology separately from natural theology principally for the sake of then employing metaphysics all the more effectively in religious apologetics, Clauberg follows Descartes in seeking a more decisive secession between the two. At the same time, in using *ens* univocally for God and creatures, Clauberg departs sharply from Descartes' restrictions on possible objects of metaphysical knowledge. Ontology, for Clauberg, becomes a propaedeutic to all other knowledge, of matters divine and mundane, regardless of whether anything exists or not.[33] Clauberg's alleged Cartesianism is, to be clear, heterodox. Like many of his countrymen engaged in crafting new

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[31] See Verbeek, "Johannes Clauberg," for an overview of Clauberg's life and works. The *Metaphysica de ente,* in fact, was the third version of a work first published in 1647, *Elementa philosophiae sive ontosophia*, and in 1660 as *Ontosophia nova*. The 1664 version was published alongside his *Physica*, and was also the version reprinted in his *Opera omnia* in 1691. The content of the three versions varies significantly in places. Here, I follow the 1664 text since it is the one Wolff cites in every instance.

[32] Met. de ente §1 OO I 283: "Est quaedam scientia, quae contemplatur ens *quatenus ens est*, hoc est, in quantum communem quandam intelligitur habere naturam vel naturae gradum, qui rebus corporeis & incorporeis, Deo & Creaturis, omnibusque adeo & singulis entibus suo modo inest. Ea vulgo *Metaphysica*, sed aptius *Ontosophia* vel scientia Catholica, eine allgemeine wissenschaft, & Philosophia universalis nominatur."

[33] Jean École, "La place de la *Metaphysica de Ente, Quae Rectius Ontosophia* dans l'histoire de l'ontologie et sa reception chez Christian Wolff," in *Johannes Clauberg (1622-1665) and Cartesian Philosophy in the Seventeenth Century,* ed. Theo Verbeek (Dordrecht: Springer, 1999), 66, reads Clauberg as having "secularized" ontology: "En un mot, Clauberg représente… l'intérêt d'avoir sécularisé, si l'on peut dire, l'ontologie." At the same time, Clauberg departs from Descartes insofar as he takes being to apply univocally to God and creatures.

intellectual identities alongside confessional ones, Clauberg is less interested in giving allegiance to one or another school, and more in using resources which Aristotle, Descartes, Scotus, or any other author could provide in the articulation of new philosophical systems.[34]

Beginning with a definition of metaphysics as a "science that contemplates being insofar as it is being," Clauberg identifies three significations of the term *ens*. In its most general signification, "being is whatever can be thought or said," which includes discourse about nothing (*nihil*) as well as chimeras.[35] As Clauberg suggests with his examples, this sense of being is expressed in the dialecticians' term "theme" (*thema*) and is even sometimes meant by philosophers when they use the term *ens* without further specification.[36] This widest sense of being allows Clauberg to accommodate, and go beyond, a Cartesian (and Suárezian) identification of being with metaphysical possibility. For Clauberg, unlike Descartes, includes in this ambit of being the idea of nothing, thus appearing to grant it at least objective reality in Descartes' sense. Descartes himself, as

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[34] See Francesco Trevisani, *Descartes in Germania: La ricezione del Cartesianesimo nella facoltà filosofica e medica di Duisburg* (Milan: F. Angeli, 1992), for a detailed study of the reception of Descartes in German universities. As Trevisani notes: "The so-called Cartesian Scholastic is thus a less monolithic phenomenon as one might think. In particular, it is not so much a movement, if one understands by that an organized consciousness and a programmatic approach, which inclines to replace one scientific system, one vision by another system or another worldview" (15-6).

[35] Met de ente §6, OO I 283. "Ens est quicquid quovis modo est, cogitari ac dici potest. Alles was nur gedacht und gesagt werden kan. Ita *dico* Nihil, & cum dico *cogito*, *est* illud in intellectu meo."

[36] As Andrea Strazzoni, "The Foundation of Early Modern Science: Metaphysics, Logic and Theology" (Erasmus University Rotterdam, 2015), 67, notes, in the *Logica vetus et nova,* Clauberg identifies ideas with *themata*, either simple or complex propositions. Being in the most general sense, thus, can exclude from its sphere ontology in a narrower sense.

Clauberg surely knew, objects to Burman that an "idea of nothing is purely negative, and can hardly be called an idea."[37] By contrast, Clauberg is willing to include within the field of being whatever can be the subject of discourse: fictitious entities, conventional objects of history or geography, and even *nihil*.

Narrowing the semantic range, Clauberg approaches the Cartesian conception of knowable reality. In the second sense, being signifies something (*aliquid*) that provides determinate content for thought, or that which does not involve logical contradictions such as 'four-sided circle' or 'leaden gold-coin.'[38] Determinate being thus arises from the recognition of a logical opposition between positive reality and what is purely privative, in which lies also the origin of the principle of contradiction. *Aliquid* excludes mere beings of reason (*entia rationis*) and concerns those contents which are objects of logical operations such as definition, division, or inference.[39] This sense of being is proper to the mathematical sciences of arithmetic and geometry when, for example, one contemplates the essence of a triangle or a chiliagon and discovers their immutable properties. For Clauberg, as for Descartes, there are primary truths which can be known with certainty simply be considering the meanings of the terms in which they are expressed, or reducing propositions to identity statements. *Aliquid* signifies the domain of determinate possibilities, thus is narrower than the sphere of the merely thinkable and sayable, yet broader than that of the actual.

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[37] AT V:153; CSMK III:338.
[38] Met. de ente §38, OO I 289.
[39] Ibid. §40, OO I 289.

Finally, in its strictest sense (*magis propria significatione*), being coincides with Descartes's idea of substantial reality. In this third sense being signifies thing (*res*) or real being (*ens reale*), as when one thinks of a substance together with its modes, such as a mind distinguished from its faculty of thought, or a body from its attribute of extension.[40] Substance is defined in agreement with the Aristotelian and Cartesian senses of something which is not lacking for its existence, and as the subject of accidents.[41] In this meaning as *res* or *substantia*, being applies to the essences of both created and changeable, and uncreated and unchangeable substances and, thus, captures the subject matter of the sciences of nature on the one hand, and of theology on the other.[42] Under this threefold understanding of the core concept of general metaphysics, and especially under its third sense as substantial being, Clauberg builds a familiar apparatus of the attributes and qualities of beings, such as essence and existence, sameness and difference, whole and part, truth and falsity, or goodness and evil, and of their relational properties such as causation and signification. While abstracting away from every special discipline, Clauberg's *ontosophia* aims to serve as a universal conceptual scheme for each one of them, whether belonging to the book of physical nature or to the book of the human mind. Indeed, it leaves open the possibility of a science of a perfect or infinite mind, or a

[40] Ibid. §42, OO I 290.
[41] Ibid. §44, OO I 290: 'Substantiae, id est, rei quae ita existit, ut aliquo ad existendum subjecto non indigeat, opponitur Accidens, quod in alio existit, tanquam in subjecto.'
[42] Ibid. §45, OO I 290.

rational theology, of a substance in the most proper sense insofar as God is considered as absolutely self-sufficient and the source of all reality.[43]

Whereas essence, along with existence, duration, unity, truth, good, and perfection are predicated absolutely of any thing (*res*) or substance, Clauberg identifies a class of respective attributes (*attributa respectiva*), by which one thing is related to another. Importantly, relative or respective predications depend on cognition, for "one thing cannot be called prior or posterior, or cause or effect, except by regarding the other." Relations, thus, are nothing but intellectual operations (*operatio intellectus*).[44] Foremost among these mental operations is the relation of causality, or production.[45] The status of a being as cause or effect, or as active or passive, strictly speaking, depends on an act of the intellect, rather than on any intrinsic determination of a thing. In an absolute sense, Clauberg recognizes only God as cause or active being or principle, insofar as only God is a cause of the being or essence of things, as opposed to the cause of their changes.[46] What suffices for causation in mundane matters, by contrast, are external relations among things as cognized by the mind. But to these external relations belongs neither essence nor necessity. In effect, Clauberg restricts causality in the created world

[43] Ibid. §164, OO I 310: 'Deo multo magis definitio & nomen adeoque idea Substantiae convenit, quam Creaturae.' See Pius Brosch, *Die Ontologie des Johannes Clauberg* (Greifswald: L. Bamberg, 1926), 43-8, for more discussion of Clauberg's concept of substance and its affinity with Descartes's.
[44] Ibid. §206, OO I 318: "Sic res nulla prior vel posterior, causa vel effectus dicitur, nisi intuitu alterius. *Relatio* igitur vocatur, cum intellectus noster rem unam confert cum alia, propter certam utriusque proprietatem vel actum, aut aliam quamcunque rationem… Itaque relatio omnis per se nihil aliud est, quam operatio intellectus."
[45] Ibid. §218, OO I 320: "Inter attributa entium respectiva *Productionis* seu *Originis* ratio & relation primum locum obtinet."
[46] Ibid.,§223, OO I 320: "Deus causa rerum creatarum non modo *secundum fieri*, verum etiam *secundum esse*".

to external causes, or efficient and final causes in the Aristotelian scheme, conceived as cognized relations; internal causes, form and matter, are instead to be regarded as the parts from which the essence of a thing is composed and, consequently, to be attributed to God's intellect.[47]

But the efficient and final cause are not identical with respect to the manner of their causality, and Clauberg distinguishes them in much the same fashion as the late sixteenth-century scholastic tradition. Thus, whereas efficient causation results in a transfer of properties, an *influens* from the cause to the effect, final causality consists only in an inquiry, or urging, or deliberation (*rogat, hortatur, consulit*). Accordingly, Clauberg distinguishes efficient and final causes as physical and moral causes, respectively. From the division of substance into intellectual and corporeal, each kind of cause operates differently in the two domains. Thus, an efficient cause that is a corporeal agent of motion is a necessary cause (*causa necessaria*) in virtue of producing its effect of natural necessity. As an intellectual reason for the motion of the will, however, the efficient cause is called freedom (*libera*).[48] Clauberg identifies the activity of the final, or moral cause, meanwhile, with the intentional action of a rational agent. Final cause is, consequently, intentional cause (*causa intentionalis*), and, in keeping with tradition, its causality consists in a metaphorical motion of the will toward a represented good. In virtue of participating in God's will, human agents can direct their efficient causal powers—corporeal and intellectual—by setting their own practical ends. The efficient causality of non-rational agents, by contrast, requires direction by God or another

[47] Ibid. §225, OO I 321.
[48] Ibid. §257, OO I 326.

intelligent agent, which Clauberg illustrates with Aquinas' metaphor of an arrow directed by an archer.[49] Much of this bears the stamp of the Suárezian analysis of final causation, as a mode of causality distinctly understood only by attention to the character of free, human agency.

Clauberg's Cartesianism is the first systematic effort to bring Descartes' philosophy into German universities. Clauberg wholeheartedly embraces the Cartesian doctrine of substance and its rejection of substantial forms and real qualities. Closely related is a shift toward a conception of efficient causation as a mental relation of succession, in addition to the older meaning of efficient cause as a productive power. As with every other Cartesian in the seventeenth century, Clauberg also confronts a vexing question concerning the nature of the relation between mental and physical substance. Clauberg's solution in his *Conjunctio animae et corporae* (1664) carries occasionalist overtones, but it is importantly distinct from Malebranche and other French followers of Descartes in retaining only its negative thesis: given the radical distinctness of mind and body, it is impossible for extended beings and thinking beings to directly affect one another. Missing from Clauberg's account are the positive theses of occasionalism, namely, that of God possessing exclusive causal efficacy in the production of modifications in creatures, and the institution of his efficacy through law-like relations, as

[49] Ibid. §261, OO I 327: "Res intelligentiae expertes proprie non agunt propter finem, sed a Deo vel aliis etiam causis intelligentibus pro arbitrio huc illuc moventur, quemadmodum sagitta a sagittario dirigitur ad certum scopum, quem ipsa non cognoscit." See also Detlev Pätzold, "Johannes Claubergs Behandlung des Kausalitätsproblems in der 1. und 3. Auflage seiner *Ontosophia*," in *Johannes Clauberg (1622-1665) and Cartesian Philosophy in the Seventeenth Century,* ed. Theo Verbeek (Dordrecht: Springer, 1999), 127-129, for a related discussion of Clauberg's treatment of causality.

one finds in Malebranche. For Clauberg, God establishes the connection between bodily events and mental events only through a special, non-causal relation. This relation is non-causal, because mind and body are entirely heterogeneous entities, neither requiring the other for its existence or perfection.[50] But, while he moves toward occasionalism as a negative doctrine denying real causal relations between substances with incompatible attributes, Clauberg struggles to characterize positively the relation grounding the mind-body union. He proposes to class mind-body causation as a relation of origin (*originis*) or production. Yet, it is, paradoxically, a productive relation distinct from the sort which obtains between the paradigm of an efficient cause and its effect.[51] Resorting to metaphors, Clauberg ultimately suggests a kind of primitive, divinely instituted sympathy between mental modifications and bodily events:

> Therefore the actions and passions of the mind and body are conjoined… not as begetting father and begotten son, in which one is the cause of the other; but as master and servant, or better as two friends, who are united closely with one another by mutual services, which are to be given, received, taught, learned, sold, bought.[52]

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[50] An. et corp. IV, OO I 211-2. Also, Pätzold, "Kausalitätsproblem," 125-6; and Jean-Christophe Bardout, "Johannes Clauberg," in *A Companion to Early Modern Philosophy,* ed. Steven Nadler (Padstow, Cornwall: Blackwell, 2002), 136-8.
[51] An. et corp. IX.11, OO I 215.
[52] Ibid. IX.17, OO I 216: "Conjunguntur ergo actionibus passionibusque mens & corpus, quemadmodum e superioribus liquet, non ut pater gignens & filius genitus, quorum alter alterius causa est; sed uti dominus & servus, vel potius ut amici duo, qui mutuis officiis, dado, accipiendo, docendo, discendo, vendendo, emendo, inter se devinciuntur".

Clauberg's name would become synonymous with Cartesianism in Germany, where Descartes' complete works did not appear until 1692. Both Leibniz and Wolff, despite their familiarity with French Cartesians such as La Forge, Cordemoy, Geulincx and Malebranche, held their fellow countryman in higher esteem as a representative of Cartesian philosophy.[53] As should be evident, however, Clauberg was no mere epigone of Descartes. Instead, partly due to his concern to make Cartesianism suitable for instruction in German academies, he retains as many traces of Suárez and the new, Protestant scholasticism to forge a unique synthesis of the old and new philosophies. As we shall see in the next chapter, Clauberg's influence on Wolff's metaphysics is unmistakable.

3. Method and metaphysics in German university philosophy

While Wolff does not mention Clauberg in his autobiographical reflections on his education at Jena, references to Clauberg's works appear as early as his 1703 treatise "Disquisitio philosophica de loquela." Given Clauberg's preeminent status as a representative of Cartesianism in Germany, we may safely assume that his introduction to the Cartesian philosophy in Breslau through his teacher Caspar Neumann (1648-1715)

[53] For Leibniz's admiration of Clauberg, see Christia Mercer, "Johann Clauberg, Corporeal Substance, and the German Response," in *Johannes Clauberg (1622-1665) and Cartesian Philosophy in the Seventeenth Century,* ed. Theo Verbeek (Dordrecht: Springer, 1999), 159n48. Wolff consistently draws on Clauberg in arguing for the conformity of his own treatments of substance, relation, and cause with those of the Cartesians (e.g., Ont. §772, §865, §951).

would have taken the form given to it by Clauberg.[54] Neumann sparked in the young Wolff an interest in mathematics, and in particular a desire to study Tschirnhaus' proposal in the *Medicina mentis* to replace scholastic logic with a logic of discovery based on algebra. Since the resources at Breslau were lacking, Neumann encouraged his pupil to pursue his ambition to bring "theology to indisputable certainty" by enrolling at the University of Jena to study with the mathematician and physicist, G.A. Hamberger.[55] The move would expose Wolff to one of the hotbeds of eclecticism in Germany, where the imprint of the recently deceased professor of mathematics, Erhard Weigel, and his student Johann Christoph Sturm ran deep. The self-consciously developed methodology, articulated at length in Sturm's *Philosophia eclectica* (1686), aimed to overcome sectarianism in philosophy and religion by exhorting its practitioners to draw freely from

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[54] Neumann, a Lutheran professor of theology and a student of Erhard Weigel's, advocated reconciliation between religion and modern science. He also corresponded with Leibniz, to whom he expressed in 1689 his view that the theologians should apply in their own inquiries the methods of natural science and mathematics. Neumann, in fact, sent Leibniz some of the fruits of his own application of mathematics to understanding divine providence in nature, "*Reflectiones über Leben und Tod bey denen in Breslau Geborenen und Gestorbenen,"* an early work in population statistics; see Walther Arnsperger, *Wolffs Verhältnis zu Leibniz* (Weimar: Emil Felber, 1897), 9-10.

[55] WeLb 118-21. In fact, the municipal stipend arranged by Neumann carried the tacit agreement that Wolff would return to Breslau after his studies. But a correspondence between the two ensued following one of Wolff's early dissertations that effectively voided that understanding. On account of a corollary in Wolff *Dissertatio de algorithmo infinitesimali* (Leipzig 1704), in which he proclaimed the universal validity of the Copernican system, Neumann appears to have admonished his former pupil that "man müsse mehr Veneration gegen die Schrift haben, als dergleichen zu behaupten." Wolff insisted on the independence of science from revelation, stating that Scripture "nur in phaenomenorum recensione acquiescierte, nicht aber dieselbe erklärte", leading Neumann to retort that, "solche principia, dass nemlich in der Schrift blos phaenomena angeführet, nicht aber rationes phaenomenorum gegeben würden, hegten die Spinosisten." Thus, Wolff received from Neumann the first of many accusations of "Spinozism" he would face in his life. See Arnsperger, *Wolffs Verhältnis zu Leibniz*, 12.

all sources, ancient and modern, in the search for truth.[56] The result was a fertile, if unstable, mix of ideas and directions.

3.1. Erhard Weigel's mathematical philosophy

Having arrived in Jena in 1699, Wolff remained there for three years and completed a dissertation, which he defended at Leipzig, titled *Philosophia practica universalis mathematica methodo conscripta*. This youthful endeavor applied the mathematical method, superficially in the Euclidean style of definitions, axioms, propositions, and corollaries, to ethics. While his teachers in those years were Hebenstreit, Treuner, and Müller in philosophy, and Hamberger in mathematics and physics, a more significant impact on his intellectual development came from the enduring influence at Jena of Erhard Weigel, the eclecticist methodology of Weigel's student Johann Christoph Sturm, and the enigmatic Cartesian Walther von Tschirnhaus.[57]

The truculent Weigel—who, in addition to Neumann, Sturm, and Hebenstreit, also counted Samuel Pufendorf and Leibniz among his students—was a leading figure in the program of reforming Aristotelian philosophy by means of the mathematical method. His early work, *Analysis Aristotelica ex Euclide restituta* (1658), credits Aristotle with

[56] See Mercer, *Leibniz*, 47-9, for an overview of Sturm's eclecticist approach.
[57] See Max Wundt, *Die deutsche Schulphilosophie im Zeitalter der Aufklärung* (Tübingen: J.C.B. Mohr (Siebeck), 1945), 127; and Bissinger, *Struktur*, 9-10, for brief accounts of Hebenstreit, Treuner, and Müller. Wolff recounts his assessment of these figures in his autobiography (WeLb 129-32). Their significance seems largely to have consisted in fueling further Wolff's anti-scholastic direction and introducing him to such authors as Weigel, Sturm, and Pufendorf, from whose textbooks they taught.

having prepared the mathematical steps to human knowledge that moderns such as Descartes have merely extended. Underpinning the proposed restitution of Aristotelian philosophy is Weigel's bold claim that the theory of demonstration contained in the *Posterior Analytics* is nothing other than Euclid's geometrical method. The grand failure of classical scholasticism, Weigel contends, rests wholly in its failure to recognize the fundamentally geometrical character of syllogistic logic.[58]

While posterity has remembered him as a mathematician and logician first and foremost, Weigel's quest for certainty extended to all branches of learning, including natural philosophy, ethics, metaphysics, and theology. His systematic project culminates in *Philosophia mathematica, Theologia naturalis solida* (1693).[59] A central feature of Weigel's thought here is his denial of any sharp distinction between metaphysics, theology, and mathematics, either with respect to their methods or their objects. Thus, he proclaims that all propositions of Euclid carry a metaphysical character, and that the method of proof is applicable for knowledge of all objects, including moral precepts.[60] In

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58 Ar. ex Eucl., 4.
59 An edition of the *Analysis Aristotelica* of 1671, accordingly, bore the ambitious title *Idea totius encyclopaediae mathematico-philosophicae*. Weigel also organized the "*Collegium pansophicum*", a reading group on various matters of "*Lebensweisheit,*" taking up a universalist project in philosophy directed beyond the academe, what Wolff would later call *Weltweisheit*, in a series of popular German volumes, the *Himmels-Spiegel* (1661), *Zeit-Spiegel* (1664), and *Erd-Spiegel* (1665), as well as in a number of other writings. Weigel participated in the incipient movement to develop philosophical terminology in the vernacular, providing German glosses on key Latin terms in his *Philosophia mathematica*. See Max Wundt, *Die Philosophie an der Universität Jena in ihrem geschichtlichen Verlaufe dargestellt* (Jena: Fischer, 1932), 45.
60 Phil. math. *Preface*: "Mathesis in suo ambitu spectata, non est disciplina distincta a Philosophia; sed apicem summum omnium eius partium constituit." Sascha Salatowsky, "Eine neue Methodendiskussion? - Der Zusammenhang von Mathematik, Logik und Theologie bei Erhard Weigel und Johann Paul Hebenstreit," in *Erhard Weigel (1625-*

Weigel's Pythagoreanizing vision, "quantity is the determinate reason of finite things," and the object of philosophical cognition is the quantitative extents and limits of things.[61] Since philosophy resolves ultimately into theology, mathematical cognition amounts to nothing less than an imitation of divine thoughts.[62] In Weigel's system, accordingly, arithmetic and geometry occupy the role of foundational sciences for metaphysics and natural philosophy respectively.[63] Arithmetic, as the "science of being insofar as it is number," forms one half of *prima philosophia* alongside metaphysics or ontology, the "science of being as such." Determinate things are strictly speaking finite quantities, and cognition of their properties is due to the operation of the mind Weigel calls estimation or computation (*aestimare, computare*).[64] The condition for such knowledge, meanwhile, consists in the possibility of geometrical cognition, or of knowing spatial facts of position, congruence, and similarity, which grounds the sciences of physics, phoronomy, statics, mechanics, optics, acoustics, as well as the technical arts. In a creative attempt at reconciliation, Weigel interprets Aristotelian prime matter as a principle of created beings in Cartesian fashion as geometrical extension. At the same time, however, he rejects Descartes' substantivized conception of space as an extended material plenum. Instead,

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1699) und seine Schüler, eds. Katharina Habermann and Klaus-Dieter Herbst (Göttingen: Universitätsverlag Göttingen, 2016), 126, writes: "Er [Weigel] war der Überzeugung, dass der Habitus des Beweisens auf *alle* Gegenstände anwendbar ist, also auch auf die kontingenten Handlungen, ja sogar auf bloß erdachte Dinge (*entia rationis*)."

[61] Phil. math. I 1-2.

[62] Ibid. I 26: "Mathemata sunt Geometrica Divinarum cognitationum imitamina"; "Scopus igitur Matheseos praecipuus est DEUS" (31).

[63] In *Philosophia mathematica,* Weigel calls arithmetic and geometry *Pantometria* and *Archimetria* (130). Arithmetic is also the subject of a treatise, *Compendium logisticae* (1691), in which Weigel and two of his students at Jena situate arithmetic in a theory of cognition such that it is applicable to real life activities, can lead to perfect cognition, is scientific, and can be used for acquiring new knowledge.

[64] Phil. math. I 4.

for Weigel, space is materially or substantially nothing (*nihil*), but formally it is an aptitude of the mind to receive finite things.[65]

With his doctrine that the essence of finite being consists in numerical quantity and its ratios and proportions alone, Weigel replaces the qualitative substantial forms of the Aristotelian tradition with measurable properties of size and figure as the sole principles conferring primary determinations to things. The traditional notion of form, on Weigel's view, cannot be anything other than a mode of prime matter, or extension, cognizable under the conditions of ideal space. Change in the primary determinations, consequently, is simply the result of modifications in its geometrical properties as conceived in the receptive capacity of the mind. The external ground or source of the change, or moving force, however, is neither to be found in external finite things, nor in a power of the mind, but in God alone.[66] Thus, on the one hand, metaphysics leads to God as a divine geometer with the power to actualize the objects of his cognition.[67] On the other, it grounds natural philosophy in the science of phoronomy, or the study of spatial motion. In Weigel's meticulous organization of the special disciplines, phoronomy emerges as the principal part of physics from which all other corporeal change, including change in sensible qualities, is explained.[68] Thus, under Weigel's influence at Jena, where he taught until his death in 1699, an idealistic, mathematized Aristotelianism aspiring to

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[65] Ibid. I 11: "Patet itaque, quod Spatium utrumque veluti materialiter (substantialiter) sit nihil; sed formaliter sit aptitudo conceptibilis."
[66] Ibid. I 52.
[67] For a reading of Weigel's application of mathematics to theology, see Salatowsky, "Methodendiskussion," 127-133.
[68] Weigel lays out his conception of the parts of philosophy at Phil. math. II 131-4.

bring all the sciences on secure footing was being professed, quite independently of the philosophy being forged in Hanover.[69]

The influence of Weigel's conception of the unity of mathematical and philosophical method as rooted in the cognitive demand for certitude would be echoed thirty years later in Wolff's *Preliminary Discourse on Philosophy in General*.[70] Wolff's idea of an architectonic of knowledge constructed with the mathematical method, in which each special discipline finds its proper place, likewise finds a striking precursor in Weigel's *Philosophia mathematica*. Nevertheless, Wolff's appropriation of Weigel's mathematical approach to metaphysics and natural philosophy within a broadly Aristotelian framework is strictly methodological. Wolff rejects Weigel's claim that mathematical propositions pick out metaphysically real objects. In the opening pages of *Vernünfftige Gedancken von den Würckungen der Natur* (or the *German Physics*), Wolff argues against the geometrical demonstrations of the infinite divisibility of matter given by Rohault, du Hamel, and Grandi. Wolff's goal there is to establish that mathematical proofs cannot fully account for material events as they are perceived, and separate dynamical principles are required.[71] Nevertheless, like Weigel, Wolff consistently aims for a reconciliation of the ancient and modern ways, rather than treating them as competing alternatives. Wolff, like Weigel, departs from Descartes' self-understanding of

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[69] See Wundt, *Philosophie an der Universität Jena*, 45-52, for an overview of Weigel's life and works.

[70] Disc. prae. §139. Wolff appears to have read Weigel's *Philosophia mathematica* himself (WeLb 136). École documents traces of Weigel in Wolff's mature works in his preface to the edition of Weigel's *Philosophia mathematica* in Abt. III, Bd. 95 of the Georg Olms series.

[71] DPhys. §4.

the goals of the new philosophy. Whereas Descartes often cast his project in revolutionary language of "overturning" and "replacing" Aristotelianism, and warned readers of the perils of traveling down the wrong path,[72] Wolff instead regards Descartes' achievement as one of providing refinements and elaborations of Aristotle.[73]

3.2. Johann Christoph Sturm's hypothetical method

Wolff did not have the opportunity to learn from the renowned Weigel himself. He did, however, learn mathematics from his successor, Georg Albrecht Hamberger, a student of Johann Christoph Sturm (professor at Altdorf and student of Weigel's), whose textbooks *Mathesis enucleata* (1689) and *Physicae conciliatricis* (1687) Hamberger used in his lectures.[74] In all likelihood, Wolff studied from the 1695 edition of Sturm's mathematical text, appended to which was an introduction to algebra "according to the method of Descartes."[75] The prominent Cartesian mathematician and natural philosopher clearly made a lasting impression on Wolff. As a student, Wolff recounts siding with Sturm

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[72] Discourse on Method, AT VI.13; CSM I.117; Principles, AT VIIIA.8-9; PP. Pref.

[73] Descartes' own assessment of his relation to the history of philosophy is ambiguous. In concluding his account of material nature in the *Principles of Philosophy*, for example, Descartes declares that he has not used any principle "which was not accepted by Aristotle and by all other Philosophers of all periods: so that this Philosophy is not new, but the oldest and most commonplace of all," a claim he repeats to the Jesuit Charlet; AT VIIIA:323, CSM I:286; AT IV:141, CSMK III:238. Depending on what part of Descartes' works—which, as noted, were not published in their entirety in Germany until 1692—one emphasizesd, one could come away with an impression of an intended continuity with Aristotle.

[74] WeLb 120.

[75] Math. enuc. 329: "In analysin speciosam sive geometriam novam introductio. Ad Cartesii praecipue methodum".

against Leibniz on the occasion of the latter's criticisms of Sturm in "On Nature Itself" (1698).[76] And in 1722, a year before the publication his *German Physics*, Wolff would write a laudatory preface for a new edition of Sturm's four-volume *Physica electiva sive hypothetica*.[77]

While Sturm's *Mathesis enucleata* emphasizes the achievements of the moderns over the superstitious "veneration of antiquity and especially of Aristotle,"[78] his physics texts present an elaborate attempt to show the basic agreement of Descartes and Aristotle on the principles governing the material world. For Sturm, the basic concepts of Descartes' physics—matter and local motion—correspond in the main to those of Aristotle's. Preferring to follow Aristotle's ancient Greek commentators such as Philoponus, Simplicius, and Ammonius rather than the Latin Aristotelian tradition, Sturm interprets Aristotelian prime matter not as merely potential, but as actual being, which he identifies with body. Corporeal substance and extension, for Sturm, are identical notions, with figure, size, and place being their common determinations. Sturm construes the actuality-conferring substantial forms and real qualities of the Latin Aristotelian tradition as heuristics, subjective means for conceiving changes in bodies but not as constituting

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[76] WeLb 116.

[77] The preface is printed in Abt. III, Bd. 97.2.1 of the Georg Olms edition of Wolff's works.

[78] Math. enuc. *Preface* 1: "Quemadmodum enim immane quantum olim obstitit Philosophiae Naturalis incrementis & progressibus superstitiosa illa antiquitatis, & speciatim Aristotelis veneratio, quos ex adverso felicissimos ac uberrimos ubique nunc videt, ac laeta quidem, praesens ateas, posteaquam ausa est suis quoque viribus aliquid tribuere, inventis addere, intentata periclitari, dubiis certiora, bonis meliora, rem nominibus, credulitati experientiam, substituere".

the essences of material substances.[79] Whether or not the Aristotelian corpus could truly withstand Sturm's heterodox readings, his efforts to harmonize it with the Cartesian are valiant. As in Weigel, we find in Sturm an often-strained interpretation of the categories of Aristotelian metaphysics under the pressures of the new metaphysics of nature emerging in the seventeenth century.

Unsurprisingly, in certain matters the desired reconciliation between Aristotle and Descartes proves harder to establish. Despite the Aristotelian window dressing, Sturm's system turns to a familiar, occasionalist model of causation in which change in the material world is governed by mathematical laws instituted by God, who is the sole cause of motion and preserves the quantity of motion.[80] Similarly, the category of final cause retains a merely nominal sense in Sturm's physics. While the ultimate end of all things is indeed the glory of God as testified by reason and revelation alike, the wish to trace out the countless particular ends in nature reflects mere temerity and arrogance, as Descartes had warned in the *Principles*.[81] Final causes play little role in Sturm's explanation of phenomena. But, departing from Clauberg in this regard, Sturm regards the unity of mind and body in the case of the human substance a case of final causality.[82] Like the Cartesians, Sturm maintains a steadfast distinction between material and mental domains, the former being the proper subject matter of physics in which all explanation is limited

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[79] See Josef Bohatec, *Die cartesianische Scholastik in der Philosophie und reformierten Dogmatik des 17. Jahrhunderts* (Leipzig: A. Deichert'sche Verlagsbuchhandlung, 1912), 130-34.
[80] Phys. conc. 91, citing PP II.36.
[81] Ibid. 11-2.
[82] Ibid. 13: "Solus homo ex ordine naturalium agentium suarum actionum finem proprie loquendo cognoscit, propter mentem corpori unitam: In caeteris mere-corporeis & materialibus cognitio proprie dicta, consilium, deliberatio, &c. locum non inveniunt".

to geometrical properties of size, figure, and motion. In this regard, Sturm's approach to natural philosophy comes apart from Weigel's. While agreeing with his teacher on the basic identity of the mathematical and metaphysical method, Sturm does not regard mathematical cognition as yielding insight into God's mind. Following the Cartesians, he instead finds in the occasionalist doctrine of continual creation a sufficient proof of God's existence and an adequate transition to theology from a correct understanding of physical phenomena.[83]

The methodological implications of Sturm's conception of natural pilosophy are evident in the organization of *Physica electiva sive hypothetica.* Each chapter begins with descriptions of numbered "phenomena," followed by a series of hypotheses to explain the data. For Sturm, the physicist should begin with careful observation of the composition and modifications of material substances, and consider in its light all legitimate speculations that purport to account for the evidence.[84] The principal object of physics here is neither mathematical extension as such, nor the active causal powers underlying events, but rather observable effects in material things. Hypotheses, in turn, are causal speculations forwarded to unify the observations. Sturm provides several conditions for the legitimate use of hypotheses in the service of greater certainty in physical knowledge. First among these is that the phenomenon must be established through observation and experiment—hypotheses to explain the activity of sympathies and antipathies, in Sturm's opinion, are illegitimate, for their targets are not among the data of sense and imagination. In addition, hypotheses must only be employed in cases where the

[83] Phys. elec. 844-46.
[84] Ibid. *Praeliminarium* i.5.

phenomena cannot be explained otherwise. Thus, astronomical hypotheses are admissible since the well-confirmed regularities of celestial motions demand an explanation, which cannot be extracted from the data alone. The method of hypotheses dovetails with Sturm's eclecticist method in philosophy in general. The proper application of metaphysics in natural explanation requires systematically considering each of the legitimate hypotheses on offer and evaluating them with regard to their empirical adequacy, unifying power, and simplicity.[85]

In Sturm's conception of physical hypotheses one can discern the origins of Wolff's account of philosophical hypotheses as explanatory proposals to account for the facts of experience. Like Sturm, Wolff does not regard hypotheses as mere heuristics in the conduct of everyday and scientific life. Rather, hypotheses are necessary to reach greater certainty in knowledge by unifying inductively gathered conclusions. A philosophical hypothesis, according to Wolff, is "an assumption which cannot yet be demonstrated, but which provides a reason."[86] Unlike the Lockean or Boylean conception of hypothesis, under which whole theories may be regarded as hypotheses, Wolff's definition applies more restrictively to particular propositions advanced for the explanation of a limited set of phenomena. Natural philosophy employs such statements to deduce unobserved events on the basis of past observation, and thus directs inquiry toward new facts by suggesting further observations or experiments.[87] Predictions, or

[85] Ibid. *Praeliminarium* iii.1-4.
[86] Disc. prae. §126.
[87] Observation and experiment are distinct technical concepts, for Wolff. Roughly, observations do not, whereas experiments do, require human manipulation of nature (DMet. §325; Psy. emp. §456). Experimentation, for Wolff, lays the foundations of

deductions, which agree with experience increase the probability of a hypothesis, while contradictory evidence falsifies it. The path to greater certitude lies in the gradual refinement of hypotheses to increase their probability, and thus the degree of belief they command, as evidenced above all in the practice of the astronomers whose example Wolff thinks philosophers ought to follow. Like Sturm, Wolff also places constraints on the use of hypotheses. "Spurious" hypotheses, or those which posit entities that cannot be known to exist in nature, need not be included in the set of hypotheses to be considered in physics. Thus, both the hypothesis of Cartesian vortices and that of occult qualities can be safely excluded from the set of valid hypotheses to explain planetary motion. Evidence from experiments and observations should guide the formulation of hypotheses and the construction of philosophical explanations, rather than the other way around. In particular, Wolff's empiricist commitments here, whose roots we find in Sturm's conception of method in physics, temper a kind of rationalism he associates with Descartes:

> I take this to be the securest path, that one assumes nothing further as a ground, from which one explains other things, except what is attested through experience. And it seems to me still much too early that, as e.g. Descartes did, one should posit certain general grounds as elements of things, from which one draws everything that is possible in nature through the mere intellect.[88]

In his own physics, by contrast, Wolff emphasizes the extensive use of experimental data,

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physics, for we are not in a position to learn everything about nature from general principles of reason (AN §164).

[88] DPhys. *Pref.*

collected in his three volume *Allerhand nützliche Versuche, dadurch zu genauer Erkäntniss der Natur und Kunst der Weg gebähnet wird* (1721), as the foundation of his conclusions. In fact, Wolff aims to combine "experimental" and "dogmatic" procedures beyond physics: his new science of teleology serves also as experimental natural theology, and empirical psychology occupies an analogous role with respect to rational psychology.[89]

At the same time, hypotheses may never be allowed as premises in *proofs* of philosophical dogmas, for their certainty has not yet been demonstrated.[90] The usefulness of a philosophical hypothesis, for Wolff, depends on the possibility of deriving further empirical effects than ones previously observed. They merit retention when the new effects are not in contradiction with established truths, when they provide greater unification of previous data, or guide inquiry in a different domain. Thus, according to Wolff, Leibniz's hypothesis of the pre-established harmony of mental and physical events is admissible, for not only is it consistent with experience, but, more importantly, it allows researchers in either domain to use well-confirmed results in one to investigate the other. Similarly, the hypothesis of simple substances in ontology makes the notion of a composite more distinct by constraining the space of possible properties of bodies.[91] For example, a conceptual contrast between simple and composite beings precludes attributing to bodies indivisibility, immateriality, or immutability. Yet, since the existence of simples can never be adequately attested (except in the case of moral agents), they

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[89] Cosm. §53; Disc. prae. §111.
[90] Disc. prae. §127-8.
[91] Ibid. §129n.

remain at the level of hypotheses, and are admitted in explanation only under this qualification. This condition is crucial for a proper assessment of Wolff's metaphysics. In Wolff's system, metaphysical propositions such as mind-body parallelism, or the postulate of simple substances that are unextended and yet in space occupy the status of hypotheses rather than dogma. Such hypotheses earn their keep by providing greater unification of phenomena and, in the case of mind-body parallelism, supporting useful inferences from the mental to the physical and vice versa.[92]

3.3. Walther von Tschirnhaus and the status of the syllogism

Besides Weigel, whose influence at Jena likely fed Wolff's youthful enthusiasm to extend the mathematical method to theology and ethics, and Sturm, who served Wolff as a model for an empiricist approach in physics, a third key figure in Wolff's intellectual formation is Ehrenfried Walther von Tschirnhaus.[93] Tschirnhaus was known to Wolff in

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[92] For more detailed discussions of Wolff's conception of probabilistic reasoning and hypotheses, see Corr, "Certitude and Utility," and Alberto Vanzo, "Christian Wolff and Experimental Philosophy," in *Oxford Studies in Early Modern Philosophy,* Vol. 7, 2005. Wolff's thinking on hypotheses was well-advanced as early as 1713, when he discussed the topic in detail in chapter IX, "On the study of astronomy," in volume 5 of *Elementa matheseos universae*. While the above discussion relates to what Wolff may have learned from Sturm, I do not wish to deny the influence of other figures in the development of Wolff's thinking. From about 1704 onward, Wolff had gained familiarity with Locke, Boyle, Newton, and other proponents of experimental philosophy in England and France, whose works he regularly reviewed for the *Acta eruditorum*.

[93] The aristocratic Tschirnhaus was well-traveled, unlike Weigel and Sturm. Having studied mathematics and medicine in Leiden, Holland in the late 1660s and early 1670s, Tschirnhaus spent time in Italy, England, and France, and got to know the leading intellectuals of the day. A recommendation from Oldenburg, the secretary of the Royal Society in London, to Leibniz and Huygens allowed him to forge a close working

his gymnasium days as the author of *Medicina mentis* (1687), a treatise on logic which aimed to supplant the syllogistic method with an art of discovery (*ars inveniendi*). Wolff's encounter with Tschirnhaus reveals the seeds of a tension that runs throughout Wolff's philosophy. This tension arises between his self-conscious commitment to establish real or causal definitions, or those through which it is understood how a thing is produced, and the suspicion that his entire edifice might ultimately rest on merely nominal definitions and axioms. In other words, whereas Wolff aspires to an analysis of real being, his system, some commentators have suspected, is nothing but a construction based on arbitrarily defined terms and stipulated axioms. Wolff's early commitment to the mathematical method, inherited from Weigel and Sturm, appears ill-suited to his quest for complete certitude in domains such as natural philosophy and metaphysics, where he rejects the deductive certainty of mathematical propositions in favor of probabilistic reasoning and hypotheses. Thus, while Wolff regards philosophy or science as the search for complete rational certitude, achieved through demonstration of all propositions from apodictic grounds so that "all truths should hang together and the whole work could be compared to a chain (*einer Ketten gleich wäre*), because one part

relationship with Leibniz in Paris from 1675 onward on topics in algebra and the differential calculus, to which he made significant contributions. Tschirnhaus declined an offer to become rector of the newly founded University of Halle in 1693, and spent much of the last two decades of his life trying to set up a porcelain manufacture in Dresden. See Lewis White Beck, *Early German Philosophy: Kant and His Predecessors* (Cambridge, MA: Belknap, 1969), 189-94, for a biographical sketch of Tschirnhaus.

always hangs together with another, and each with the whole,"[94] the structure of knowledge that results from his efforts can only be deemed provisional.[95]

In 1718, a year before the publication of his influential *Vernünfftige Gedancken von Gott, der Welt, und der Seele des Menschen, auch allen Dingen überhaupt* (or the *German Metaphysics*), Wolff gave a detailed assessment of his relation to Tschirnhaus and Leibniz concerning the logic of demonstration and discovery.[96] In *Ratio praelectionum in Mathesin et Philosophiam*, Wolff recounts his initial attraction to the promise of Tschirnhaus' art of discovery. But this was soon tempered by his dissatisfaction with what he saw as Tschirnhaus' failure to supply an adequate criterion of truth (*criterium veritatis*). Tschirnhaus' proposal that "truth is what can be conceived, false however, what cannot be conceived" was, in Wolff's estimation, lacking an explication of conceivability (*concipere*).[97] In response, Wolff tentatively elaborates the

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[94] DMet. *Pref.*

[95] Thus, Kohlmeyer, *Kosmos*, 19, passes a negative verdict on the validity of Wolff's system: "Es entsteht das Trugbild einer Wissenschaft, die aus wenigen allgemeinsten Begriffen gleichsam ein mathematisches System konstruiert. Es ist darum kein Zufall, das WOLFFs Beispiele in der Metaphysik ständig von mathematischen 'Dingen' genommen sind."

[96] Rat. prae. II.2 §16-20. For background to debates and positions in seventeenth-century German logic texts between Aristotelian, Cartesians, Ramists, and Semi-ramists, see Hans Werner Arndt, "Introduction," in *Deutsche Logik, Wolffs gesammelte Schriften*. (Hildesheim: Georg Olms, 1965), 31-55, who summarizes: "Auf ganze gesehen, scheint Wolff in gleicher Weise von der aristotelischen und der kartesischen Richtung der Schullogik beeinflußt worden zu sein, während er zur ramistischen Tradition keine Bezüge aufweist, wenn man von deren weithin wirksamen Neugestaltung des Aufbaues der Logikdarstellung und Tendenz zu eklektischer Ausrichtung und Auflösung der Schultradition absieht."

[97] "*esse verum quod potest concipi; falsum vero, quod non potest concipi; dubium, cujus nullum habemus conceptum*. Quoniam itaque non explicat, quid sit concipere posse; sed exemplis tantum probat, nos quaedam concipere posse, quaedam non: ipsemet notionem conceptus distinctam quaerere conabar" (Rat. prae. II.2 §18). Also, WeLb 124: "Was

notion of *concipere* for himself in stronger terms than the mere absence of contradiction. Any logical possibility, for Wolff, counts as an object of cognition, insofar as it has determinate conceivability conditions. But in addition to this notion of conceivability as logical possibility, Wolff arrives at a definition of truth that would be central to the metaphysical system he would later construct. Wolff defines truth in terms of conceivability: a judgment is true just in case the subject and predicate must be mutually posited in thought (*per cogitationes se mutuo ponentes*, or *eine umb das andere willen*); or, that the truth of a judgment requires a necessary connection between its subject and predicate. Conversely, a judgment is false when the "notion of the predicate [is] repugnant to the notion of the subject."[98] In correspondence with his gymnasium teacher Neumann shortly after meeting Tschirnhaus at the Leipzig book fair on Easter 1705, Wolff expressed equal dissatisfaction with Tschirnhaus' notion of *concipere,* Descartes' method of clear and distinct perception, and the scholastics' essential predicates, but also reservations about his own stringently analytic definition of truth.[99] None of the available options seemed to him a satisfactory criterion for judging truth and falsehood, and thus for arriving at real definitions.

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insonderheit bey der Medicina Mentis des H. von Tschirnhausen mir dunckel vorkam, war, daß er keinen deutlichen Begriff von dem concipere gab und nicht ausführlich zeigete, wie die definitiones reales sollten erfunden werden."

[98] Rat. prae. II.2 §19. Also, WeLb 124: "Das concipere erklärete ich per cogitationes se mutuo ponentes, da ich mir von einer Sache zweyerley gedencke und zwar das eine umb das andere willen, dergestalt, daß wenn ich von ihr das eine annehme, ich ihr auch nothwendig das andere zugestehen muß und das non posse concipi, per cogitationes se mutuo tollentes, da, wenn ich mir das eine von einer Sache gedencke, ich mir unmöglich das andere von ihr gedencken kan."

[99] WeLb 125: "Meine Cogitationes se mutuo ponentes, Tschirnhausens concipere, Cartesii clara et distincta perceptio, und der scholasticorum praedicationes essentiales wären einerley."

Nevertheless, discernible in Wolff's direction at this stage is an essentialist conception of truth and of the task of philosophy as the search for real essences of things, two features that remain ostensible, if unattainable, goals of his later philosophy. Wolff's definition of philosophy as "the science of the possibles, insofar as they can be," in fact, dates to this period.[100] Most consequential, however, is his early conception of truth, which would exert wide-ranging influence over his thought. The formula of mutual positing as one term being for the sake of another, would underlie not just his logic of concepts and judgments, but also the cosmological relation between bodies and the structure of their composite essences, between minds and their series of modifications, and ultimately constitute the heart of his teleological conception of reality. For, in a locution that recurs throughout Wolff's writings, "when we consider things that are beside one another or follow one another, we learn that one always has its ground in another and one is for the sake of another [*eines um des andern willen ist*]."[101] Since the complete determination of objects existing in community, whether with respect to their essential attributes or to their modes, depends on their relation to one another, true judgments of any material being always entail mutually determinative grounds, and thus corollary truths, in other beings. Unlike for Leibniz, for whom external relations are mere appearances coordinated between perceptive substances, substances in Wolff's world are genuinely held together by real relations. At least some truths about any ontological subject are constituted by its relations to other subjects.

[100] Disc. prae. §29. Wolff claims to have learned the definition from Caspar Neumann. In his own texts, the definition first appears in the *Aerometriae elementa* of 1709.
[101] DMet. §543.

The encounter with Tschirnhaus' *Medicina mentis* would not only leave an indelible impression on Wolff for its rejection of the syllogism, it would also bring his philosophical reflections toward a topic central to Leibniz, namely an analytic containment theory of truth.[102] More generally, Wolff's education in Jena and Leipzig prepared him to engage with Leibniz as an able interlocutor. As we shall see, Wolff's familiarity with the leading philosophical topics and authors of his time meant that he would not uncritically accept Leibniz's views.

4. The Leibniz-Wolff correspondence: substance, force, causation

In late 1702 Wolff traveled to Leipzig, where he remained until the Swedish invasion of Saxony in 1705 during the Great Northern War compelled him to flee to Gießen for a brief position as professor of mathematics, secured with Leibniz's help. His four years at Leipzig would be of tremendous intellectual and professional consequence. After earning his Master's degree in January 1703, he submitted his dissertation on *Universal Practical Philosophy* for examination in order to earn his teaching license. A stridently anti-scholastic work bearing the influence of Tschirnhaus, it applied the Euclidean method to

[102] Wolff would meet Tschirnhaus in person in 1703 in Leipzig, and again in Leipzig in 1705, where he traveled with the explicit intention of inquiring after the method of discovering the elements of real definitions. Tschirnhaus answered evasively ("*dieses wäre eben die HauptSache*") and hinted at a solution in his forthcoming, second part of the *Medicina mentis*, in which the rules for discovering truths would not only be applied to mathematics, but also to physics. The sequel, however, never appeared. When, upon Tschirnhaus' death in 1708, Wolff inquired after any papers he may have left behind, he learned that Tschirnhaus had, like Spinoza, condemned them all to the flames (WeLb 125-7).

ethics. It was examined by Otto Mencke, professor of moral philosophy at Leipzig.[103] Mencke was, more significantly, the founding editor of Germany's most important learned journal, *Acta eruditorum*, for which he promptly hired Wolff as an assistant. Unbeknownst to the aspiring academic, moreover, Mencke sent a copy of Wolff's dissertation to Leibniz, who responded favorably. Under Mencke's advice, Wolff also learned English and French, thereby gaining access to the more established journals of London and Paris, and commenced upon a prolific series of reviews for the *Acta eruditorum* beginning with Newton's *Opticks*.[104] Also during this time, Wolff wrote several short works of his own and, with a note from Mencke, personally sent to Hanover a treatise on algebra, "De Algorithmo infinitesimali differentiali." Leibniz replied to Wolff in February 1705, initiating a correspondence that would continue until Leibniz's death in 1716.[105] Much of the conversation concerns mathematical questions on which Wolff readily defers to Leibniz's instruction. But ethical and metaphysical topics also emerge in the course of the exchange, and Leibniz presents to Wolff many of the central themes of his system. Wolff's reception of these is equivocal.

One immediate consequence of the early correspondence is Wolff's dramatic

[103] WeLb, 134. For an overview of the contents of the work, see Arndt, "Introduction," 12. Tschirnhaus, however, whom Wolff did not meet in person until Easter of 1703, and whose energies in this period were directed at developing his porcelain manufacture, definitely did not supervise the dissertation, contra the Stanford Encyclopedia of Philosophy article on Wolff.
[104] The biographical article in Zedler's *Universal-Lexikon* lists an astonishing 284 book reviews penned by Wolff for the *Acta eruditorum*. Arndt, "Introduction," 18n52, identifies many of these, among which works by Cartesians and mechanical philosophers predominate: e.g. Bernhard Lamy, John Locke, Jean-Baptiste du Hamel, Ruardi Andala, and Johannes de Raey.
[105] Arnsperger, *Wolffs Verhältnis zu Leibniz*, 66-72, gives a chronological list of the correspondence as collected by Gerhardt (LW).

reversal of his earlier opposition to the syllogistic method. In his first letter to Wolff, Leibniz responds both to the mathematical treatise and to Wolff's earlier dissertation on practical philosophy. Objecting to Wolff's rejection of the syllogistic method, Leibniz writes that he "would not say absolutely that the syllogism is not a means of discovering truths."[106] The remainder of the letter addresses Wolff's definitions of pleasure, blessedness, and the glory of God, but does not shed further light on Leibniz's reasons for rejecting Tschirnhaus' view. Nor does Wolff press the issue in subsequent correspondence. Yet, the letter appears to have led to a *volte face* concerning Wolff's earlier opinion. We may conjecture the mediation here of Otto Mencke, who, in his capacity as editor of *Acta eruditorum* and intimate of Leibniz would have been familiar with the latter's "Meditations on Knowledge, Truth, and Ideas," published in the journal in 1684. Indeed, in the *Ratio praelectionum* Wolff points to the essay as having "poured unexpected light on him" concerning the question of how syllogisms could lead to new truths.[107]

Leibniz's proposed *criterium veritatis* in the 1684 essay is similar to the one Wolff landed upon in his struggle with Tschirnhaus: "An idea is true when the concept is possible; it is false when it implies a contradiction."[108] We know possibilities, further, either through a finite analysis of a concept, that is, by reducing it to an identical proposition, as in causal definitions in mathematics, or through experience. Given the finitude of human symbolic cognition, however, Leibniz is pessimistic that we could ever

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[106] LW 18.
[107] Rat. prae. II.2 §27; DLog. *Pref.*
[108] GP IV 425; L 293.

have *a priori* knowledge of primitive concepts, so that, "[f]or the most part we are content to learn the reality of certain concepts by experience and then to compose other concepts from them after the pattern of nature."[109] Thus, Leibniz criticizes the Cartesian criterion of clear and distinct perception on the grounds that criteria of possibility for clear and distinct perception must first be established through either of two sources, *a priori* reason or *a posteriori* experience. Leibniz, in effect, shifts the debate on the question of the discovery of new truths from one about methods, such as the adequacy of syllogistic or of mathematics, to one about criteria for judging possibilities. A harmony obtains between the two methods, for the "*common rules of logic*, of which also the geometricians make use," are universal in their scope.[110] The same operations of the mind, in other words, underlie both ordinary reasoning about perceptions as well as mathematical demonstrations. Mathematics has the virtue, however, of better training the intellect in the correct use of these operations, what Wolff would call the "cultivation of the intellect" (*cultura intellectus*), thereby preparing the mind for philosophy.[111] Further, by admitting the experience of stable and regular phenomena as a source of knowledge of possibilities, and thus as a guide to identifying elements of real definitions, Leibniz prepares the way for a signature thesis of Wolff's mature thought: that philosophical

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[109] GP IV 425; L 293. The experience, of course, is that of "well-founded phenomena", or those that exhibit stability, regularity, and above all, predictability. Leibniz's clearest explication of this notion is in his "On the Method of Distinguishing Real from Imaginary Phenomena" (GP VII 319-22; L 363-66). See previous chapter.

[110] GP IV 425; L 294.

[111] Rat. prae. I.1 §1; WeLb 138-40. Leibniz also urges upon Wolff the propaedeutic role of mathematics for philosophy in a letter of 8 December, 1705 (LW 51). For the teaching of Leibniz's differential calculus in German academies, both Leibniz and Mencke sought to recruit promising young scholars, such as Johann Bernoulli, whose example Leibniz advised Wolff to follow; WeLb 142; Arnsperger, *Wolffs Verhältnis zu Leibniz*, 26-7.

cognition—the cognition of possibles, insofar as they can be—requires "a marriage of reason and experience."[112] Indeed, "Meditations on Knowledge, Truth, and Ideas" appears in Wolff's later writings as one of the most cited of all of Leibniz's essays.

A second topic of the early correspondence, one which arises in the context of Wolff's ethical theory but has implications for metaphysics and natural philosophy, concerns the origin of God's goodness in the world. Leibniz is broadly in agreement with Wolff's perfectionist ethics, and makes clear that his remarks are intended to promote rather than to emend Wolff's views on the matter.[113] According to Wolff, God intends to demonstrate his wisdom in the world by producing and conserving his perfections in creatures. Insofar as they are constituted by divine wisdom, therefore, creatures may be regarded as ends ordered among themselves, each directed by intelligence and will toward its own proper measure of perfection, as parts conspiring for the conservation of the whole. While such a position has consequences for moral philosophy and politics, Wolff emphasizes as well its utility for physics, "for hence proceeds the method of

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[112] Log. §1232; Psy. emp. §497 Disc. prae. §12. See École, "En quels sens," 48-52, and Dyck, *Kant and Rational Psychology*, Ch. 1 for a discussion of this thesis. See Arndt, "Introduction," 19-21, for Wolff's change of heart concerning the syllogism. Wolff recollects his reversal regarding the syllogism at WeLb 136-7. In his recounting of his study of Tschirnhaus, as well, Wolff writes that he came then through his own contemplations to the conclusion that real definitions are to be found partly *a priori* and partly *a posteriori*, a thought he would later develop in the *German Logic* (WeLb 125). I withhold judgment regarding the veracity of Wolff's memory.

[113] LW 20: "Has notationes meas spero Tibi non ingrata fore, quod magis ad promovenda quam emendanda cogitata Tua pertineant." See Donald Rutherford, "Idealism Declined: Leibniz and Christian Wolff," in *Leibniz and His Correspondents*, ed. Paul Lodge (Cambridge: Cambridge University Press, 2004), 218-9, for a brief summary of the correspondence concerning ethics.

estimating the perfections of natural things, just in the manner of divine wisdom."[114] By experiment and observation, Wolff contends, divinely instituted uses of natural things can be discovered. Recognition of the end of any whole allows the subordinate parts from which it is composed to be judged with respect to their contribution to its satisfaction, as is the case in the investigation of the structures of organic bodies in anatomy.[115] Likely unbeknownst to him, Wolff advocates a position close to that held by Leibniz on which the discovery of causes from a functional analysis of observed effects should be combined with the synthetic method of reconstructing phenomena from discovered, mechanical laws of statics and mechanics. Leibniz responds only briefly to Wolff's reflections on method in natural philosophy, merely indicating his agreement that the "contemplation of ends leads to discovery" and noting his deduction of the laws of optics by this method.[116]

At this early stage, Wolff and Leibniz stand opposed, however, on the institution of God's perfections in creatures, a topic that leads to the problem of the union of mind and body. The disagreement emerges from Leibniz's reaction to Wolff's short treatise, "Disquisitio philosophica de loquela," a work espousing a theory of language as a system of mental signs for the transmission of immaterial ideas. In occasionalist manner, Wolff appeals to God's arbitrary will to explain the connection between thought and speech, or the correspondence of mental events with linguistic behavior, and thus the manner by

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[114] LW 36-37 (Letter of 15 October, 1705): "Fluit enim hinc methodus aestimandi perfectionem rerum naturalium, itemque Sapientiam Numinis."
[115] Ibid. 37-8.
[116] Ibid. 43.

which mental signs acquire corporeal signification.[117] Recognizing the occasionalist assumptions informing the work, Leibniz directs Wolff to his articles in the *Journal des savants,* the *Histoires des ouvrages des savants* and the article "Rorarius" in Bayle's dictionary on the theory of preestablished harmony, presumably in order to impress upon Wolff that the commerce between souls and bodies requires divine will just as little as the mechanical interaction among bodies.[118] Wolff was unable to find the articles and requested clarification, which Leibniz provided in his next letter. The tangle of metaphysical questions arising from this thread of the correspondence reach the heart of the divergence between the two.

Leibniz introduces his theory of pre-established harmony as an alternative to the occasionalist thesis of God as the interpreter for interaction between soul and body. The soul and body, Leibniz tells Wolff, are like two clocks constructed entirely differently, which, even while following their own laws conspire perfectly with one another.[119] Both in the structure of matter and in the nature of the soul, God creates an initial harmony, which mitigates the further need for God's intervention in the ordinary course of nature. As elsewhere, Leibniz highlights for Wolff the twin strengths of his view over occasionalism: first, that the parallelist thesis avoids the implication of perpetual miracles in nature; and second, that it leads to a new demonstration of the existence of God, for

[117] The treatise, written in December 1703 and strongly influenced by Bernhard Lamy's *La Rhétorique ou l'art de parler* (1675), was later printed in *Meletemata mathematico-philosophica* II.3, 244-67.
[118] LW 32 (Letter of 20 August, 1705).
[119] Ibid. 43-4 (Letter of 9 November, 1705): "dicemus animam et corpus esse instar duorum Horologiorum diversissimae quidem constructionis, sed a summo tamen artifice ita temperatorum, ut dum unumquodque suas leges sequitur, perfecte inter se conspirent."

such a harmony of substances is not possible except through a common cause, which, because of the infinity of effects, must itself be infinite.[120] A common source for the harmonized laws of mind and body also opens the space for a unified principle of the conservation of force—not of motion, as Descartes had mistakenly believed, Leibniz reminds Wolff—underlying the laws of generation and transformation of organic bodies on the one hand, and the moral laws for rational subjects on the other. Thus, Leibniz concludes by offering Wolff a version of his principle of uniformity, that all occurrences in the ordinary course of nature, no matter how large or small, visible or invisible, take place in the same manner and vary only in degree.[121]

Both the doctrine of pre-established harmony and the principle of uniformity appear immediately thereafter in a short dissertation of Wolff's on rules for summation in infinite series, "Methodus serierum infinitarum" (December 1705), which he sent to Leibniz on 5 May, 1706. The mathematical content of the work does not contain anything with which Leibniz was not already familiar, and it receives only a brief response. In the Corollaries, however, Wolff advances metaphysical interpretations of the computability of infinite series, which Leibniz takes as an occasion to initiate his young compatriot further into his theory of substance. Wolff's Corollary VI affirms a version of Leibniz's principle of uniformity, that "in the least machines of nature the same mechanisms are to be discovered, which are known in the greater machines, and in both cases… the same

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[120] Ibid. 44.
[121] Ibid. 44 (9 November 1705): "Itaque apud me magna uniformitate naturae omnia ubique in magnis et parvis, visibilibus et invisibilibus, eodem modo fiunt, soloque gradu magnitudinis et perfectionis variant." Recall that, in the previous year, 1704, Leibniz had conveyed his most explicit thinking on the principle of uniformity to Damaris Masham (previous chapter).

laws of motion operate," which are "not only most agreeably confirmed by microscopic operation, but also by laws of divine wisdom through metaphysical demonstrations."[122] But Wolff draws a further consequence, in Corollary VII, from the principle of uniformity together with the doctrine of preestablished harmony. For Wolff, the operations of our mind are also to be considered as being in accordance with the same mechanical principles without opposing freedom and immortality.[123] In the letter to Leibniz attached to the dissertation, Wolff further explains his interpretation of the principle of uniformity to the relation of mind and body. Just as the parts of a machine have a necessary influence on one another so that the motion of one determines the motion of the other parts, in the same way the many faculties of the mind have a necessary influence on each other's operations.[124] The analogical inference licensed by the principle of uniformity, for Wolff, moves from laws discovered in the external, physical world to laws of the mind. Just as the parts of artificial machines and organic bodies instantiate mechanical functions, so could the structures of the mind be analyzed as functionally connected parts of thinking substance. From Leibniz's point of view, the error in Wolff's interpretation of the principle of uniformity would not be one of scope, or of too wide an application. Leibniz, too, intends it to hold "everywhere and at all

[122] Melet. II.5 318.
[123] Ibid., 318-9. Wolff's invocation of Leibniz's pre-established harmony in Corollary VII of his dissertation betrays a confusion. That a common cause (God) has coordinated the natural operations of mind and body does not entail—certainly not for Leibniz—that the two domains share the same natural laws.
[124] LW 54: "Quemadmodum plures in machinis dantur partes, quarum una ad motum excitata seu determinata in motum partis alterius juxta certas motus leges necessario influit; ita similiter in mente plures dantur facultates seu Potentiae, quarum una ad cogitandum determinata juxta certas cogitandi leges in cogitationem alterius necessario influit."

times." Rather, whereas Wolff takes the uniformity of nature to privilege mechanical laws, Leibniz intends exactly the opposite, namely, that the fundamental principle of order in nature is psychological—perceptual and appetitive—in character.

Accordingly, Leibniz immediately explains his own conception of the principle of uniformity. As an illustration of the doctrine of pre-established harmony, Leibniz applauds Wolff's analogy between the structure of a machine as a system of mutually determinative parts, and the organization of the cognitive faculties. But he also forwards a more basic agreement between internal and external things: that in souls as well as in bodies there are two things, a state and a tendency to another state. What the pre-established harmony grounds, for Leibniz, is a common expressive relation between the modifications of two fundamentally opposed kinds of thing: souls and bodies. In all substances, there is an immanent force or power, an appetite, by which their states change in such a way as to preserve the harmony between their representations. Leibniz here refers to appetite, the tendency of a monad to alter its state, strikingly as a *percepturitio*, or a "perception-to-be." In a very general sense, for Leibniz, the content of an appetite of a substance consists in nothing other than the disposition toward a future perceptual state.[125] In Leibniz's metaphysics of soul-like monads, or entelechies, the uniformity and harmony of inner and outer, of simple and composite, resolves into the coordination of

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[125] Ibid. 56 (undated, but between May and September 1706): "Anima universim concipere licet, ad duo possunt revocari: expressionem praesentis externorum status, Animae convenientem secundum corpus suum; et tenentiam ad novam expressionem, quae tendentiam corporum (seu rerum externarum) ad statum futurum repraesentat, verbo: perceptionem et percepturitionem. Nam ut in externis, ita et in anima duo sunt: status et tendentia ad alium statum." Wolff would subsequently adopt the term *percepturitio* for appetition, the striving of the soul to change its state (Psy. rat. §480).

representational states of substances.

At this point, the conversation lies idle for a few years, during which Wolff was appointed professor of mathematics in late-1706 at the University of Halle, once again with Leibniz's referral. Much of the correspondence in these years concerns topics in mathematics. In particular, a question arising from the foregoing discussion of the pre-established harmony, namely of whether the tendencies, or the forces responsible for change of representational state, have a common ground in internal and external things, is not raised. For Leibniz, a uniform kind of substance, the monad, is implicated in both corporeal change as well as in the modifications of rational minds. When Wolff resumes the discussion in November 1708 by inquiring into the foundations of Leibniz's dynamics, Leibniz explains his doctrine of primitive and derivative forces and the monadic grounding of dynamical change in bodies more fully. Wolff decisively rejects this central thesis of Leibniz's system, which would have far-reaching consequences not only for his metaphysics of body, but also for his conception of the relation between metaphysics and natural philosophy.[126]

As we have seen, Wolff quickly accepts versions of Leibniz's doctrine of the preestablished harmony and of his principle of uniformity. Wolff likewise accepts Leibniz's correction of Descartes' laws of motion with its consequence that force rather than extension is the essence to matter. In this light, Wolff appreciates the significance of

[126] This facet of the correspondence has previously received attention from École, "Cosmologie wolffienne," Rutherford, "Idealism Declined," and Anne-Lise Rey, "Diffusion et réception de la dynamique. La correspondance entre Leibniz et Wolff," *Revue de Synthèse* 128 (2007): 279–94. The following discussion owes much to these essays.

Leibniz's new science of dynamics, a term which Leibniz had already introduced in the conversation as a method for explicating the correct laws of motion, namely those which entail the principle of conservation of force, and which do not require positing God's continuous creation as the unique source of force and thus of motion in the world.[127] Yet, he is unable to follow Leibniz further along the path to positing simple soul-like beings as the metaphysical unities from which physical forces result. On 6 November 1708, in the context of the French mathematician Antoine Parent's criticisms of Leibniz's system of preestablished harmony, Wolff requests from Leibniz an account of how he conceives the force to be ascribed to matter from which its changes could follow, such as the increase in force that results from the acceleration of falling bodies, or from the mutual change resulting from collisions.[128] Wolff explicitly raises the contrast both with the scholastic theory of the migration of properties from one body to another, and with the occasionalist theory of God's continuous annihilation and creation of accidents in interacting bodies.[129]

Leibniz, unsurprisingly, rejects both the theory of physical influx of accidents between bodies, and the occasionalist thesis of divine intervention at the moment of interaction. In response to Wolff's questioning, he emphasizes the distinction between primitive and derivative force, where the latter is a modification of the former. Leibniz explains the distinction through an analogy between matter and shape: just as shape is a

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[127] LW 34: "Ex sola vulgari notione corporis, sive pro re extensa sive pro re impenetrabili habeas, n on potest reddi ratio legum naturae circa motum, ut adeo completa substantiae corporeae notio rem dynamicam involvere debeat." See Rey, "La correspondance," 287-8.
[128] In Parent's "Disquisitionum Mathematicarum", from which Wolff cites at length (LW 100-1)
[129] LW 102.

modification of matter, so is derivative force a limit or modification of primitive force or form.[130] While not making explicit to Wolff the deeper reasons stemming from his view of substances as causally isolated monads, Leibniz simply urges to Wolff the importance of not mistaking motion or *nisus* for something substantial.[131] Phenomenally expressed forces in collision events, on Leibniz's view, are grounded in intrinsic, expressive states of substantial unities, rather than in a real connection between substances, whether in the mind of God or in a relation of mutual physical dependence. Observable force is something changeable and therefore an accident. Consequently, it requires a perduring entity to which it could belong.

The explanation fails to satisfy Wolff, who raises the issue again two years later. This time he requests an intelligible account of the origin of force in bodies. Wolff frames his inquiry in the context of Leibniz's thesis, rehearsed in the *Specimen dynamicum* and "On Nature Itself," that the principles of mechanics have their origin in reasons of finality.[132] Specifically, Wolff admits being unable to understand how modifications in physical force brought about by interactions governed by the laws of motion have their intelligible ground in the "motion of the mind" (*motus secundum mentem*). As we saw in the previous chapter, Leibniz locates final causation in mental activity and its particular manner of motion in the inclination of the appetite toward a determinate representation of

[130] Ibid. 103 (Letter of 18 November 1708).
[131] That the entire metaphysical picture underlies Leibniz's response, however, is evident from his notes around Wolff's original letter quoting Parent's critique of Leibniz's dynamics (Ibid. 104, *Beilage*).
[132] Ibid. 128 (Letter of 8 November 1710): "omnia in natura Mechanice fieri, principia Mechanismi vero ab altiori principio per rationes finales oriri. Avebam igitur scire, num quodnam sit illud altius principium et quomodo ab eodem Mechanismi leges deriventur".

a future state of affairs as good. The role of final causes in physical explanation consists in their expression in general axioms presupposed by a system of empirical laws, such as the principle of equality of cause and effect underlying mechanics, which Leibniz offers to Wolff as a metaphysical principle founded in divine wisdom. The intelligible reason not only for the modification of primitive force but also for the mathematical laws of motion, Leibniz explains, lies in such metaphysical principles. These principles are teleological, moreover, in virtue of being contingent laws of the best possible world.[133] Leibniz's response to Wolff's request for an account of the moving force present in bodies—a key topic in the mathematical analysis of force animating the work of Newtonian physicists in the first decades of the eighteenth century—effectively takes the matter over to the psychology of representation and desire.

Wolff broaches the matter again a month later. He expresses difficulty in grasping the relevance of Leibniz's notion of an intelligible reason or a reason of finality, as opposed to a mathematical one, for the physical problem of force. He has trouble, in the first place, with Leibniz's claim that, in a collision event no force is transferred from one body to another but that the source of change in derivative force is wholly internal to a body.[134] In the second place, Wolff expresses skepticism about Leibniz's treatment of the principle of equality of cause and effect as a metaphysical, rather than a mathematical

[133] Ibid. 129: "Principia rei Mechanicae pendere ex altioribus, aliquoties admonui in Actis. Tale est Axioma effectum integrum causae plenae aequivalere, quod utique metaphysicum est, sed fundamentum ultimum habet in sapientia divina, convenientissimum eligente."

[134] Ibid. 129-30: "Scilicet cum vim primitivam ab essentia materiae non diversam concipiam, non capio, quomodo augeri possit, quantitate materiae immutata, et quomodo per leges conflictus fieri possit, ut quicquid virium ab uno corpore perditur, id alteri acquiratur".

principle deducible from Leibniz's own method for the estimation of *vis viva* outlined in the *Specimen dynamicum*.[135] For why could it not be regarded as akin to an axiom in a system of mathematical theorems, a status not typically characterized as having much to do with providence or choice? In other words, Wolff objects that the non-demonstrability of first principles, such as the equality principle or conservation laws, does not license the conclusion that such principles must depend on wisdom.

Leibniz's response takes two parts. In the first place, he clarifies the sense in which the principle of equality is an abstraction from inductively gathered laws of sensible phenomena—"abstracted from gravity, elasticity… the composition of physical things"—but not derivable from them.[136] Wolff's proposed demonstration of the principle, Leibniz objects, confuses the phenomenal action of interacting bodies conceived in terms of speed and distance traversed for the pure action of the cause which is to be included in the effect and vice versa. In other words, demonstrations from a consideration of changes in relative position and momentum of interacting bodies (as Leibniz himself had undertaken in the 1670s) only prove that the equality principle is not violated by empirical laws. The same is the case with principles of the conservation of force, which is upheld in all systems of impact and collision but is not demonstrable from any finite number of observations. What Leibniz has emphasized since the 1670s, as we have seen, is that nothing in the data of experience is sufficient to establish such

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[135] Ibid. 130: "Caeterum cum nuper considerarem axioma, effectum plenum causae plenae aequivalere, videor mihi inde deduxisse demonstrationem perfacilem theorematis E.V. [Excellentiae Vestrae] de aestimandis viribus vivis."
[136] Ibid. 132 (undated).

principles as necessary, where, recall, necessity is formally understood as reduction of a proposition to an identity in a finite number of steps.[137]

In the second place, Leibniz explains his position that derivative or mechanical forces themselves are internal modifications of a body's primitive force. Strictly speaking, the change in the force of a ball when struck is an internal change in its elastic force, rather than a transfer of force from another body. The primitive force itself is neither increased nor decreased, but only variably determined. Primitive force is, in other words, not itself an extensionally measurable quantity like derivative force but a continuously variable quality akin to the intensities of sensory qualities like color or sound. For a succession of such accidents to be determinations of stable empirical objects (well-founded phenomena), however, requires something permanent and enduring. This permanent and enduring subject of variable determinations is what Leibniz calls an entelechy, and also a primitive active substance. In other words, force is not something a body acquires, the way it might acquire other properties, such as velocity when thrown or a certain color when painted. Rather, force is always present in a body, and results from the activity of the simple substances constituting the body as aggregate. The external appearances of bodies are indeed expressed in mathematical laws governing change in quantities of accelerating mass, but these in turn are contingently grounded in the dynamical natures of simple substances.[138]

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[137] See also Rey, "La correspondance," 288-9.
[138] LW 130-1.

At this stage, Wolff's line of questioning pushes toward the radical core of Leibniz's idealism. Having provisionally accepted Leibniz's reduction of transfer of force to changes in the internal elastic forces of colliding bodies, Wolff now asks Leibniz for an explanation of the nature of the perduring primitive force which is the essence of a simple substance and which gets modified in collision events. While he can distinctly conceive change in the number of parts of bodies and their positions in physical events, he is unable to grasp an analogous change in primitive force.[139] Wolff's concern, in effect, is that Leibniz's primitive entelechy does not appear to do any explanatory work, insofar as it does not shed further light on the mechanisms governing derivative forces. Metaphysical reasons do not, for Wolff, add further intelligibility than what is attained through explanation in terms of the mechanical laws which express sensible and observable change.

Wolff's puzzlement prompts an extraordinary response from Leibniz on July 9, 1711. In answer to Wolff's query concerning the modification of primitive force, Leibniz declares that it cannot be better explained than by showing how derivative force changes in phenomena: "for what is exhibited extensively and mechanically in phenomena, is [exhibited] concentratedly and vitally in monads."[140] In colliding bodies, for example, the

[139] Ibid. 136: "id adhuc difficultatis mihi restat, quod non satis distincte concipere valeam, quomodo vis primitiva modificetur… Mutationes in extensione per imminutum partiuta (*sic?*) aut augmentatum numerum viriatumque ipsarum situm clare ac distincte concipiuntur: sed quid accidat vi primitivae… nondum capio."
[140] Ibid. 139: "respondeo, modificationem vis primitivae, quae in ipsa Monade, non posse melius explicari, quam exponendo quomodo mutetur vis derivativa in phaenominis. Nam quod in phaenomenis exhibetur extensive et mechanice, in Monadibus est concentrate seu vitaliter." See Rutherford, "Idealism Declined," 223-4, for an insightful discussion of this letter.

observed reactions of resisting bodies and the compression and restoration of their surfaces has its source, according to Leibniz, "in the entelechy itself." This entelechy, however, is not a physical force-point, but a psychological simple substance endowed with the power to represent the various changes in a unified perception. Changes in material states of bodies are appearances of underlying entelechies, "for phenomena result from monads, which alone are true substances." Leibniz's proposed solution to Wolff's question of how primitive force is modified, in effect, proceeds via the problem of conceiving the conditions under which a changing multitude could be brought to unity. Given the manifold changes bodies undergo as they interact, a substantial ground is required to unify those modifications, for which Leibniz advances his force-bearing entelechies. Indeed, in his own mature system, Wolff would face up to this problem and place simple, active substances under the composite bodies or phenomena. But Leibniz's identification of the simple substances grounding bodies as specifically mind-like is one that Wolff does not accept. The crux of the dispute between the two lies in the fact that Wolff continues to take the natural philosophical task to be that of giving an account of force in material substance, which he takes, in Cartesian fashion, to be a distinct domain equally as fundamental as mind. Consequently, an explanation of corporeal change resulting from physical forces must remain within the bounds of what can be conceived distinctly in matter as such, namely its mathematical properties of size, figure, position, and motion. Leibniz, by contrast, locates force in simple substances endowed with perception and appetite, whose representations ground composites, or bodies, as well-founded phenomena. For Leibniz, the intelligibility of primitive force consists ultimately in perceivers' ability to represent dynamically changing spatial relations that are "exhibited mechanically and extensively" in bodies. In order to understand the nature of force in bodies, in other words, the natural philosopher ought to proceed by reflecting on the psychological conditions in which material aggregates are able to be represented as unities undergoing change.

Recognizing an impasse, Wolff politely brings this topic of conversation to a close in a brief response to Leibniz's letter:

> because of the different requirements for philosophizing correctly contained in your most cherished letter, I had decided not to respond to it before defending these [requirements], especially since one or two points still remain doubtful to me, and in order to settle them it seems my entire method of philosophizing together with my hypotheses on this topic would have to be explained… I add nothing now except to thank you profusely for such a wealth of exceedingly rare and fertile truths, with which it is fitting to enrich my knowledge.[141]

Thus, already in 1711, eight years before the publication of his *German Metaphysics*, Wolff possesses enough conviction concerning the "requirements for philosophizing correctly" to part company with the celebrated Leibniz on the metaphysical foundations of physics. When confronted with Leibniz's idealist solution to the question of the origin of force in bodies, Wolff insists on a sharp separation of the mental and the physical as distinct ontological domains, conceived under distinct attributes, and thus requiring different interpretations of metaphysical notions such as substance and force. Wolff

[141] LW 142.

would qualify his own appeal to simple substances in Cosmology, or in the realm of created material being, as hypothetical. His “elements” or “atoms of nature” would later emerge as a postulated reductive base of physical rather than metaphysical unities.[142] Wolff’s simple physical substances, briefly, would constitute an infinitely dense field of force-points to provide the basis for a mathematical analysis of force, and to model dynamical interactions in a closed system of bodies. But the mysterious force of these simple substances from which bodies derive their inertial and moving force, for Wolff, cannot be presumed to be the same as the representational force of minds. Despite the great impression Leibniz makes upon the young Wolff, it is certainly not the case that Wolff simply adopts the Leibnizian picture of reality. Rather, Leibniz takes his place alongside Scheibler, Clauberg, Weigel, Sturm, Tschirnhaus, Newton and many other figures of the age in providing Wolff with a range of conceptual tools which he would use to construct a new system.

5. Wolff on force and substance

According to Donald Rutherford, Leibniz’s account of the grounding of appearances in perceptual states of monads should be understood in Kant’s terms as a “Platonic concept” of the world. That is, Leibniz recognizes a fundamental separation between the world understood as an object of sensibility, or phenomenon, from the world conceived as an object of understanding, or noumenon. The reality of phenomena, for Leibniz, is not

[142] See also École, “Cosmologie wolffienne,” 7-8.

absolute, but consists in the possibility of understanding them in terms of the reality of monads, which alone are true beings.[143] The monadological theory explains this possibility by reducing observed, dynamical changes in bodies to rule-governed transitions in ideal (perceptual) space. The primitive force in composite bodies responsible for dynamical change, correspondingly, reduces to the force of perception which is the essence of simple substances. The bearers of this perduring, primitive force, consequently, must be beings capable of perception (minds, or mind-like beings).

To be sure, Wolff continues to share with Leibniz a commitment to a reductive model of explanation. Wolff would endorse the Leibnizian and scholastic thesis of the convertibility of being and unity, that *"what is not truly* one *being is not truly one* being *either.*"[144] Consequently, where there are true composite beings—true as opposed to imaginary phenomena—there must be an intelligible source of their unity, for "where there are composite things, there must also be simple [things]."[145] The search for truth in the physical world must culminate, in other words, in simple unities as the real subjects in which apparent change inheres. On pain of restricting physics to merely useful descriptions of appearances but not a system of truths about nature, the continuously variable quantities of forces expressed in the motions and collisions of bodies, which account for their modifications of magnitude, figure, motion, and place, must be attributable to simple substances as the real basis for material phenomena. Physics, thus, should be anchored in metaphysics. In the decades after Leibniz's death, Wolff would

[143] Rutherford, "Idealism Declined," 225-6.
[144] GP II 304; GP II 97; AG 86.
[145] DMet. §76; Ont. §686.

champion a Leibnizian conception of natural philosophy against the "so-called Newtonian Philosophy." In a letter to his friend Count Manteuffel later in life, Wolff objects that Newtonianism does not deserve the title of philosophy for it does not culminate in metaphysical hypotheses.[146] Indeed, Wolff criticizes Newton for failing to recognize the hypothesis at the center of his natural philosophy, namely, that of universal gravitation.[147]

At the same time, Wolff diverges from Leibniz on the method by which metaphysical unity and certitude in natural philosophy should be pursued. In particular, Leibniz's proposal to ground dynamical change in bodies in the perceptual states of mind-like substances would fail to pass Wolff's test for legitimate hypotheses. For, while one might reasonably ascribe perceptual content and some analog of volitional force to animals in order to explain their observed behaviors, such a hypothesis would not be legitimate as an explanation for the motions of falling rocks or colliding billiard balls. Given his commitment to the adequacy of mechanical principles for explaining corporeal change, Wolff excludes from consideration hypotheses that reach beyond the physical domain to posit mental entities. Leibniz's spiritual monads, which are neither suggested in observations of falling bodies and planetary motions, nor add to their intelligibility, can be ruled out as the building blocks of the physical world. For Wolff, Leibniz's theory of monads offers only a confused conception of primitive force and, consequently, does not contribute further to the explanation of phenomena than what is understood in the

[146] Letter to Manteuffel, 6 January 1741; Heinrich Ostertag, *Der philosophische Gehalt des Wolff-Manteuffelschen Briefwechsels* (Leipzig, 1910), 62.
[147] Elem. Math. V.309.

empirical physics.[148]

Wolff divides his own, generic theory of substance—a partless, unextended, indivisible being lacking magnitude and figure—into two species: one physical and the other mental.[149] In general, Wolff defines substance as “a subject of constant and variable determinations,” which, he argues in typical fashion, is compatible with both the scholastic notion of “that which subsists by itself and sustains accidents,” as well as Descartes’ definition of substance as “a thing which exists in such a way as to depend on no other thing for its existence.”[150] Despite Wolff’s conciliatory intent, the influence of Descartes prevails. The traditional notion of substance as a self-subsisting thing, Wolff writes, is obscure, and presents especial difficulty for conceiving corporeal substance, since there are no recognizable marks by which we can establish the independent subsistence of any finite being. Under one interpretation of self-subsistence—namely, as absolutely independent existence—no finite being could be regarded a substance, since all creatures draw their existence from God. Creatures should then count as modes, and Wolff warns against falling into a form of idealism.[151]

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[148] Cosm. §359n.
[149] Ont. §§673-9. It is noteworthy that the univocal notion of simple substance is entirely composed of negative predicates.
[150] Ibid. §769; Ibid. §§771-2; AT VIIIA.24; PP I.51.
[151] “Idealism”, for Wolff, targets a Berkeleyan ontology of perceptions sustained in a single mind, rather than the Leibnizian monadological metaphysics, strictly speaking. Ont. §771: “Olim juvenis existimabam, per se subsistere idem esse ac independenter ab ente finito alio subsistere, quod accidentia subsistere animadverterem dependenter a substantiis, quibus insunt: enimvero postquam in Physicis perpenderem, nullum corpus independenter ab alio corpore subsistere posse, quae tamen non modo in substantiarum numerum a nobis referuntur, verum etiam ipso Idealistarum testimonio substantiae esse

Yet, the common or scholastic notion of substance can be saved, according to Wolff, once we understand that self-subsistence is not a mode of existence, but indicates the presence of an unchanging determination—or principal attribute, as Descartes terms it—by which a finite substance is recognized. That is, no clear knowledge of created substance is possible for us except as conceived through its attributes.[152] When we consider self-subsistence simply as a mode of existence, an incorrect position Wolff attributes to the scholastics, the category of substance fits only God, upon whose concourse all things depend. The correct meaning of self-subsistence, however, requires conceiving it as the internal ground of activity of a substance, characterized by its distinctive attribute by which it (at least partly) constitutes its modifications. A rational substance, in this way, produces its own effects by the internal activity of its force of representation and volition and, to that extent, is a self-subsisting being (*ein vor sich bestehendes Ding*). In effect, Wolff credits Descartes with having cleared the path for conceiving created substances through their intelligible properties and qualities as cognizable in experience rather than through the logical notion of an independently existing subject of predication. And he interprets Descartes' notion of principal attribute by treating it as an aspect under which a force-bearing substance produces its changes. With this move, Wolff departs from Descartes, for whom only thought but not extension could be a principal attribute of active or force-bearing substances; extended substance,

videntur, qui iisdem nonnisi apparentem existentiam, non vero realem tribuunt, illam explicationem statim missam feci."

[152] Wolff cites Descartes' *Principles* I.52, where he writes: "We can, however, easily come to know a substance by one of its attributes, in virtue of the common notion that nothingness possesses no attributes, that is to say, no properties or qualities. Thus, if we perceive the presence of some attribute, we can infer that there must also be present an existing thing or substance to which it may be attributed" (AT VIIIA; PP I.52).

for Descartes, is necessarily inert. For Wolff, however, substance in general is now conceived as that which contains the dynamical source of its modifications, thus as an active, self-subsisting being.[153]

At the same time, Wolff remains committed to the scholastic and Leibnizian position that substancehood in the proper sense entails simplicity. Simple substance and corporeal substance, for Wolff, "are not two species contained under the same genus." Only the former are substances in the true sense, while corporeal substances are aggregates of simple beings.[154] The possibility of conceiving bodies substantially requires identifying the principal attribute under which they appear as unified, perduring and modifiable beings. That is, when the category of substance is applied to a stable, persisting material object, it is conceived under that attribute (extension, thought) which appears to persist through the variable modes of the object. To capture this qualified meaning of substance, Wolff calls body "substantiated phenomenon" (*phenomenon substantiatum*), and also "that which appears in the image of substance."[155] Bodies are neither illusions nor mere *entia rationis*, but are distinguished from such fictions by having their stable ground in ultimately real beings, or substances. Wolff also accepts here a metaphysical consequence of Leibniz's correction of Descartes' physics, namely, that the essence of matter should consist in force rather than geometrical extension. As a result, the substantiality of bodies endowed with moving force, for Wolff as for Leibniz, consists in their dependence on simple substances conceived as bearers of force, just as

[153] Ont. §772. DMet. §114ff. See as well, Burns, *Dynamism*, 29-38, for a related discussion of these passages.
[154] Ont. §794n.
[155] Cosm. §299: "*Phaenomenon substantiatum* dicitur, quod substantiae instar apparet."

their knowability depends on the stability of their perceptible qualities from which we formulate rules for predicting their behavior. Thus, the substance of the world cannot be *res extensa*, nor, for that matter, Cartesian *res cogitans*, but must be understood more generally as a force-bearing thing.

A large gulf separates, however, our knowledge of physical and psychological simple substances. The kind of created, simple substance of which we can have certain knowledge through an incorrigible experience is only the human soul. Knowledge of the existence of the soul, that in us which is conscious of itself and other things, supplies the highest standard of philosophical certainty.[156] The essence of this simple substance is a representational power to perceive external objects, limited materially by the organic body with which it is presumed, through the hypothesis of the pre-established harmony, to be joined.[157] In psychology, thus, Wolff retains the notion of a simple substance as an intellective and volitional being, a category to which belong humans, angels, and God. However, Wolff is careful to identify this intellective and volitional substance as spirit (*Spiritus; Geist*),[158] and immediately distinguishes it from physical simple substances: "the elements of material things," he writes, "are not Spirits." For even if we cannot define exactly what kind of force these physical elements possess by which they organize as bodies and produce motion, we have no reason to conceive this force as that of

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[156] DMet §1; Ont. §1.
[157] Psy. rat. §66. The harmony of the soul and body, Wolff warns however, should not be confused with Leibniz's system of preestablished harmony, but is instead adopted as a heuristic psychological principle (Psy. rat. *Pref.*)
[158] Ibid. §643: "Per *Spiritum* intelligimus substantiam intellectu & voluntate libera praeditam." Cf. DMet. §896.

intellection and volition.[159]

The distinction between simple substances which are spirits and those which are elements aggregated into material things directly targets Leibniz's theory of monads. While Wolff recognizes physical simples, the crucial difference in their intelligibility compared to human, rational simple substances, consists in the distinctness of their essences. Whereas we know from reflection on experience that the essence of the mind consists in the force of representing a changing world guided by desire and will, we do not have first-personal access to the nature of physical forces. But where Leibniz is willing to conceive the force inhering in bodies on the model of perception and appetite, Wolff declares that we must, contra Leibniz, "remain in doubt" (*in dubio relinquamus*) about the innate force in the physical elements of things, even though we must admit for purely conceptual reasons that, if composites exist, so must simples.[160] Wolff is deeply concerned to avoid a vitalistic or panpsychist conception of matter, a consequence he takes to follow from Leibniz's doctrine of monads. If perception and appetite should be the attributes of simple substances in general, then not just minds, but all beings must be understood as psychical entities, a conclusion Wolff finds repugnant. The criticism of Leibniz is only thinly veiled in the *German Metaphysics*:

> I know well, that some are accustomed to calling "Spirit" everything that is not constituted from matter. And consequently they would also call the souls of

[159] Psy. rat. §644: "Elementa rerum materialium Spiritus non sunt". Wolff continues: "Etsi autem non definiverimus, qualis sit vis ista; facile tamen apparet, nullam esse rationem, cur intellectum & voluntatem liberam elementis tribuamus."
[160] Ibid., §644n.

> animals "spirits," indeed in this sense they must count among spirits all simple things, even the simples of Leibniz… but I find it more advisable that one retains the name of "spirit" only for those simple things, which have understanding and will, so that one does not, from an unsteadiness of words, admix the properties of a simple thing, and attribute to it what does not appertain to it… If one wants to call all simple things "spirits," then matter would not be anything other than a mass of spirits, because it arises from a mass of simple things. If one now wants to say, matter consists of pure spirits, one would accordingly imagine as if the parts of matter had understanding and will…[161]

Consequently, the simple substances of Wolff's cosmology, which he calls "elements" (*elemente*) or "atoms of nature" (*atomi naturae*), remain at the level of philosophical hypotheses. They are assumptions that are justified partly in virtue of being implied by other commitments, but also partly for their value in supporting research, as the theory of

[161] DMet. §898. The passage is worth having in full: "Ich weiß wohl, daß einige alles, was nicht aus Materie bestehet, Geister zu nennen pflegen. Und daher würden sie auch die Seelen der Thiere Geister nennen, ja in diesem Verstande müsten sie alle einfache Dinge, ja auch die Einheiten des Herrn von Leibniz unter die Zahl der Geister rechnen. Allein, ob zwar die Benennung keine Aenderung in der Sache hervorbringet, und demnach nichts daran gelegen wäre, wenn wir auch den Seelen der Thiere und überhaupt allen einfachen Dingen den Nahmen eines Geistes beylegten; so finde ich doch für rathsamer, daß man den Nahmen des Geistes bloß denenjenigen einfachen Dingen vorbehält, die Verstand und Willen haben, damit man nicht aus der Unbeständigkeit im Reden nachdem die Eigenschafften der einfachen Dinge vermenget, und einem etwas beyleget was ihm nicht gebühret… Wenn man alle einfache Dinge Geister nennen wolte; so müste die Materie nichts anders als ein Hauffen Geister seyn, weil sie aus einem Hauffen einfacher Dinge entstehet. Wolte man nun sagen, die Materie bestünde aus lauter Geistern; so würden nach diesem ihrer viele ihnen einbilden, als wenn die Theile der Materie Verstand und Willen hätten, weil sie dergleichen in ihrer Seele antreffen, die auch ein Geist ist…. Und dieses hat sonder Zweiffel den Herrn von Leibniz bewogen, daß er den Elementen der Materie bloß den Nahmen der Einheiten beygeleget."

physical force-points allows the physicist to model continuously varying attractive and repulsive forces in closed systems. Yet, it is important to bear in mind that the hypothesis of physical simple substances cannot be adequately demonstrated, and that it resists an informative, positive characterization.[162] As such, Wolff is content to leave his doctrine of elements shrouded in mystery. He recognizes, on the basis of his own metaphysical commitments, that the sufficient reason for facts about composites must be found in simple substances, so that the elements should contain "the ultimate reasons for whatever is apprehended in material things."[163] The stable objects of experience, the *phenomena substantiata*, must have their ground in metaphysical simples. Thus, since bodies contain inertial and active force through which their states result, so must the elements underlying bodies.[164]

Nonetheless, while conceding the rational grounds for the existence of force-bearing simple substances underlying bodies, Wolff freely admits his ignorance about the "specific difference of that in elements from which their diverse modifications proceed."[165] In effect, Wolff denies that we have any distinct conception of the nature of the primitive force in elements and, in general, of force over and above what is known of phenomenal force in bodies. The physical concepts of moving force (*vis motrix*) and inertial force (*vis inertiae*) are concepts of phenomena, or of that which is perceived confusedly.[166] The explanation of phenomena, however, is the province of the new

[162] Disc. prae. §126. See above, §2.2.
[163] Cosm. §191.
[164] Ibid., §196.
[165] Ibid. §197n.
[166] Ibid., §225; §296; §298. Wolff adopts the definition of phenomenon from Goclenius.

"corpuscular philosophy," and it is "to be sought in derivative qualities of corpuscles and the manner in which they are connected." That is, Wolff grants to the new physics a good deal of autonomy for conceptualizing its objects independently of all but the most general constraints from metaphysics (or, strictly, Ontology). The "special reasons of phenomena," as fruitfully developed in the new physics, consist in laws of impact and collision, the lively efforts in the early eighteenth century to conceptualize material forces, together with the developing norms of experimental evidence. Physics internally specifies its concepts of substance, causation, or force with the goals of producing what Leibniz had termed "real phenomena" and Wolff calls substantiated phenomena, thus to predict reciprocal changes in quantities of force between interacting bodies and modifications in their mechanical qualities (*figura, magnitudo sive moles, motus & situs*).[167] The moving force of a body should indeed by conceived substantially insofar as it appears as a perdurable and modifiable subject. Yet, the stable appearance of bodies, for Wolff, does not license inferences about the specific nature of the simple elements from which they are composed and which endow them with moving force. That is, nothing beyond the generic properties of being indivisible, partless, or extensionless can be attributed to the force-bearing elements on the basis of observations of dynamical change in bodies. Leibniz's psychologically conceived primitive force, or entelechy, consequently, has just as little validity in the sphere of the new science of dynamics as do the scholastic notion of substantial form.[168]

Wolff's objection, in effect, assumes a sharper separation of the demands of

[167] Ibid. §§235-7.
[168] Ibid. §§360-1.

metaphysics and those of natural philosophy than Leibniz grants. For the purposes of physical explanation, Wolff regards metaphysical speculation as irrelevant in some respects even though, in the interests of her own discipline, the metaphysician must not rest content with mere descriptions of phenomena. For example, Wolff holds that, "of what kind are the elements of material things, and whether or not there are material atoms, can be ignored in natural philosophy without danger of erring," because any error in such matters does not hinder the discovery of "the true reasons of phenomena."[169] The special reasons governing phenomena, for Wolff, are not the province of metaphysics, but may instead be seen as developing out of—as well as deriving their legitimacy and normative standards from—the successful practice of mathematical physics. The further, speculative demand to adduce ultimate reasons, meanwhile, serves the interests of systematic philosophy, and the disposition of the human understanding to seek greater completion and certainty in knowledge.[170] As a result, Wolff remains reluctant to speculate in what manner moving force arises in bodies from simple substances. All he leaves us with is a perhaps deliberately vague suggestion, that "the active forces of simple substances conspire in some certain way so as to appear as one [body], something that cannot be more clearly explained."[171]

Wolff's doctrine of substance is ultimately unstable. On the one hand, he

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[169] Ibid. §243. The question of Leibniz's monads can likewise cheerfully be left behind: "Etenim hinc patet, cur in specificam elementorum differentiam ab aliis substantiis simplicibus non inquiramus & *Leibnitio* suam de monadibus sententiam lubenter relinquamus."

[170] Wolff sometimes describes the quest for complete rational certitude as a "natural disposition" of the understanding. See, e.g., DLog. §3, §6.

[171] Cosm. §294n.

approves of a tendency he finds among leading, contemporary experimentalists of restricting the claims of metaphysics in the practice of the new physics. On the other, he is sufficiently committed to the systematic proclivities of the Aristotelian tradition to be unwilling to embrace an ascendant instrumentalism in the natural philosophy of the early eighteenth century. The tensions in his thinking on the fundamental constituents of bodies is betrayed by the fact that his elucidation of the nature of simple substances is mostly negative: the elements of bodies are neither soul-like entelechies, nor perfectly rigid atoms, nor unextended mass points as would be found in the young Kant's physical monadology. The conflict between the various tendencies comes to a head in his encounter with Leibniz. But from their decade-long correspondence, Wolff appears as a far more independent and sophisticated thinker than he has typically been given credit for. He is no mere epigone, determined by the history of *Geist* to the role of systematizing Leibnizian thought, but himself the author of a new philosophical system. Indeed, he could rightly be deemed an eclectic thinker in the precise sense in which the term was understood in the eighteenth century: not as one who borrows and combines the ideas of others, but rather one who does not give allegiance to any of the acknowledged schools such as Platonism, Aristotelianism, Stoicism, Pythagoreanism, or, indeed, Cartesianism. In his *Historia critica philosophiae* (1741-43), Johann Jakob Brucker regards the modern eclectic as a new breed of philosopher distinct from the ancient Alexandrian Platonists with whom the term was traditionally associated. For Brucker, an eclectic is one who does not defer to intellectual authority, but determines "by the vigorous exertions of their own faculties, to investigate certain and universal principles for themselves, and upon this foundation to frame a system of opinions, which should be truly and properly their own."[172]

6. The rise of Wolffianism as a new *Schulphilosophie*

Wolff would insist on the distance of his views from Leibniz's throughout his life. This statement was made more urgent in light of the proliferating label of "Leibnizian-Wolffian" philosophy, a confusion purportedly caused by his student Georg Bilfinger, and then perpetuated by Georg Hartmann and Carl Ludovici.[173] The association of Wolff's philosophy with Leibniz's would remain impressed in the philosophical imagination throughout the eighteenth century and beyond, despite Wolff's insistence to the contrary. The exchange with Leibniz on the topic of dynamics perhaps accurately reflects Wolff's view of their relation. In a letter to Count Manteuffel, Wolff declares that his own philosophy begins where Leibniz's ends; the monads, in particular, remain to him a "mystery" that he does not wish to resolve.[174] The express opposition to Leibniz's monads reappears frequently throughout his writings. The feelings were, to be sure,

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[172] Johann Jakob Brucker, *The History of Philosophy* trans. William Enfield Jr. (London: J. Johnson, 1791), vol 2, 509.

[173] Hartmann authored the *Anleitung zur Historie der Leibnitzisch-Wolffischen Philosophie* (Frankfurt & Leipzig, 1737); Ludovici was the author of *Neueste Merkwurdigkeiten der Leibnitz-Wolffische Weltweisheit* (Frankfurt & Leipzig, 1738).

[174] Letter to Manteuffel, May 11 1746: "(Systema des Leibnitz) als welches erst sich da anfänget, wo meines aufhöret. Die Confussion aber hat H. Bülffinger gemacht, welcher zuerst mit der Philosophia Leibnitio-Wolfiana aufgezogen kommen. Und also könnte man auch noch wohl jetzt sagen, daß die Monades Leibnitianae, darauf sein eigentliches Systema gebauet ist, ein Rätzel sind, sonach nicht völlig aufgelöset, und ich nicht auflösen mag, ob ich wohl könnte, weil ich es zu meinem Vorhaben nicht brauche, ich auch diese Sache in ihrem Werth und Unwerth beruhen laße"; Ostertag, *Philosophische Gehalt*, 60.

mutual: in Leibniz's estimation, on account of Wolff's busy teaching load as professor of mathematics at Halle, their correspondence on philosophical matters had been limited and, consequently, Wolff "can know very little about my opinions beyond those which I have published."[175]

In the end, Wolff's relationship to Leibniz is complicated. Given his rejection of the central Leibnizian doctrine of monads, and his qualified endorsement of the pre-established harmony as only a useful hypothesis for investigating the mind-body relation, the traditional judgment that Wolff was a mere follower of Leibniz is untenable.[176] At the very least, the complex intellectual genesis of Wolff's philosophical outlook makes any straightforward identification of his system with his predecessor's problematic. In considerable measure, both Leibniz and Wolff may be seen as equal participants in a program of synthesizing the Protestant Aristotelian tradition as represented by Scheibler or Scharf, a scholasticized Cartesianism as propagated by Clauberg, alongside other European intellectual currents at the turn of the seventeenth century. At the same time, the elder Leibniz certainly left a deep impression on his younger countryman as attested

[175] Letter to Remond, July, 1714; G III.618; L 657. Given their wide-ranging correspondence, Leibniz's opinion is surely unfair.

[176] Bissinger, *Struktur*, 24, sees a sharp break between Leibniz and Wolff for this reason: "Die Monade ist der Grundbegriff Leibnizischen Denkens. Gibt man die Monadenlehre auf, so gibt man das ganze System auf." Jeongwoo Park, "Le débat wolffien sur l'idéalisme de Leibniz lors de la première diffusion de la Monadologie latine," *Revue de Synthèse* 128 (2007), 337, takes a more qualified position on Wolff's departure from Leibniz's idealist position in the Monadology. According to him, Wolff's piecemeal appropriation and reworking of Leibnizian themes amounts to a desystematization of Leibniz's thought, contrary to the common view of Wolff as a systematizer of Leibniz. He concludes: "C'est ainsi que Wolff accomplit la désystématisation de la pensée leibnizienne au sein de son système, tout en approfondissant une métaphysique profonde, mais non pas sublime."

in the abundant references to Leibniz throughout Wolff's corpus. Even if Wolff did lack insight into the inner recesses of Leibniz's thought, he nonetheless positioned himself as Leibniz's disciple in the public sphere. Thus, Wolff championed his compatriot's cause in the priority dispute over the discovery of the calculus against Samuel Clarke, and in the fierce debates between Newtonians and Leibnizians that roiled European royal academies in the mid-eighteenth century. Crucially, Wolff may also have been responsible for the Latin translation of Leibniz's *Monadology* in the *Acta eruditorum* in 1721 under the title *Principia philosophiae*, which would remain the standard presentation of Leibniz's text in the eighteenth century, reproduced by Michael Gottlieb Hansch in his *Principia philosophiae more geometrico demonstrata* in 1728 and, importantly for Kant, in the first authoritative compilation of Leibniz's works by Ludovici Dutens in 1768.[177] Whether or not it would have met with his approval, Leibniz's thought was indeed largely transmitted to eighteenth-century Europe in the form it received from Wolff's prolific pen.

On Leibniz's recommendation, Wolff was appointed professor of mathematics at the avant-garde University of Halle in 1707, where the charismatic theologian and jurist Christian Thomasius (1655-1728) was at the forefront of a movement to follow the

[177] *Acta eruditorum supplementa tomus VII*, 500-514. The authorship of the translation has been contested, with some scholars instead crediting Michael Hansch (e.g. Stuart Brown, and N.J Fox. *Historical Dictionary of Leibniz's Philosophy,* eds. Stuart Brown and N.J. Fox (Oxford: Oxford University Press, 2006), xxiii). A German translation bearing the word "Monadologie" by Heinrich Köhler and with a preface by Wolff had already appeared in 1720 (*Lehrsätze über die Monadologie,* Frankfurt-Leipzig: Johann Meyer). See Lloyd Strickland, "Introduction," in *Leibniz's Monadology: A New Translation and Guide,* ed. and trans. Lloyd Strickland (Edinburgh: Edinburgh University Press, 2014), 10-11, who does not take a stand on the authorship question, for the translation and publication history of Leibniz's *Monadology*.

French and English in instituting a university curriculum in the vernacular.[178] Despite his misgivings about Thomasius' conception of philosophy as an essentially belle-lettristic enterprise directed at the improvement of civic morals, rather than a disinterested search for truth, Wolff embraced the project of the Germanization of philosophy and bequeathed to the eighteenth century perhaps his most important legacy.[179] In a series of textbooks starting with his 1710 *Der Anfangs-Gründe aller mathematischen Wissenschaften* and ending in 1725 with the *Vernünftige Gedanken von dem Gebrauche der Theile des menschlichen Leibes, der Thiere und Pflanzen*, Wolff constructed a comprehensive philosophical and scientific vocabulary in the German language, which would remain the

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[178] Thomasius arrived at the newly founded University of Halle in 1694, after having been forced out of Leipzig in 1690 for advertising a course offering in German. The censors at Leipzig disallowed him from going ahead with the course on the grounds that they could not assess a German language course description. Thomasius wrote a treatise on logic, the *Vernunftlehre*, which insisted on a conception of logic as treating the rules of thinking in common life, dealing with ordinary, probabilistic reasoning, rather than as a means for arriving at eternal and necessary truths. Thomasius exerted a great deal of influence at Halle, and in the wider public intellectual culture of his time through his journal, the *Monatsgespräche*. Wolff disapproved of what he saw as Thomasius' anti-intellectualist conception of philosophy, or *Weltweisheit*, as a merely practical discipline concerned with the improvement of human affairs, especially in the realm of faith. For Thomasius, philosophy's task was limited to the cultivation of rational belief (*fides intellectualis*), rather than a search for truth as such. For the early history of the founding of Halle, see Johann Christian Förster, *Uebersicht der Geschichte der Universität zu Halle in ihrem ersten Jahrhunderte* (Halle: Buchhandlung des Waisenhauses, 1799). For Thomasius' importance for the German Enlightenment, in particular for the dialectic of faith and reason, see Thomas Ahnert, *Religion and the Origin of the German Enlightenment* (Rochester: University of Rochester Press, 2006).

[179] Werner Schneiders, "Deus est philosophus absolute summus: Über Christian Wolffs Philosophie und Philosophiebegriff," in *Christian Wolff 1679-1754,* ed. Werner Schneiders, 9–30 (Hamburg: F. Meiner, 1983), notes that Wolff's reaction to the freethinking at Halle merely strengthened his conviction, already present in his 1702 dissertation, that philosophy ought to seek truth for its own sake.

basis for the arts curriculum in German universities and gymnasia into the nineteenth century.[180]

Wolff's star rose steadily through the second decade of the century, and he was wooed not only by other universities in Germany, but also by Peter the Great of Russia.[181] His efforts to implement his lifelong goal of bringing all areas of knowledge, especially theology, to the certitude of mathematics, however, landed him in trouble with the Pietist theologians at Halle in 1723. While the theology faculty there had long harbored suspicions concerning Wolff's writings and lectures on ethical and theological matters, the immediate occasion for the controversy was his rectoral address of 1721, "On the practical philosophy of the Chinese."[182] There, Wolff used the example of Confucianism, as an ethical theory not founded upon Christian revelation that nonetheless contained the ethical truths of Christianity, to argue for the possibility of attaining virtue through natural experience alone. Human beings possessed a natural capacity to distinguish good from bad, Wolff argued, which implicitly undermined the claims to privilege of any systematic theology in teaching moral conduct. With his praise for the secular ethics of Confucius, Wolff incurred the ire of the Pietists, which led to a series of increasingly acrimonious exchanges between Wolff and his students including Bilifinger

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[180] See Eric Blackall, *The Emergence of German as a Literary Language* (Ithaca, NY: Cornell University Press, 1978), 26-48, and Paul Piur, *Studien zur sprachlichen Würdigung Christian Wolffs: Ein Beitrag zur Geschichte der neuhochdeutschen Sprache* (Halle: Karras, 1903), for Wolff's contribution to the systematization of German language philosophy.

[181] Correspondence with Blumentrost and Schumacher (Brf. 2-15). Wolff dedicated the *German Physics* (1723) to Peter the Great.

[182] "Oratio de Sinarum philosophia practica." See Donald Lach, "The Sinophilism of Christian Wolff (1679-1754)," *Journal of the History of Ideas* 14, no. 4 (1953): 561–74, for a discussion.

and Thümmig on the one hand, and followers of Thomasius such as Rüdiger, Budde, Francke, and Lange on the other. The dispute escalated and the Pietists managed to persuade Friedrich Wilhelm I of Prussia to have Wolff expelled on the grounds that, according to his philosophy, army deserters ought not to be punished because they cannot be held morally responsible for their pre-determined actions.[183] On 8 November 1723, the King ordered Wolff to leave Prussia within forty-eight hours or face execution.[184] The star professor had anticipated such a turn of events, and had already negotiated offers from Peter the Great to join the Russian Academy, and from the Landgrave of Hesse-Kassel for a position at the University of Marburg. When the royal edict came, he promptly headed to Marburg to take up appointment as professor of philosophy and mathematics for a handsome salary of 500 RT per year and generous benefits.[185] Wolff remained in Marburg in relative peace, and was able to embark on the project he had announced in 1718 of composing a series of Latin volumes for a Europe-wide audience. The fame of the second *Praeceptor Germania* (Melanchthon being the first to have the title) spread further and, in 1740, the ambitious young monarch Friedrich II invited the

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[183] Leonhard Euler, who met Wolff at Marburg in 1723, recalls a courtier telling the King that, "according to [Wolff's] doctrine, all soldiers were nothing but machines, and that, should one desert, it would be a necessary consequence of its structure, so that it would be unjust to punish them, as if one might punish a machine for producing such and such a motion"; quoted in Simon Schaffer, "Enlightened Automata," in *The Sciences in Enlightened Europe*, eds. William Clark, Jan Golinski, and Simon Schaffer (Chicago: University of Chicago Press, 1999), 152.
[184] See Wundt, *Schulphilosophie*, 234-44, for an account of the controversy.
[185] Letter to Blumentrost, 7 May, 1724 (Brf. 23). The benefits included: 50 bushels of corn, 90 bushels of barley, 55 bushels of oats, 5 bushels of peas, 2 pigs, 167 pounds of fish, 164 gallons of wine, and free housing in the observatory; Heilbron, *Electricity*, 154n115; Johann Christoph Gottsched, *Historische Lobschrift des weiland hoch- und wohlgebohrnen Herrn Christians, des H.R.R. Freyherrn von Wolf*, in *Christian Wolff: Gesammelte Werke, I. Abt. Bd. 10: Biographie* (Halle, 1755, reprint Hildesheim: Georg Olms, 1980), *Beylage,* 34.

elderly Wolff back to Prussia to assume co-presidency of the Berlin Academy with the French Newtonian, Pierre Maupertuis. Wolff declined the invitation, but returned to Halle amid great pomp and ceremony, where he remained until his death in 1754.

What is beyond doubt is the rapid rise of Wolffianism as a philosophical paradigm in the German Enlightenment. Even as Wolff's extensive texts were rolling off the presses, his students and adherents, many with university appointments across Germany, were composing *compendia* and elaborations. Already in the 1720s, his first disciples, Georg Bernhard Bilfinger and Phillip Ludwig Thümmig, had produced Latin tomes following the structure of their teacher's *German Metaphysics*. The flurry of *Streitschriften* resulting from Wolff's clash with the Pietists at Halle certainly furthered the Wolffian cause, with his students strenously defending their teacher's philosophical positions against increasingly hostile attacks.[186] Textbook presentations of Wolff's philosophy increased in number and distribution over subsequent decades. Volumes such as Johann Nikolaus Frobesius' *Systematicis metaphysici Wolfiani delineatio* (1730), Johann Peter Reusch's *Systema metaphysicum* (1734), Friedrich Christian Baumeister's *Institutiones philosophiae rationalis* (1735), Johann Friedrich Stiebritz's *Philosophia Wolfiana contracta* (1744-5, in two volumes!), Andreas Böhm's *Metaphysica* (1753), and Johann Franz Coing's *Institutiones philosophicae de Deo, anima humana, mundo, et primis cognitionis humanae principiis* (1765) cemented the status of Wolffianism as the dominant framework for philosophical pedagogy.[187] The *littérateur*, Johann Christoph

[186] Ludovici, an early biographer of Wolff, collected many of these texts in his *Sammlung und Auszüge der sämmtlichen Streitschriften wegen der Wolffschen Philosophie* (1737-8).
[187] See also, Schönfeld, *Young Kant*, 556-7.

Gottsched, produced a hugely successful, popular version of Wolff's philosophy in his *Erste Gründe der gesamten Weltweisheit* (1733-4), and a comprehensive biography shortly upon Wolff's death, the *Historische Lobschrift des weiland hoch- und wohlgebohrnen Herrn Christians, des H.R.R. Freyherrn von Wolf* (1755). A direct Wolffian influence on Kant's early philosophy came from his teacher, Martin Knutzen's *Elementa philosophiae rationalis seu logicae* (1744), from Alexander Gottlieb Baumgarten's *Metaphysica* (1739), and from the latter's student Georg Friedrich Meier's *Vernunftlehre* (1752), textbooks which Kant would use in his own lectures at Königsberg. It was this tradition of *Schulphilosophie* that Kant would set himself the task of overturning with the *Critique of Pure Reason*. Before getting to Kant, we need to examine in greater detail the teleological character of Wolff's cosmology and physics.

CHAPTER 5: Teleology in Wolff's Doctrine of Corporeal Being

1. Introduction

"Teleology" counts among Wolff's many terminological innovations. As a special branch of physics, Wolff introduces *Teleologia* to designate that "part of natural philosophy which studies the ends of things."[1] In its disciplinary guise, Wolff's Teleology has been the target of much bemusement and derision. Wolff has been chided for suggesting, for example, that mountains are for the sake of supplying water to rivers, or that the rooster crows at unusual times in order to signal a change in weather.[2] Wolff's extensive catalogue of the practical uses of natural phenomena for human advantage and for strengthening belief in God as the author of nature needs to be understood in the context of his system of philosophical disciplines, and in its relation to other sciences. Teleology conforms to the general principles of Wolff's metaphysics of the natural world, or Cosmology. It also serves a propaedeutic function with respect to the science of divine nature, or Natural Theology, to which Teleology stands as "experimental natural theology."[3] But the specific claims made in Wolffian Teleology concerning the behaviors of roosters and coastal wind patterns do not, contrary to popular criticisms, have the

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[1] Disc. prae. §85.
[2] DTel. §196, §134.
[3] "*Cosmologia,*" however, is not one of Wolff's neologisms. Erhard Weigel, in fact, had published a small book in 1680, which bore the full title *Cosmologia nucleum Astronomiae & geographiae, ut & usum Globorum, tum vulgarium, tum novis adornationbus & compendiis instructorum, quos inde dixeris GLOBOS Correctos & Perputuos, succincte tradens.* Earlier still, Johannes Scharf had published in 1625 a *Cosmologia seu Disputatio Physica de Mundo*, a work of which Wolff may have been aware. The term appears in chapter titles in works from the sixteenth and early seventeenth centuries.

status of demonstrations of truths about nature. Rather, Teleology for Wolff serves a variety of practical functions in both science and morals. Recognition of useful ecological relations guides natural scientific inquiry in specific directions, while also strengthening faith by providing sensible illustrations of the truths of revelation, rationally demonstrated in the separate science of Natural Theology.

This chapter examines Wolff's teleological conception of the world and its implications for the empirical study of nature. Before turning to his Cosmology and Physics, however, §2 first directs attention to Wolff's encyclopedia of the sciences in order to identify the systematic place of these disciplines. It also briefly introduces the relevant texts. §§3-4 elaborate the ontological principles underlying Wolff's cosmology. §5 then outlines the general cosmological framework underpinning the empirical sciences of Physics, Teleology, and Physiology, which are the subject of §6. Finally, §7 concludes with a brief recap of the narrative arc of teleology in early modern German philosophy traced thus far. As we shall see, Wolff's metaphysical commitments enter to varying degrees in his conception of the methods of the special natural sciences. With their practical and theoretical successes, the mechanical-physical sciences attain perhaps the greatest degree of autonomy. The manifold aims of Teleology, meanwhile, require it to draw assumptions from rational theology about divine creation, and from moral psychology to inform ethics. Yet it remains, ultimately, a science of phenomena and a practical discipline with didactic and moral aims. Its subdiscipline of Physiology hews close to a neo-Galenic conception of mechanical function in living beings, even as Wolff endorses a creationist account of the origin of such functions.

Just as Wolff cannot be treated as a mere disciple of Leibniz, the image of Wolffian philosophy as a hyper-rationalistic, deductive system of conclusions is also not accurate. For Wolff, metaphysics and physics have distinct aims and methods: the former is a speculative enterprise concerned with articulating a plausible structure of reality from a liberal use of the principle of sufficient reason, while the latter remains a study of the phenomenal world based on probable reasons and practical success. While Wolff's physics is not a positivist enterprise wholly free of metaphysical commitments, it is also not straightforwardly derived from the armchair. Rather, what emerges in Wolff is a conception of rational inquiry that allows for varying grades of metaphysical involvement and criteria for assent. Wolff's systematic conception of knowledge presents itself, in classical Aristotelian manner, as a rigid, demonstrative system of conclusions based on first principles. Yet, it also shares with Aristotelianism another characteristic which is just as persistent a feature of the tradition, even if less frequently acknowledged, namely, its internal elasticity. Wolff's system admits a range of weaker and stronger connections between the sciences, from a tight dependence of the three special metaphysical sciences on Ontology, to the practical relevance of Teleology for Natural Theology, to the methodological autonomy of empirical Physics in conceptualizing its objects of investigation by bracketing off the problem of simple substances.

2. An architectonic of knowledge.

In his 1718 *Ratio praelectionum*, Wolff announced his intent to publish a series of treatises covering all parts of philosophy in both German and Latin. The ten German works—which would come to be known as the *German Metaphysics* (plus a second volume of annotations), *German Experimental Physics* (three volumes)*, German Ethics, German Politics*, *German Physics, German Teleology,* and the *German Physiology*—spanned the years 1719-1725, followed by a lengthy reflection on his products, the *Ausführliche Nachricht von seinen eigenen Schriften.* The *German Logic* had appeared in 1713, with a prefatory discussion on the subject matter and divisions of philosophy. Starting in 1726, Wolff produced a series of Latin texts, beginning with the *Preliminary Discourse on Philosophy in General.* Intended as a general preface to his philosophical system, the *Preliminary Discourse* offers definitions of the various disciplines of philosophy, the method of reasoning in philosophy, the style of writing to be employed, as well as a chapter on academic freedom. The picture of philosophical activity conceived there, together with the extensively cross-referenced, textbook presentations of his system convey the impression of a rigid, hierarchical organization of disciplines. Such an impression is misleading. Wolff's architectonic conception of knowledge, like Kant's, is more organic than it appears at first.

In early modern philosophical usage, "architectonic" connotes, following Aristotle's usage of 'architektonikos' in the *Politics* (1282a4-6), the *Nicomachean Ethics* (1094a15-26), and the *Physics* (194a34-b8), a master science or art that supplies principles to a subordinate field in virtue of knowing the latter's goal of production.

Aristotle's conception of an architectonic discipline as one that regulates and orders others, and for whose sake special disciplines are practiced, was alive in the seventeenth and eighteenth centuries. In his *Lexicon* of 1652, for example, Johann Micraelius notes Aristotle's extension of the classical, architectural sense of the term as *scientia bene aedificandi*, to the science of politics through which cities are properly ordered and governed. Leibniz applies the term to describe metaphysics as the "primary and architectonic discipline," and the notion of architectonic as the art of constructing systems becomes general in the eighteenth century.[4] It finds its most self-conscious expression in J.H. Lambert's *Anlage zur Architectonic, oder Theorie des Einfachen und des Ersten in der philosophischen und mathematischen Erkenntniß* (1771), and reappears in the last chapter of Kant's *Critique of Pure Reason* ("The Architectonic of Pure Reason").[5]

But, just as Kant's conception of a system of knowledge is one of an articulated, organic whole, "like an animal body, the growth of which does not add any limb, but, without changing their proportions, makes each in its sphere stronger and more active,"[6] Wolff's idea of an architectonic is likewise not that of an inflexible hierarchy, but of a system in which the special disciplines stand in reciprocal relations to one another. The many, carefully distinguished disciplines borrow assumptions, provide constraints, and

[4] "On the Correction of Metaphysics and the Concept of Substance" (1694), GP IV 468; L 432. Kant's notion of an "architectonic of pure reason" preserves this conception of a governing science of principles, which he identifies with his critique of the cognitive faculties.
[5] Baumgarten treats the following terms as equivalent: "ontology," "ontosophia," "metaphysics," "universal metaphysics," "architectonics," "first philosophy." Each of these denotes "the science of the more general predicates of being" (*Metaphysica*, §4).
[6] A833/B861.

offer new results to one another. Indeed, Wolff often appears content to leave the question of an asymmetrical dependence of the various sciences unanswered. In considering the relation between "rational" and "experimental" parts of Cosmology, for instance, Wolff recommends that, while experimental cosmology presupposes the "scientific" or theoretical part, it is to a certain extent cultivated before the latter and the two can be conjoined.[7] Similarly, while Psychology borrows from Cosmology the general rules of order and succession among external things, it nonetheless draws closer to Ontology as a propaedeutic discipline for uncovering the first principles of human knowledge by reflection on the activities and powers of the human mind. Thus, while Wolff explicitly states the order of the metaphysical sciences as proceeding from Ontology, to Cosmology, Psychology, and Natural Theology, his presentation of the four disciplines in the *German Metaphysics* accords priority to the empirical part of Psychology.[8] Wolff's philosophical system is better regarded as an organic, interconnected whole, rather than following a strict deductive order, as it was sometimes depicted by his students.[9]

The architectonic of philosophy is also less essentialist than it has sometimes been judged to be. Wolff's definition of philosophy as the "science of possibles, insofar as they

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[7] Cosm. §5.
[8] In Disc. prae. §99.
[9] See, for example, Ludovici's diagram of Wolffian philosophy (1737), 122. Modern interpreters have followed the appearance of a strict deductive order among the parts of Wolffian philosophy; e.g. Blackwell, "Doctrine of the Soul," 211. The practice of diagramming the parts of philosophy was well-established in Germany. See Joseph S. Freedman, "Philosophy Instruction within the Institutional Framework of Central European Schools and Universities during the Reformation Era," *History of Universities* 5 (1985), 127-9, for three representative schemes from the sixteenth and seventeenth centuries.

can be" has often been interpreted to entail a project entirely directed toward essences to the exclusion of existences.[10] Such a construal of Wolff's philosophical program, however, applies properly only to the science of Ontology. The strongly empiricist character of the system as a whole defies such a characterization. As science, or the habit of drawing conclusions from firm principles, philosophy indeed seeks rational certitude by establishing how something can be or not be, and thus to perfect a natural disposition of the human understanding.[11] But at the same time, a firm and unshakeable foundation in philosophy requires that reason be joined to experience, such that "only those things which truly exist and occur are admitted as possible."[12] The foundation of philosophical knowledge, accordingly, consists in what Wolff calls "historical knowledge," or knowledge of fact, "insofar as experience establishes those things from which the reason can be given for other things which are and occur, or can occur."[13] The application of reason to the data of experience leads the mind to certain universal principles as underpinning its regular order. Using principles discovered in reflection on experience, we then reconstruct natural facts and organize them into a system of well-confirmed propositions. Bringing empirical facts under the ontological categories of reason increases our confidence in their truth. Scientific or philosophical knowledge, thus, is

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[10] Disc. prae. §29. Wolff writes that "I have always directed all my thoughts on philosophy according to this definition", and recounts his discovery of this definition of philosophy in 1703 in Leipzig, and defending it against his gymnasium teacher Caspar Neumann's objections. The definition appears for the first time in the preface to his *Elementa aerometriae* (1709), as well as in the Preface to the *German Logic* (DLog. §1).
[11] Disc. prae. §30: "By science here I mean the habit of demonstrating propositions, i.e., the habit of inferring conclusions by legitimate sequence from certain and immutable principles"; Phil. pract. §1: "Philosophia est scientia… habitum conclusiones ex firmis principiis demonstrandi"; DLog. §3, §6;
[12] Disc. prae. §11.
[13] Ibid. §10.

always knowledge of reasoned fact, rather than knowledge either of bare possibility or of bare fact.[14] Far from inhabiting merely possible worlds, Wolff's philosophy is primarily oriented toward the actual world considered as possible, to understand the reasons for the past and present actuality of experienced things, and with that to predict their future possibility. For this reason, Wolff describes the experienced world also as the "rational world" (*mundus rationalis*), as distinct from either the merely sensible or the merely intelligible worlds (*mundus sensibilis, mundus intelligibilis*).[15] Philosophical cognition, then, is defined as cognition of the rational world resulting from a unity of sensational and conceptual elements, or, in his oft-repeated metaphor, from a marriage of reason and experience.[16] Optics, Astronomy, and experimental physics exemplify, for Wolff, the fruitful combination of *a posteriori* knowledge of things with *a priori* knowledge of principles.[17] The locus at which reason and experience meet is the indubitable fact of consciousness.

[14] Mathematical knowledge, the third species of knowledge alongside historical and philosophical, finally, aims at the quantities of things. It is able to yield complete certainty about its theorems because of its method, which allows it to define its general concepts ('circle' or 'line' or 'point') by arbitrary combinations of concepts. Philosophical knowledge partakes of mathematical certitude only to the extent that the "quantity of an effect is shown to be proportionate to the power of the cause" (Disc. prae. §27). But in philosophy, universals cannot be defined by arbitrary synthesis, but must be discovered by an analysis of experience.

[15] Theo. nat. I §260.

[16] Ibid. I §265. The idea of a "connubium rationis et experientiae" appears, for example, at Log. §1232; Psy. emp. §497 Disc. prae. §12. See École, "En quels sens," 48-52, and Dyck, *Kant and Rational Psychology*, Ch. 1, for discussions of this thesis.

[17] Log. §1232: "Quoniam in Optica praesertim & Astronomia observationes cum demonstrationibus combinantur, & idem multo luculentius fieri potest in physica experimentali, siquidem rite tractetur; *habitum utendi operationibus mentis in cognitione rerum a posteriori & cum ea combinandi cognitionem a priori, Opticae, Astronomiae*

Thus, the fundamental orientation of Wolff's philosophy around the Cartesian standpoint that "we are conscious of ourselves and other things" not only provides a standard for philosophical certainty, but also leads to the basic divisions in the objects of knowledge.[18] This experience discloses three kinds of object: God, bodies, and the human soul. Knowledge of the latter two is conjoined. For Wolff, consciousness of external things ineluctably brings with it awareness of oneself as that which is distinct from the objects of consciousness. Thus, the soul is "that in us which is conscious of itself," while bodies are "extended things, which differ from each other in figure and magnitude, and which we intuit outside us." Crucially, Wolff's *cogito* argument requires both consciousness of both oneself and other things. Self-consciousness does not privilege the subject of experience. Rather, the fact of self-consciousness already presupposes the distinct being of the subject as well as the object of experience. The field of external objects and the microcosm of the human mind jointly constitute the world as the object of philosophical analysis. Meanwhile, knowledge of the possibility of the third kind of object, God, consists in the further recognition that neither bodies nor human souls arise or persevere by their own power. This object is importantly distinct from the first two, however, inasmuch as its existence is not immediately known from the incontrovertible experience that we are conscious of ourselves and other things. It is for this reason that, at this primitive stage of knowledge, Wolff admits knowledge of God as a third species of

atque physicae experimentalis studio comparare licet, exercitiis prasertim logicis institutis."

[18] DMet §1; Ont. §1. For a comparison of Wolff's "cogito" moment with Descartes', see Dyck, *Kant and Rational Psychology*, 176-180.

object for merely "probable reasons."[19] The threefold division of objects organizes Wolffian philosophy into three special branches: Natural Theology, which treats whatever is possible through God; Psychology, which treats whatever is possible through the soul; and Cosmology, or the science of what is possible through bodies.[20] The three special metaphysical sciences, in other words, treat objects of experience under principal attributes that identify them as divine beings, finite spiritual beings, and material beings—the modern specification of the traditional Scotistic division of *res* into *increatum immateriale, creatum immateriale,* and *creatum materiale*.

Wolff's tripartite division represents an historically significant moment in the development of *metaphysica specialis*. Seventeenth-century metaphysicians such as Scheibler and Scharf had treated under the special metaphysical science of Pneumatics or Pneumatology the doctrine pertaining to the divine, angelic, and human mind together.[21] For those scholastics, metaphysics should be the science of the first principles of cognition, paying especial regard to the nature of beings capable of cognition. While retaining the Suárezian and Scheiblerian conception of first philosophy as the science of the first principles of cognition, Wolff separates natural knowledge of the human soul, which rests on a first-personal experience of oneself as distinct from external things, from knowledge of the divine spirit. Angelology or Angelographia, meanwhile, is expunged from the encyclopedia of the sciences altogether; Wolff declares that "before we

[19] Disc. prae. §§55-56.
[20] Ibid. §§56-59.
[21] Wolff refers to the categorization of psychology and natural theology under "pneumatics" at Disc. prae. §79. Leibniz had also retained this characterization in, e.g., the *New Essays,* §57.

philosophize, we know of no genera of beings that are proper objects of philosophy except souls, bodies, and God."[22] While revelation may compel us to hold the existence of angels for true (*für wahre halten*), it is no part of natural experience, or the knowledge of natural fact that forms the fundament of philosophy. Wolff's reconstruction of special metaphysics takes it beyond the doctrine of spirits. In keeping with his dualism of mental and physical substance, separate, a special metaphysical science of Cosmology organizes the general principles of the material world, considered as a totality of interconnected, dynamically interacting, extended spatial objects. Thus, one may well see Wolff's division of metaphysics as taking a further step toward the Cartesianization of the neo-scholastic tradition of metaphysics, as ontology. The new divisions in the venerable "science of being, of the world in general, and of spirits," reflect Wolff's commitment to the autonomy of the physical world as a domain of explanation subject to mathematizable laws of matter.[23] This world is stripped not only of Aristotelian real qualities and substantial forms, Hermetic sympathies and antipathies, but now also of Leibnizian spiritual substances. The world of mental substance equally reflects the autonomy of the self-conscious human mind, limited materially by the location of its organic body, as a domain of inquiry distinct from that of God or the angels.

Wolff's division of metaphysics is founded upon an identification of the attributes, or the general or transcendental affections in the scholastic language, specific to each of the three kinds of object from which the special metaphysical disciplines take their particular subject matter. The task of Cosmology in this scheme is to identify the

[22] Disc. prae. §56.
[23] Ibid. §79.

general categories and principles governing a world of bodies considered independently of principles governing minds. "Transcendental or general cosmology"[24] informs each of the further subdivisions of the sciences of the physical world, such as Meteorology, Oryctology, Hydrology, Phytology, as well as two governing physical sciences of bodies as such: the first, of bodies as governed by efficient causal laws of mechanics, or Physics, and the second, under the aspect of the ends of bodies, for which Wolff coins the term "Teleology." Psychology, meanwhile, takes two divisions. Empirical Psychology describes the powers and operations of the soul through a descriptive and analytical procedure that one might call a phenomenological investigation of the acts of the mind. Through reflection on the operations of the mind, Empirical Psychology adduces not only concepts of the various mental powers, but also of the categories presupposed in all symbolic cognition. Consequently, Empirical Psychology supplies the concrete conditions for the logical operations of the cognitive faculties.[25] Empirical Psychology, in Wolff's metaphysics, may be regarded as a propaedeutic discipline for the other metaphysical sciences; by directing an introspective gaze at its actual operations, it elucidates the structure of the human mind in experience. In describing and analyzing inner experience, Empirical Psychology further prepares the ground for its speculative, sister discipline of Rational Psychology, which addresses those questions concerning the soul left open by introspective evidence, such as its relation to the body, its immateriality,

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[24] Ibid. §78.

[25] Ibid. §111; Psy. emp. *Pref.*

personality, simplicity, and immortality.[26] Natural Theology, finally, focuses on the question of the being, attributes, and operations of God, considered as the necessary cause of the world, from an investigation of his effects, and thus draws on both Cosmology and Psychology.[27]

Preceding the special metaphysical disciplines is *philosophia prima*, or Ontology, which Wolff had already singled out in 1718 as his most important undertaking.[28] Wolff explicitly situates his task in general metaphysics in the seventeenth-century German program of constituting ontology as the science of the first principles of knowledge. In the Prolegomena to *Ontologia*, Wolff credits the impetus to revive the science of ontology on a new basis as the doctrine of intelligible being to Clauberg's *Ontologia sive Metaphysica de Ente* (1660), and to Leibniz's call for an emendation of metaphysics in his *Acta eruditorum* essay, "On the correction of metaphysics and the concept of substance" (1694). Wolff's achievement here of a systematic articulation of concepts and principles to underwrite the modern sciences of mind and nature could be regarded as the culmination of a program in the reconstruction of general metaphysics as ontology—separately from another conception of metaphysics, also found in Aristotle, as the science of divine things—begun in the late-sixteenth century.[29] The lasting contribution lies in his

[26] Psy. rat. §9. See Dyck, *Kant and Rational Psychology*, 27-42, for an outline of Wolff's empirical and rational psychology. Dyck rightly stresses the interdependence of the two disciplines, rather than their separation.
[27] Disc. prae. §96.
[28] Rat. Prae. III.2 §3. See Mora, "Ontology" for a survey of conceptions of ontology in the sixteenth and seventeenth centuries leading up to Wolff's modernization of the foundational discipline; also, Lohr, "Metaphysics."
[29] Wundt, *Schulphilosophie*, 161, emphasizes that, "Diese Ontologie ist auch deshalb wichtig, weil sie zweifellos neben der Logik und mehr noch als diese Wolffs selbständige

sharp separation of ontology as a distinct part of metaphysics concerned exclusively with possible being, leaving questions concerning particular kinds of substance to the special metaphysical sciences.[30] Ontology studies *possibilia*, which are strictly beings of reason and do not make any claims to existence, which, for Wolff belongs only to concrete individuals. Existence, for Wolff, is understood as the completion of possibility (*complementum possibilitatis; Erfüllung des Möglichen*), which results from the thoroughgoing determination of an individual.[31] That is, for every pair of opposed, real predicates, A and not-A, an existent being either has one or the other; it is never in a state of indeterminacy with respect to any real predicate.[32] This complete determination requires an exhaustive connection among its possible relations. For existence, an individual requires, in addition to its logical possibility and compossibility with other individuals, an extra ingredient, which, in the actual world, consists in what Wolff calls the connection of things (*nexus rerum; Verknüpffung der Dinge*). In other words,

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Leistung ist. In dieser Erneuerung und Umprägung hatte er überhaupt keine Vorgänger. Weder Descartes noch Tschirnhaus noch Leibniz hatten so etwas versucht." In light of Wolff's conception of Ontology as dealing with the first grounds or principles of human knowledge, alongside his concern to delimit proper philosophical knowledge to the domain of reasoned fact, one might justly inquire into the extent to which Wolff's philosophy constitutes "transcendental philosophy" in Kant's sense; or, rather, the extent to which Kant's critique of the knowing subject is continuous with a tradition in German ontology stretching back through Wolff to Clauberg and Scheibler. G. Kahl-Furthmann, "Inwiefern kann man Wolffs Ontologie eine Transzendentalphilosophie nennen?" *Studia Philosophica* 9 (1949), 73, raises exactly this question, and answers it in the affirmative: "Die tranzendentaler Logik der Kritik der reinen Vernunft ist selbst nicht anderes als die Skizze einer Ontologie."

[30] Etienne Gilson, *Being and Some Philosophers* (Toronto: Pontifical Institute of Medieval Studies, 1952), 119, sums up this feature of Wolff's Ontology: "in the philosophy of Wolff, existence is completely excluded from the field of ontology. There are special sciences to deal with all the problems related to existence, and none of them is ontology."

[31] Ont. §174; DMet. §14.

[32] Ont. §§226-7.

concrete individuals, the contingent beings populating the natural world, exist in virtue of real relations in space and time that each one bears to every other individual. Since Ontology is concerned only with possible beings, which coincide with necessary and eternal essences of things, it consequently foregoes any direct claim to knowledge of existents.[33] Rather, its contribution to philosophical knowledge of the actual world depends on the application of its pure concepts and principles to a domain of concrete beings given in experience, whether one of bodies existing in community, or one of thoughts in the microcosm of the human mind, or, controversially, to the idea of a transcendent being.[34] Wolff's elevation (or relegation) of Ontology to merely possible being, thus, opens the space for distinct, domain-specific ontologies of actual being, as in his own special sciences of Cosmology, Psychology, and Natural Theology, as metaphysics of bodies, of minds, and of the divine.

3. The ontology of composite being

The order of inquiry into the existing or observable world (*mundus adspectabilis*) begins with transcendental or general Cosmology. The goals of Cosmology are multiple. For one thing, it is to prepare the way for knowledge of mental substance, for, Wolff maintains, "one can grasp neither the essence of a spirit in general nor of the soul in particular

[33] DMet. §§38-9; Ont. §299.
[34] Controversial, on the one hand, with the theologians who drove Wolff out of Halle for what they regarded as the illegitimate extension of the claims of reason into matters of faith and revelation; and, on the other, with those such as Kant, who would deny that the idea of a transcendent being has any experiential content.

before one understands what a world actually is and what kind of constitution it has."[35] Just as self-consciousness involves awareness both of oneself and of objects distinct from oneself, metaphysical knowledge of the soul requires knowledge of its essential relationship to a world. For another, Cosmology should pave the way for knowledge of God from a consideration of the general principles of created, material nature, a task to be completed in Natural Theology.[36] Cosmology, in other words, is preparatory both for the study of the soul, and for the study of the being and attributes of God. In addition to these tasks, Cosmology also provides first principles for the empirical investigation of nature, or natural science (*Naturwissenschaft*) as "a science of that which is possible through the essence and forces of corporeal things."[37] To that end, it specifies the general attributes of being and its relational categories (notably, of cause) in order to account for the external world of moving bodies in space. The intelligibility of bodies, for Wolff, consists in their conceivability as machines:

> bodies are pure machines, and there is reality in them for the very reason that they are machines; indeed for that reason alone can they be intelligibly explained.[38]

Judgments of truth in Cosmology, in other words, requires material objects to be conceptualized as mechanical structures. The class of machines is broader than one might ordinarily suspect. Not only are particular bodies such as clocks and horses machines, but

[35] DMet. §540.
[36] Cosm. *Pref.*; Anmk. §173.
[37] DMet. §631.
[38] DMet. §617; Cosm. §75.

the world taken as a whole is also one thing (*ens unum*) and a machine.[39] For Wolff, the idea of a machine is more than a mere analogy for the structure of the world. It contains the core of a teleological conception of the universe, knowledge of which sheds light on the nature of the soul on the one hand, and the designing intentions of a divine craftsman on the other.

3.1 Essences, attributes, modes

The idea of a machine expresses both the reality of bodies, and the possibility of their intelligibility. The particular kind of reality a machine possesses is that of a composite thing, or one whose properties are grounded in its manner of composition.[40] A composite being (*ens compositum; zusammengesetzes Ding*) is a thing consisting of multiple externally distinct parts connected with one another in a definite order.[41] "The philosophy of composite being" constitutes the first of the particular species of being in Wolff's Ontology, and supplies principles concerning both natural and artificial bodies.[42] Composites involve a multiplicity of parts, and belong entirely to the class of objects of which we are aware as external and distinct from ourselves. A composite thing fills space, has three-dimensional extension, and a definite shape. It is analyzable into its parts, and modifiable through the motion of its parts.[43] The essence of a composite thing

[39] DMet. §549, §557; Cosm. §60, §73.
[40] DMet. §557; Cosm. §65.
[41] DMet. §51; Ont. §531.
[42] Ont. §641.
[43] DMet. §52-7; Ont. §640.

by which it is known and which determines its qualities, consists just in the manner of composition of its parts.[44] Composites, or bodies, thus have essences, or an unchanging, necessary and eternal character by which they are known and determined with respect to their type. Composite or corporeal essences are structures of predicates that ground the possibility of fixed species of created, material beings.[45]

Essence, in general, is a combination of primitive predicates, or essentials (*essentialia*), which are not contradictory in themselves and are also not mutually determinative. For example, the essentials of an equilateral triangle are the predicates 'triple number of sides' and 'equality of sides', because together these contain the sufficient reason for something's being an equilateral triangle, without the two predicates entailing each other.[46] The predicates, 'equal sides' and 'equal angles', by contrast, would not constitute an essence, for these entail one another. Essentials are identical with a thing's attributes, or the unchanging determinations of a being, which perdure through its various modifications. By contrast, modes are accidental predicates, being neither contradictory to, nor wholly determined by the essentials.[47] That is, modes may or may not be present in a thing, as a stone may be hot at one time and cold at another, or a triangle may be divided into two equal parts. Since the modes of a being are only minimally determined by the essence, the sufficient reason for the thoroughgoing determination (*omnimoda determinatio*) of any existent being, or its full ontological

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[44] DMet. §59; Ont. §533-4.
[45] DMet. §38-41.
[46] Ont. §143: "Quae in ente sibi mutuo non repugnant; nec tamen per se invicem determinantur, *essentialia* appellantur atque *essentiam entis* constituunt."
[47] Ibid. §148.

profile, must lie outside it. Determining all the necessary and accidental properties which a body has, and those which it does not have, requires locating it among a community of objects, or a world. For, while the essentials or attributes of a thing ground the specific identity of a being over time, they only partially determine its modes, for the particular qualities, quantities, and places of material objects partially depend on external circumstances.

Wolff arrives at a definition of essence as "that which is first conceived in a being and in which is contained the sufficient reason, why the other [attributes, modifications] are actually present or can be present."[48] The essence, in other words, fully determines the inseparable attributes of a thing, but only constrains the set of modifications that it could possess. A stone may become hot or blue or square, depending on whether it is heated by the Sun, or painted blue, or chiseled into a die, but it could not become envious or discerning, for those modes require attributes proper to mental beings. Since the essence of a composite thing, and thus of a machine, consists in its attributes of size, figure, space-filling extension, and the possibility of motion of its parts, its possible modifications are constrained through these essentials alone.[49] As a composite thing, the essence of a machine is such that each of its parts is grounded in every other, so that a change in any one of its parts entails a change in all the rest.[50] Knowledge of the essence of a machine, thus, consists in knowing the reason for the connection among its parts, or

[48] Ont. §168. See also Gilson, *Being and Some Philosophers*, 115-6. Burns, *Dynamism*, 24-8.
[49] DMet. §73.
[50] Ibid. §72; §93.

how "one has its ground in another, and one is for the sake of another."[51] In effect, Wolff's notion of the essence of a composite being, and *eo ipso* of a machine, is fundamentally teleological. The use of the Aristotelian locution for the final cause, 'for-the-sake-of', is deliberate, and recurs throughout his corpus. On this ontological picture, the world as a totality is itself a machine, each part of which is grounded in every other.

Essences are the ground of the possibility of a thing. They are also the object of rational knowledge. Wolff's Ontology has a dual character, inasmuch as it treats both being and knowledge in the same exposition. Ontology, to reiterate, is the doctrine of intelligible or thinkable being.[52] Since understanding or intellect is nothing but "the capacity to recognize the possible distinctly," the intelligibility of a machine involves knowing its corporeal essence.[53] Wolff uses the phrase, "explain in an intelligible way" (*intelligibili modo explicare; verständlich erklären*), in a quasi-technical sense.[54] In general, something is intelligible (*verständlich*) when one has a distinct thought or

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[51] Ibid. §543: "Wenn man die Dinge, die neben einander sind, als auch die auf einander folgen, mit ihren Veränderungen gegen einander hält; so erkennet man daß immer eines seinen Grund im andern hat, und eines um des andern willen ist, das ist, daß sowohl die Dinge, welche neben einander sind, als welche auf einander folgen, in einander gegründet sind."

[52] We need not be astonished to learn, unlike Bissinger, *Struktur*, 55, "that no book either among the German or Latin works of Wolff is concerned with epistemology." For Wolff, as for Clauberg (and, I venture to add, Leibniz), the distinction between epistemology and ontology is void, for the doctrine of being is nothing but the doctrine of what it is possible to cognize.

[53] DMet. §277.

[54] In the domains of Cosmology and Physics, the phrases always signify explanations rendered through the mechanical attributes of size, figure, and motion. The Latin phrase has a precedent in Descartes' *Principles* II.7: "Eam non posse ullo alio modo intelligibili explicari," following his explanation of rarefaction and condensation strictly as a change of shape, rather than as an increase or decrease in the volume occupied by a given amount of matter.

concept of it or, what is the same, when one has a distinct concept of its possibility.[55] Concepts of composite things, or the universal representations of essences, are nothing other than the genera and species under which sensed objects are classified through a process of reflection on their similarities and differences.[56] Concepts of composites, for Wolff, thus always originate in sense experience. A difference of degree rather than kind obtains between those concepts which suffice for ordinary cognition (*Erkänttniß*), and those which are the targets of scientific understanding (*Verstande*). While clear concepts alone may suffice in everyday life for recognition of instances of a certain kind, and thus to enable facility with their use in pursuing and avoiding benefits and harms, scientific explanation requires distinct representations of the genera and species to which a thing belongs.[57] Distinctness comes in degrees, and the finer the divisions in generic and specific concepts, the more distinct one's knowledge of the objects represented by those concepts.[58] Complete knowledge should be reached when knowledge is not only clear and distinct, but also adequate, or when there is clear and distinct knowledge also of the marks and characters by which a thing is recognized. Adequate knowledge of gold would consist not just in the structural features which determine its place in the periodic table, but also in the causes of its qualities of color or ductility by which the assayer estimates

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[55] DMet. §§276-7.
[56] Ibid. §273. The terms 'concept' (*Begriffe*), and 'representations of genera and species' (*Vorstellungen der Geschlechter und Arten der Dinge*) are synonymous: "Indem wir die Sachen überdencken und durch das Gedächtniß vergewissert werden, daß wir vorhin auch dergleichen schon empfunden oder uns eingebildet; so erkennen wir dadurch die Aehnlichkeit und den Unterscheid der Dinge. Und hiedurch gelangen wir zu Vorstellungen der Geschlechter und Arten der Dinge, welches man eigentliche Begriffe zu nennen pfleget und die der Grund der allgemeinen Erkäntniß sind." Cf. Ibid. §832.
[57] Ibid. §285.
[58] Ibid. §§278-80.

its worth. It is unlikely that we ever attain such knowledge, Wolff admits, except perhaps in mathematics.[59] Nevertheless, progress in universal knowledge (*allgemeine Erkäntniß*) is possible, insofar as it is possible to attain greater precision in the concepts of things, so that,

> once we distinguish the species and genera of things, as well as their attributes and modifications, and their relations to one another, we know that this or that thing has this or that in itself, or at least could have it in itself; or even, that from it something could arise, that is, that one could find in it the ground of a modification in something else.[60]

Concepts of genera and species ground analogical inferences from known properties and modifications of a kind of being to its unknown properties and possible modifications. Scientific knowledge progresses as it makes finer specifications in the hierarchy of kinds, thus leading to more distinct concepts of the types of things, which exist or could exist.

Divisions among natural kinds require judgments of similarities and differences among essences: "The similarity of the essence is the reason for the species of things."[61] Things belong to a certain species insofar as they share attributes, or what is necessary and unchanging in their essence. At the same time, insofar as an individual thing can

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[59] See, e.g., DLog. §§15-16, for Wolff's discussion of the difficulty in establishing adequate concepts. He points to his *Elementa matheseos* for the best examples of clear, distinct, and adequate notions, or such notions that are sufficient to distinguish a thing at all times from all other things. The influence of Leibniz's 1684 essay, "Meditations on Knowledge, Truth, and Ideas," is evident here, as noted in the previous chapter.
[60] DMet. §287.
[61] DMet. §177; Ont. §233.

share some but not all of its essentials with another being, it is possible to identify differences within a kind. Wolff's examples here are quotidian: a window is essentially an opening in a wall and, as a composite thing, has the attributes of extension, size, and spatial position. But its particular dimensions or its position in the wall are not necessary, but depend on its relation to other factors that could vary from one instance to another. In an analogous manner, "one can comprehend how things, which have the same essence, are nevertheless differentiated in various species, and some of these yet further in other species."[62] Likewise, genera are yet higher categories reached by identifying similarities among species concepts: "Just as the species of things consist in the similarities of individual things, the genera are nothing other than the similarities of different species."[63] The construction of a hierarchy of genera and species yields knowledge of a sort from which further inferences become possible. Knowing the extent to which two things are similar enables judgments about whether one can substitute one for the other and still derive the desired result. For example, water and quicksilver are similar with respect to fluidity, and so belong to a common genus. If an effect is known to follow from water merely insofar as it is heavy and fluid, a similar effect can also be predicted to result from quicksilver. Thus, "whoever sees this can arrive at much knowledge through just a few experiences and experiments: because herein lies the entire ground of rational inferences (*Vernunft-Schlüssen*), why they are themselves possible."[64] The capacity of the mind to classify objects based on their qualitative similarities and differences, in other words, constitutes the possibility of human reason.

[62] DMet. §§178-9.
[63] DMet. §181; Ont. §234.
[64] DMet. §182.

Wolff takes for granted, in line with much of the scholastic tradition, that scientific knowledge is necessarily restricted to universal concepts; the individual is not the object of discursive cognition. A brief remark concerning individuals is in order, however, before we consider further the structure of the object of science.

Wolff defines the individual (*individuum; einzeles Ding*) as that which exists concretely, as a “singular being… which is thoroughly determined.”[65] An individual is a being determined both with respect to its attributes as well as to its modes and, indeed, entails its co-determination with all other existent things to which it is related in a world. As a singular being, an individual is opposed to the notion of a universal and, consequently, to the notions of genera and species. For universal representations specify a being only with respect to its attributes—that in it which is intrinsic and perdures across its various modifications—and exclude the particular determinations which involve its extrinsic relations. Since adequate knowability of an individual depends on the possibility of arriving at a complete description of a being, that is, not only of its essence, but also of all the modifications that are possible through its essence, knowledge of individuals remains beyond the scope of discursivity. Wolff observes that,

> In natural things it is difficult to give examples [of individuals], because infinite parts are encountered in these, all of which are determined in a particular manner. And thus one sees the cause, why one cannot fully comprehend things in nature, if

[65] Ont. §227. For the principle of individuation, Wolff employs the Scotist notion of an *haecceitas*: “Per *Principium indiviuationis* intelligitur ratio sufficiens intrinseca individui. Scholasticis idem venit nomine *Haecceitatis*. Quamobrem *per principium individuationis intelligitur, cur ens aliquod sit singulare*” (Ibid. §228)

> one even just considers that, which they have in them essentially, that is, the possibilities they contain in themselves.[66]

Since individuals contain an infinite number of parts, each of which is determined through an essential and falls under a universal, the task of fully describing any singular, existent being lies beyond the ken of a finite intellect. For Wolff, unlike Leibniz, individuals are not picked out by complete concepts in a perfect intellect and, consequently, cannot be regarded as lowest species.[67] The gap between Leibniz's and Wolff's views in this matter might be closed by observing that Leibniz's *infima species* conception of the individual assumes the standpoint of a pure intelligence. Thus, Leibniz emphasizes that, by species, in the context of individuals as being picked out by their complete concepts in God's mind, he always intends the mathematical usage in which species are finitely analyzable, or fully intelligible. Were Wolff to consider the problem of individuation from the standpoint of a complete concept in perfect intellect, his haecceities might coincide with Leibniz's *infima species*. Yet, Wolff does not take that route, and approaches the question in the framework of a sharp division between essence and existence, between universals and singulars. Singular existents are contingent, enmattered entities that could be known, to the extent possible for discursive reasoners, only through the application of ontological categories to experience. A Wolffian individual denotes an actual being, whose title to existence is drawn from its membership in a community of other individuals. By interacting with other beings, it receives its

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[66] DMet. §180.

[67] Leibniz frequently affirms the Thomist view that individuals are *infima species*, or lowest species, for example in the *Discourse on Metaphysics* §9, G IV.433; L 308; also A VI.4.553.

complete determination. Given the material complexity of concrete individuals, however, it remains beyond the capacities of a finite mind to represent them perfectly, that is, to represent their complete complement of necessary and accidental predicates. The scientific advance in natural knowledge through discovery of species, and greater unity through collection of species under genera, consequently, is always an advance toward knowledge of individuals under their universal aspects, not of individuals in themselves.

3.2. Truth, order, and perfection

Bodies are real insofar as they are machines, or have a determinate manner of composition of their parts. The notion of composition, as we have seen, entails in Wolff's ontology a teleological order such that each part of a composite exists for the sake of another. The notions of reality, order, and reason coincide in Wolff's ontology. The world of bodies is real to the extent that it contains order among its determinations, and it is the task of rational inquiry to discover this order. The ubiquitous word *ratio* here acquires a double meaning, a polysemy made explicit in Wolff's carefully constructed German lexicon. *Ratio* connotes both the constitutive reasons or grounds—*Grund* in Wolff's German—of the determinations of an actual or possible being, as well as the cognitive capacity—*Vernunft*—through which such beings are known. To illustrate its former sense, Wolff distinguishes the notion of reason from that of cause. A reason or ground "is that, through which one can understand, why something is, and the cause is a thing, which contains in itself the reason for another thing."[68] Reasons are the features inhering in a thing, or an agent, which is therefore identified as the cause by which change is brought about in another thing, or a patient.[69] Reasons are objects of understanding, which inhere in entities bearing the difference-making features that are known through the effects they produce. Causes are, again in line with the scholastic tradition, agents possessing powers to produce effects for determinate ends, or reasons.

In the second sense, *ratio* is synonymous with the intellectual capacity for grasping reasons or grounds. Thus, Wolff also glosses *ratio* as "the faculty for contemplating or perceiving the connection of truths"; or: "The insight that we have in the connection of truths, or the capacity to see the connection of truths, is called reason."[70] In this signification, reason is a power of the mind, whether in potency or in act, to grasp connections among truths by means of formal syllogisms.[71] *Ratio* signifies both the connection of determinations present in the objects of awareness, as well as the rational faculty by which such connections are known. Rationality, moreover, comes in degrees, so that "the more insight one has into the connection of truths, the more rationality one has."[72] The task of inquiry is to increase rationality by discovering ever

[68] DMet. §29; Ont. §71.
[69] By way of illustration, Wolff analyzes the case of warm air bringing about quick growth of plants in the following way: warmth is the reason for growth, and the air, which bears the property of warmth, is the cause of the growth (DMet. §29).
[70] Psy. emp. §483: "facultas nexum veritatum universalium intuendi seu perspiciendi"; DMet. §368: "Die Einsicht, so wir in den Zusammenhang der Wahrheiten haben, oder das Vermögen den Zusammenhang der Wahrheiten einzusehen, heisset Vernunft".
[71] DMet. §373.
[72] Ibid. §370.

greater connection among truths, and therewith to lead the human mind toward a more unified and coherent picture of reality.

The kind of truth toward which the intellect is ultimately directed is what Wolff, following a tradition beginning with Suárez, calls "transcendental truth" (*veritas transcendentalis*).[73] In contrast to logical truth, which concerns only relations of validity of inference, transcendental truth is a property of singular things themselves. Logical truth is a formal or conventional notion governing rules of judgment, which govern conditions for validity. It is also called "complex truth" (*veritas complexa*), for it depends on the composition of concepts into judgments, and judgments into premises and conclusions. Transcendental, simple truth (*veritas simplex* or *incomplexa*), by contrast, is not opposed to the notion of logical falsity, for truth denotes a certain positive fact about a being. Transcendental truth consists in the simple apprehension of what exists as an irreducible, positive fact. On this picture, the ontological profile of a thing involves only the sum of its positive reality—facts about its qualities, quantities, locations, and relations to other beings—and excludes negative predications. The latter are properly conceived as privations of objects, what it necessarily lacks in virtue of being determined to possess a certain predicate. Transcendental truth, which in the tradition had also simply been identified as metaphysical truth,[74] is therefore simple, for the real determinations of a being are either primitive predicates, or reducible to some set of primitive predicates

[73] Ont. §495. Suárez may have been responsible for introducing the term (DM 8 8.1), though the doctrine can certainly be traced further back in the classical scholastic theory of transcendentals. See also Sonia Carboncini, *Transzendentale Wahrheit und Traum* (Stuttgart-Bad Cannstatt: Friedrich Frommann, 1991), 79-81.
[74] Ont. §502. Also: Goclenius, *Lexicon*, 312; Zedler, *Lexicon,* Vol. 52, 896.

belonging to it. In this sense, every being contains truth considered as a degree of reality, or even just *is* true (*omne ens est verum*).[75] In keeping with the separation of logic and metaphysics we noted in earlier authors such as Scheibler, Wolff treats logical truth about universals as subordinate to transcendental truth about individuals such that, “if no transcendental truth is given in a thing, there is neither logical truth of universal nor of singular propositions.”[76] The possibility of valid judgment about reality presupposes, in other words, that there be an actual domain of objects with fixed determinations, or objects possessing a definite profile of simple, positive predicates. A metaphysically significant application of logical formalisms depends on the existence of knowable properties inheinge in things, which, in line with Wolff’s conception of philosophical method, must be accessed in experience. The syllogistic method earns its keep by contributing to the clarification and systematization of the facts of experience, thus revealing greater metaphysical truth. This includes, however, not just an enumeration of simple facts about the world, but also facts about the order among composite things such as machines.[77]

The notion of truth, accordingly, presupposes that of order (*ordo*; *Ordnung*), a transcendental category not found in earlier scholastic authors such as Scheibler or Scharf. Order, as defined by Wolff, is the unity in a manifold of things. In the most fundamental sense, order results from similarity in the manner in which things are

[75] Ont. §497.
[76] Ibid. §499.
[77] Ibid. §495.

simultaneous or successive.[78] Each similarity among a collection of things grounds a possible rule of order, and the more similarities that are distinguished in a manifold, the more distinct its perception. While examples of order range from pair-wise movement of people in a procession, to a sequence of performances, the notion applies most generally to the occurrence of multiple things in space and time. Space, or the order of simultaneous things, consists in the similarity of the manner in which things are related to one another with respect to their geometrical situations, and consists in the set of all positions taken together. The similarity relation upon which the spatial order rests is nothing other than the property of each simultaneous thing of being external to the others, and of being separated from every other things by a determinate degree.[79] Likewise, the temporal order consists in the manner in which the positions of singular successive things is determined. The reason for order, which constitutes the object of knowledge in bodies, consists in the rule-governed manner "by which the positions of singular coexisting or successive things are determined," so that one knows why a particular thing is assigned one rather than another position.[80] Knowing such a rule, whether in the arrangement of planets in the solar system, or in the positions of the parts of a plant, amounts to knowing some of the reality or truth (*Wahrheit; veritas*) contained in things. The degree of knowledge consists in nothing more than the degree of order that is discovered in things: "because reality (*Wahrheit*) arises through the order in the modifications of things, so

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78 Ibid. §472: "Ordo est similitudo obvia in modo, quo res juxta se invicem collocantur, vel se invicem consequuntur"; DMet. §132: "Wenn vielerley zusammen als eines betrachtet wird, und findet sich darinnen, wie es neben und auf einander erfolget, etwas ähnliches; so entstehet daraus eine Ordnung, daß demnach die **Ordnung** nichts anderes ist, als die Aehnlichkeit des mannigfaltigen in dessen Folge auf und nach einander".
79 DMet. §134.
80 Ont. §474.

there is more reality where there is greater order, and conversely less reality where there is less order."[81]

As transcendental order grounds the notion of truth on the one hand, it leads, on the other, to another scholastic transcendental category, that of the good. Wolff renders *bonitas transcendentalis* as perfection: "the agreement in variety, or several things distinct from one another in one thing. Agreement, however, I call the tendency to be obtained from one another."[82] Wolff's definition of perfection purports to collapse a distinction maintained by earlier German scholastics between the categories of the good and of perfection. Scheibler, for instance, distinguishes the two: whereas the good is what is attributed to a thing with respect to other things, perfection is said of a thing with respect to itself.[83] Thus, in the ethical domain, the good consists in the agreement of a state of affairs with the object of a volition. Similarly, the physical or natural good amounts to the harmony of a thing with its nature, thus its operation in accordance with its external ends, as a cat's good might consist in its sleeping sixteen hours during the day in order to better hunt rodents at night.[84] Perfection, however, denotes the intrinsic requisites for a thing to be able to perform those activities good and proper to its nature.

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[81] DMet. §151; Ont. §494.

[82] Ont. 503: "*Perfectio* est consensus in varietate, seu plurium a se invicem differentium in uno. *Consensum* vero appello tendentiam ad idem aliquod obtinendum. Dicitur perfectio a Scholasticis *Bonitas transcendentalis*"; DMet. 152: "Die Zusammensetzung des mannigfaltigen machet die **Vollkommenheit** der Dinge aus."

[83] Op. met. I.xi Comm.: "[B]onum dicitur per respectum ad extrinsecum, ut declaratum est. Perfectum autem dicitur unumquodque praecisè in se. Sicut hinc secundùm bonitatem Transcendentalem, res dicitur bona alii, & secundùm perfectionem, dicitur Bona in se. At ea, quae praecisè sunt in re, priora sunt iis quae rei conveniunt per extrinsecam denominationem".

[84] Ibid. I.x.1 §5.

Scheibler defines natural perfection, for instance, as “that according to which nothing is lacking in a thing for its natural operation.”[85] The perfection of a teacher consists in her possession of a pedagogical power, while her good lies in her exercise of that power to impart learning.

By contrast, Wolff identifies the two categories, and construes perfection as a functional connection in a multitude comprising a unity. Indeed, there is no separate treatment of *bonum* in Wolff’s Ontology. In the case of composite being, goodness or perfection consists in the suitability of the structure of its parts which makes it apt for its proper operations. Unlike for Scheibler, the perfection of a being here is not exhausted by an inventory of powers required for its proper operation. It likewise diverges from another notion of perfection, sometimes suggested by Leibniz, as quantity of essence. Instead, perfection for Wolff indicates a connection of parts in a reciprocal relation of means and ends for the sake of some proper function of the whole. Thus, the structure of the eye exhibits perfection insofar as its parts are in agreement for the production of clear retinal images. A clock’s perfection consists in facts about the mutual fit of its wheels, barrels, and levers in virtue of which it is able to keep time. And the perfection of a human life requires the ordering of a multitude of freely chosen actions toward a single end.[86] Wolff conceives the notion of perfection as proper function appropriate to the

[85] Ibid. I.xi.1 §3. The classical scholastic notion of *perfectio* has broader and narrower meanings. In the broad sense, perfection just means any act or entity. The broad sense is what Leibniz has in mind when he defines perfection as the “quantity of essence”, which God seeks to maximize in choosing a world to create (G VII 303; L 487). In the narrow sense, perfection refers to the acts necessary for something’s being able to fulfill its proper function. The latter sense is operative in Scheibler’s definition.
[86] Ont. §503n.

species of an individual. Each part of the eye, as a certain kind of composite being, has a function in virtue of standing in a certain relation to other parts, such that the proper activity of each part is (partially) grounded in every other. The normative standard for each part, meanwhile, derives from its contribution to the function had by the whole, in this case, the production of clear images by which the eye contributes to a still larger system, and ultimately to the end of the whole organism.

Perfections, thus, constitute a ground or determining reason which makes intelligible the proper function of a thing.[87] Since reasons are rules of order, a perfection is the sort of reason that designates rules of function or purpose. Knowledge of perfections, like other domains of knowledge, results from one of two ways: either by analysis of a composite to reveal the functional connection of its parts, as in anatomy, or by synthesis or construction, as the perfection of a window might be judged with respect to how well it comports with the ends of the builder with respect, perhaps, to illumination, or to offering a view.[88] But in each case, the normative standard for judgment lies in the aptness of the object with respect to a goal or intention for the whole. The notion of perfection converges with the notion of an end (*finis*; *Absicht*) as its source and in accordance with which a rule-governed organization of a multitude is cognized. In the ethical domain, for example: "[t]he moral conduct (*Wandel*) of human beings consists of many actions: when all these agree with one another, such that they are all ultimately grounded in one general end (*allgemeine Absicht*), the moral conduct of human beings is

[87] Ibid. §506: "Rationem illam generalem, per quam intelligitur, cur ea, quae perfecto insunt, ita se potius habeant, quam aliter, dicemus *Rationem determinantem perfectionis*."
[88] DMet. §157-8.

perfect."[89] The function and purpose of a being, whether a human, an eye, or a clock, or even the world taken as a single entity, is ultimately the unified, appropriate end toward which it operates, cognition of which results in knowledge of its perfection.

In effect, Wolff both retains and significantly transforms the classical doctrine of the transcendentals as categories which apply universally to any being whatsoever—*ens, unum, aliquid, verum,* and *bonum* (and, sometimes, *pulchrum*) in the traditional enumeration. On the one hand, Wolff adheres to the thesis of the convertibility of the transcendentals, that the notions of being, goodness, truth, and unity are at root identical; the difference in something's being good, or being true, consists only in a difference in the aspect under which being is thought, in the one case as something's being of value and in the other as its being factive. Or, to put it another way, truth differs from the good only insofar as the former is conceived in relation to the intellect, whereas the latter involves a relation to the will. In the full implication of the convertibility thesis, anything that is a really existing being, thus not a mere thought-entity, is also necessarily a source of goodness, contains truth, and is a unified thing (and, perhaps, apt to be correctly judged as beautiful).[90]

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[89] DMet. §152; Ont. §503n.

[90] Aquinas expresses the convertibility of goodness and being as follows: "Goodness and being are really the same, and differ only in idea; which is clear from the following argument. The essence of goodness consists in this, that it is in some way desirable. Hence the Philosopher says (Ethic. i): "Goodness is what all desire." Now it is clear that a thing is desirable only in so far as it is perfect; for all desire their own perfection. But everything is perfect so far as it is actual. Therefore it is clear that a thing is perfect so far as it exists; for it is existence that makes all things actual, as is clear from the foregoing (Q3, A4; Q4, A1). Hence it is clear that goodness and being are the same really. But goodness presents the aspect of desirableness, which being does not present" (ST I.v.1).

We have already seen Wolff affirm, “every being is true,” insofar as it contains positive reality. His discussion of perfection carries his commitment to the doctrine of convertibility with the thesis that every being contains transcendental goodness, insofar as its reality resolves into the goal-directed rule of order, or of perfection, according to which its acts are organized. Everything that exists, or could conceivably exist, contains a degree of goodness proper to its kind with respect to the world of which it is a member, so that nothing, which can be acknowledged as possessing positive reality, be it material or spiritual, should be without its proper function or purpose. At the same time, Wolff expands the catalogue of the transcendentals to reflect the ontological commitments of his mechanical worldview. This is reflected in his explication of truth and goodness from the newly-introduced transcendental category of order, the inspiration for which lies in his notion of a machine as a composite being conceived essentially through a rule-governed order of its structure. Organic bodies best exhibit this convergence, as the structure of the eye contains the sufficient reason for its appropriate (*aptum*) activity.[91]

Wolff, thus, deploys the language and some of the core commitments of scholasticism in service of a new vision of the nature of reality as a machine or mechanism, exemplified in the ubiquitous early modern metaphor of the clockwork. Transcendental truth and goodness are now understood through the concept of order in a multitude, just as the parts of a clock manifest order in their structure to produce effects

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Suárez concurs (DM 10.1.16), as does Scheibler (I.x.3.1). See Scott Macdonald, “The Metaphysics of Goodness and the Doctrine of the Transcendentals,” in *Being and Goodness,* ed. Scott Macdonald, 31–55 (Ithaca, NY: Cornell University Press, 1991) for a helpful discussion of the convertibility thesis in medieval scholasticism with especial reference to Albert.

[91] Cosm. §278.

inconceivable through the capacities of any single wheel or lever. To know reality in the mechanical philosophy just is to know its structure:

> To philosophize mechanically about existing things in the observable world is to explain in an intelligible way (*intelligibili modo explicat*) the changes, which occur in them, through their structures, textures, and mixtures, or from their manner of composition according to the laws of motion.[92]

We can discern in Wolff's ontology his persistent concern to reconcile the mechanical view of nature with the Aristotelian one. In a period that would give rise to a distinctly modern division between the realm of facts and the realm of values, we see Wolff as striving to retain the old unity of being as constituted by both. The view of the world as inert, passive, and an object for craftsmen both divine and human is, for Wolff, a methodological privilege to be accorded to the physical sciences, but not an ultimately viable conception of reality in its widest signification.

4. Principles and causes

The conception of the world as a well-ordered machine underpins the project of Cosmology as a theoretical discipline. Wolff's notion of the world is one of an interconnected totality of singular things, intelligible insofar as the ground of its changes consists in its structure. In the reasons for the order of composition of its parts lies its essence, the ultimate object of Cosmology. Specifically, the essence of the world as "a

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[92] Ibid. §75.

series of changeable things (*die Welt eine Reihe veränderlicher Dinge sey*), which are next to one another and follow one another, yet are altogether connected with one another" consists, as we have seen, in two kinds of order: an order of simultaneity, or space, and an order of succession, or time.[93] Each thing in the world constitutes part of the reason why another follows it in time, or coexists with it in a certain position in space. For Wolff, the study of nature is further subdivided by virtue of two different manners of connection among spatio-temporal things: one due to efficient causes, or how one thing causes another to come into being, either as such or by causing a modification in its state; and the other through final causes, or how one thing exists for the sake of another. Thus,

> the connection of material things (*nexus rerum materialium*) is dependent on final and efficient causes… the dependence on final causes, or the connection of things, insofar as it originates from divine ends, brings divine wisdom into the world… By contrast, the dependence on efficient causes, or the connection of things, insofar as the effects result from their causes, brings truth and divine reason into the world.[94]

The world, for Wolff, turns out to be a material totality of beings related by efficient and final causality, a spatio-temporal whole purposively arranged in rule-governed connection by God. These connections are of two sorts. As productive relations between beings determined in time, the parts of the world are connected in relations of succession. But as relations between beings that reciprocally sustain and modify one another in both

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[93] DMet. §544; Anmk. §175; Cosm. §55.
[94] Anmk. §176.

space and in time, the world also instantiates relations of simultaneity. Minimally, for Wolff, the serial connection of things as successive parts leading to a whole exhibits the character of a series of efficient causes; the reciprocal connection of parts governed by an idea of a whole—as in the contingent arrangement of bodies in a solar system, or in the parts of a clock—by contrast, exhibits the distinctive for-the-sake-of character of final causality. Investigation of the efficient and final causal order of nature reveals, on the one hand, truth in things according to their relations as grounds and consequences in the divine intellect; and, on the other, the perfection of the world as a plurality of things unified and ordered by an ultimate end of the divine will.

4.1. Cause as principium fiendi[95]

Wolff's generic definition of cause represents a further development of the scholastic conception we encountered in the first chapter: "A *cause* is a principle on which the existence or actuality of another thing separate from itself depends, both insofar as it exists and insofar as it exists in such a way."[96] Like Suárez, Wolff understands cause in a wider sense of dependence, and in a narrower sense of production. The productive character of cause, for Wolff, is that which is responsible for imparting being to a thing

[95] In this section I follow Wolff's treatment of causation in the Latin *Ontology.* The Latin discussion far outstrips that of the *German Metaphysics*, which contains nothing even remotely comparable. A single paragraph there covers the efficient cause or *"würckende Ursache"*, as "that thing, through the activity of which the possible is brought to actuality, that is, something is brought forth" (DMet. §120). By contrast, an entire chapter is devoted to causation and the four Aristotelian causes in the Latin *Ontologia*.

[96] Ont. §881: "*Causa* est principium, a quo existentia sive actualitas entis alterius ab ipso diversi dependet tum quatenus existit, tum quatenus tale existit."

through a real, physical relation. But Wolff further specifies causation as a principle of existence, whether of something *simpliciter*, or of the particular way something exists (*tale*). In typical fashion, Wolff regards his treatment of cause as conforming to, while at the same time refining the "received notions," by which he identifies the scholastic theory of cause and its four species, and those of Cartesians such as Clauberg. Also, like his neo-scholastic predecessors, Wolff places overwhelming emphasis on the efficient cause as the paradigm of causation, a tendency betrayed not just by the disproportionately lengthy discussion he devotes to it, but also by his frequent use of *causa* to refer simply to efficient cause, and using the terms *finis*, *forma,* and *materia* by themselves to refer to the other three Aristotelian causes. As we shall see, Wolffian causation centrally consists in the activity of force-bearing entities in producing effects. The other Aristotelian categories of cause are properly construed here as a different kind of explanatory principle, rather than active causes as such. Just as form and matter became, for Suárez, principles of composition, the final cause becomes in Wolff's hands an idea directing an agent toward its advantage.

Wolff's definition of cause, in the first place, seals the fate of form and matter as causes in only a derivative sense. His definition follows from a new, and controversial, tripartite division in the higher genus of principle: *principia essendi* (of being, or essence), *fiendi* (of becoming), and *cognoscendi* (of knowing). In Wolff's usage, a *principium essendi* contains the reason for the possibility of another, while a *principium* *fiendi* gives the reason for the existence or actuality of another thing.[97] A *principium cognoscendi*, meanwhile, is a proposition or description under which a being is understood.[98] The capacity of a stone to receive heat, for instance, is a *principium essendi*, insofar as it grounds the possibility of the stone becoming hot. The capacity is grounded in its form, or its essential attributes, and, insofar as it is a composite being, in its matter.[99] But the existence of heat in the stone requires the activity of an external principle. To take another example: the wood and brick are *principia essendi* of a house, the actuality of which depends on a house-builder as its *principium fiendi*.[100] In defining cause in general as a principle of actuality rather than of possibility, or of becoming rather than of being, Wolff advances an earlier movement of thought toward delimiting the proper scope of causal explanation to the activity of efficient causes which result, paradigmatically, in local change in the properties or states of things. Causes, in the strict sense, are substances, which produce arrangements of form and matter, arrangements which would not have come into being were it not for the activity of force-bearing agents.

Wolff's threefold division breaks with an earlier, twofold distinction between *principium essendi* and *principium cognoscendi*. The former species included, for authors such as Suárez, Fonseca, and Scheibler, all the principles in which both the essence or nature of a thing, thus both its possibility and its operation, consist. Not just the form and matter of a substance, but also its suite of causal dispositions from which its

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[97] Ibid. §874: "Quodsi principium in se continet rationem possibilitatis alterius, *principium* dicitur *essendi:* si vero rationem actualitatis, *principium fiendi* appellatur."
[98] Ibid. §876: "*Principium cognoscendi* dicitur propositio, per quam intelligitur veritas propositionis alterius".
[99] Ibid. §944; §948.
[100] Ibid. §880n.

modifications follow should originate from a common source. Consequently, the question pertaining to the *principium essendi* of most interest to Suárez concerns the problem of individuation, of whether and how essence can suffice for the individuation of a hylomorphic substance.[101] A similar concern animates Leibniz's 1663 dissertation on the principle of individuation, where the twofold division serves as a point of departure for articulating the real or "physical" principle of individuation in created substances.[102] Neither author is concerned, as is Wolff, to separate a principle to account for the perduring attributes of a substance, from one that accounts for its variable modifications. In between Suárez and Leibniz, the Calvinist metaphysician Rudolph Goclenius (1613) records a division between *principia essendi* and *fiendi*, but only within a broader category of "real" principle, as a distinction between a completed reality inherent a thing, and that which is in process of becoming.[103] In the same vein, Goclenius places *principium operationis* in the wider category of *principium essendi*.

A step toward the origin of the Wolffian distinction occurs with Scheibler (1617). In his discussion of *principium* and *principiatum,* Scheibler considers a possible opposition between principles of being and becoming, but ultimately rejects a real

[101] The topic of DM 5.
[102] G IV 2: "Principii quoque vox notat tum cognoscendi principium, tum essendi. Essendi internum et externum. Quare ut haec colligam, agemus de aliquo reali, et, ut loquuntur principio Physico, quod rationis individui formalis seu individuationis, seu differentiae numericae in intellectu sit fundamentum, idque in individuis praecipue creatis substantialibus."
[103] Goclenius, *Lexicon,* Art. PRINCIPIUM, p.872: Esse rerum est:
Reale:
- Ut iam perfectum. Huius principium dicitur Essendi.
- Ut est in fieri, seu ut incoatum: Huius principium dicitur Effectionis seu Fiendi.

Obiectiuum: Huius principium dicitur Cognitionis seu Cognoscendi.

division between them. He reasons that the former not only encompasses what a thing is essentially, but also the possibility of what could come to be in it.[104] Instead, Scheibler introduces a further division between causal and non-causal principles, defining the former principle as that which has a true influence (*influxum*) in another thing, and the latter as a condition, as privation is a condition but not a cause of motion, or the Father in the Trinity is a condition of the Son, but does not exert *influxum* by a transfer of properties.[105] Scheibler, following Suárez, construes *causa* narrowly through the notion of physical or real influx as that principle of being "upon which, or upon the influence of which, another thing depends."[106] The preservation of the *essendi/cognoscendi* distinction, together with the conception of *causa* as *principium essendi* insofar as only physical influence is a reason for the real occurrence of change in, or existence of, another thing, is retained in Johann Micraelius' *Lexicon* of 1652.[107] The Berlin-based Cartesian, Etienne Chauvin, likewise recognizes in his *Lexicon* (1692; reprinted 1712) only the standard distinction, which he also glosses as one between *principium rei* and *principium cognitionis*. However, within the former, Chauvin marks a subdivision between a principle of origination (*originationis*) and dependence (*dependentiae*), identifying causality in the wider signification as a "principle of dependence." Chauvin's specific notion of dependence is that of an effect due to force. Thus, he defines *causa* as "a principle from which an act or effect arises," which, strictly speaking, can be nothing

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[104] Op. met. I.xxi.5.1: "Dicitur adeò principium essendi, non solum quod concurrit ad esse rei, sed etiam quod concurrit ad fieri rei."
[105] Ibid. I.xxi.5.2.
[106] Ibid. I.xxii : "Causa est principium, unde (vel à cujus influxu) pendet aliud."
[107] Micraelius, *Lexicon*, Art. CAUSA, 213: "*Causa* est Principium essendi incomplexum, reale, unde esse alterius dependet."

other than the efficient cause in which consists the force by which a thing is moved.[108] The separation of physical causation, as the activity of things due to force, from the notion of a condition as a disposition or enabling factor for the production of effects by force-bearing entities is well-prepared by Wolff's time.

A direct precursor to Wolff's threefold division between *principia essendi, fiendi*, and *cognoscendi* is Johann Georg Walch (1693-1775), a Pietist theologian at Jena and vehement opponent of Wolff. In his *Philosophisches Lexicon* (1726), Walch identifies *principium fiendi* simply with cause, or that "which makes it the case that something reaches its actuality," whereas the *principium essendi* "gives a thing its essence, as matter and form to a body." Walch, however, does not affirm the standard distinction, noting that the principle of being taken in a wider sense comprehends both, and, as with Scheibler's treatment of the relation between principle and cause, can be subdivided in causal and non-causal significations. One suspects that, for Walch and for others in Thomasius' circle who were broadly skeptical of scholastic philosophy, the entire matter of defining principles and causes is empty word play.[109]

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[108] Chauvin, *Lexicon*, Art. *Causa rei*, p.95: "causa aliis definienda videtur, *cujus vi res est;* per vim autem intelligunt efficaciam aut actionem, qua intermedia res sit. Atque sic ratio formalis seu essentia causae propriè dictae consistit in actione. Unde, si stricte & loquamur, non alia est causa quàm efficiens. Causa etiam dici potest, *principium à quo oritur actio, aut effectus*."

[109] Walch, *Lexicon,* Art., "Principium", in vol.2, 2057-8: "Das principium fiendi ist die Ursach, welche gemacht, daß etwas seine Wircklichkeit erreicht, dergleichen der Schuster in Ansehung des Schuhes, der Schneider in Ansehung des Kleides sey. Dasjenige aber, welches einer Sache ihr Wesen giebt, ist principium essendi, wie die Materie und Form bey einem Cörper, auf welche Art solches dem principio fiendi entgegen gesetzet wird. Doch nimmt man selbiges auch in weiteren Sinn, daß es zugleich das principium fiendi unter sich begreifft, in welchem Verstand selbiges insgemein in den

Wolff, by contrast, embraces the separation of a principle of being from one of becoming. Whereas the former properly finds employment in Ontology, or the science of pure *possibilia*, the latter is operative in explanations in the actual world. In particular, as a principle of actuality (again, of something as such or of its modes), the *principium fiendi* can be identified with the notion of force, or the principle of motion and change.[110] The cause of change through the interactions of material parts in space in the actual world lies in the effective forces in created substances, rather than in their individual essences. Wolff, in effect, divides the internal (matter and form) and external (efficient and end) causes into principles of possibility and actuality, respectively. The internal principles belong to general metaphysics and the elucidation of the attributes of possible kinds of substance. The explanation of change in corporeal things, meanwhile, focuses on the external causes. Put another way, Wolff separates the project of explaining phenomenal change in the properties and states of existing things, the subject matter of the physical sciences, from the project of giving metaphysical accounts of essence. Among the external causes of becoming, as we shall see, it is the efficient cause that takes priority in explaining how modifications in bodies come about through the rule-governed transfer of force. The final cause, by contrast, is a further determination resulting from the involvement of an intellectual agent, who presupposes the efficient causal determination

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Metaphysicen genommen wird, wenn man solches nebst dem principiato als eine Eigenschaft des Entis ansiehet. Man theilet dasselbige in das principium caussale, welches eben das, was man sonst caussam nennet, von der oben gehandelt worden, und in principium non caussale, davon eine Sache nur den Anfang nähme, wie, z.e. die Morgenröthe das Principium des Tages; der Weg zum Thor hinaus das Principium zur Reise sey."

[110] Ont. §869-70.

of natural events as grounds and consequences.[111]

4.2. Efficient cause and end

Wolff's doctrine of the efficient cause comprehends all the technical detail relevant for an account of phenomenal change in composite being in general. Wolff defines efficient cause as "*such a being… whose action is the reason for the existence of another,*" and in which "there is both power and force of acting."[112] He further analyzes the relation of efficient causality through a series of distinctions drawn directly from Clauberg—whether a cause is *causa procreans* or *conservans, remota* or *proxima, principalis* or

[111] In the following century (1813), Arthur Schopenhauer, *On the Fourfold Root of the Principle of Sufficient Reason,* trans. Karl Hillebrand (London: George Bell, 1903), §10, would recognize Wolff's achievement in distinguishing the essence from cause as two significations of the principle of sufficient reason, and criticize him for retaining the former. In Wolff's own time, the situation is complex, and it is unclear when Wolff settled on such a division within the principle of reason. One thing that is clear just from a comparison of the German and Latin works is that Wolff's thinking around causation underwent considerable evolution in the 1720s. Wolff's student, Ludwig Phillip Thümmig, whom Wolff frequently praised as a reliable interpreter of his thought (e.g. AN §81), flatly identifies *principium essendi* with *causa* in his 1725-6 *Institutiones philosophiae Wolfianae* (Inst. §93). Bilfinger, another of Wolff's students, only considers the threefold distinction in a dialectical context as an "irksome question" raised by his opponents (Budde, perhaps) surrounding the use of the principle of sufficient reason with respect to God's existence (Diluc. §391). Alexander Baumgarten retains the division in his *Metaphysica* (Met. §§306-13). Christian Crusius, in contrast, returns to the older position, recognizing only a distinction between a real and an ideal reason, or one between *"principium fiendi vel essendi"* on the one hand, and a *principium cognoscendi* on the other. Crusius rejects any essential difference between the concept of a cause and that of any other ontological ground in a lengthy and influential critique of Wolff's teaching on the principle of sufficient reason, or what he prefers to call "determining reason."

[112] Ont. §§886-7: "*ens sit causa efficiens alterius, cujus actio est ratio existentiae alterius";* "*in causa efficiente datur & potentia, & vis agendi."*

instrumentalis, solitaria or *socia*, and *adequata* or *inadequata*.[113] For, except with respect to the general condition that every cause precede its effect, not every efficient cause is related to its effect in like manner.

For example, events form a series in which they are connected as causes and effects proximately or remotely depending on their situation in a causal series, a manner of connection which allows for their subordination when the action of a proximate cause depends on the prior action of a remote cause. If the causality of B to bring about C depends on the action of A as the cause of B, then A, B, and C are subordinated as mutually related causes and effects.[114] Within such a series, causes may have the status of instruments, rather than principal causes. Wolff terms an instrumental cause one which guides the active power of an agent, but lacks the requisite force to bring about the effect. A sword by which a wound is produced, for example, is an instrumental efficient cause in the agency of the swordsman as the principal cause in whom the force transferred to the sword originates.[115] The designation of "efficient cause," thus, is ultimately relative to the event under analysis. Something could count as an efficient cause by virtue of having had force transferred to it, as a sword or a ball that carries merely impressed force could nonetheless be regarded as the proximate cause of an effect. Conversely, in relation to God, even a human artisan is merely an instrumental cause of her products, insofar as God alone is the "sufficient efficient cause" of any finite effect.[116]

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[113] Cf. Met. de ente. 61-3.
[114] Ont. §889-95.
[115] Ibid. §890n.
[116] DMet. §1031.

Nevertheless, causal knowledge of phenomena can enjoy a greater or lesser degree of sufficiency, depending on the degree of distinctness achieved in any chain of efficient causes. Indeed, precision in the explanation of the chain of causes, whether these are analyzed locally as remote or proximate, principal or instrumental, is the goal of physical knowledge, "where we take pains to pursue not only distinct, but also as far as possible adequate notions of effects of actuality, or the way in which they could be determined."[117] Any composite system contains a complete description in terms of efficient causes and effects, or of changes in the structural properties of parts interacting through reciprocal changes in their quantities of force. Yet, the parts of the whole, each operating as an efficient cause, and thus as having "both power and force of acting," need not possess force intrinsically. It is sufficient for their status as producers of effects that material parts have derivative force, whether originally impressed by another finite agent, or directly by God. The world itself, understood as a *series* or *succession* of events or things, thus has the character of a chain of efficient causes and their effects. In this series, the designations of cause and effect always have to be contextualized to a specific, partial system of bodies under analysis, thus relative to the delimited explanatory goals of the student of nature. Since God alone ultimately enjoys the status of an efficient cause *simpliciter*, only knowledge of divine causation would constitute knowledge of the ultimate efficient cause of any finite thing. In physical research, by contrast, causal

[117] Ont. §896n: "Propositio praesens [i.e., *Adaequata actualitatis effectus cognitio consistit in distincta notione subordinationis causarum*] usui est in Physica, ubi non modo distinctam, verum etiam adaequatam, quantum datur, actualitatis effectuum, seu modi, quo ea determinata fuit, notionem consequi studemus. Et omnis profecto de causis, praesertim efficientibus theoria ontologica viam monstrat, qua sit in Physica eundum, ut solidam rerum naturalium cognitionem consequamur."

explanation aims at identifying the efficient causes of changes in properties, for which the category of cause admits a range of specifications.

Wolff restricts the final cause sharply to an ideal existence. He defines the end or final cause in the familiar locution of "that for the sake of which an efficient cause acts," and also in the Thomistic formula as the "cause of the action of the efficient cause."[118] Perhaps unwittingly, Wolff draws the full consequence of the classical statement of the final cause within a mechanistic metaphysics. For if an efficient cause acts in order to bring about a certain effect, as the architect acts to produce a house, then the end can simply be identified as the effect resulting from any efficient cause or force-bearing agent.[119] Where such an agent possesses intellect, and therefore the capacity to cognize an effect as possibly resulting from efficient causal action, the relation of cause and effect should instead be considered as one of means and ends:

> Since the effect is the end, and the action of the efficient cause is the means for its following; *in the series of contingent things, in which the immediately preceding is the cause of the following, things can be mutually subordinated in such a manner that the subsequent are referred to the preceding as ends to means*.[120]

The consideration of causes and effects as means and ends, respectively, only signifies a

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[118] Ont. §§932-3: "Id propter quod causa efficiens agit, dicitur *Finis*, itemque *causa finalis";* "finis est causa actionis causae efficientis".
[119] Ibid. §934.
[120] Ibid. §939: "Quoniam itaque effectus est finis, & actio causae efficientis medium eum consequendi (§938); *in serie rerum contingentium, quarum praecedens continuo est causa sequentis, res ita invicem subordinari possunt, ut sequentes referantur ad praecedentes sicuti finis ad medium*."

special case of *efficient* causation, namely, one in which the cause follows from an intelligent agent's cognition of an effect prior to its occurrence. It remains true that "every cause is prior to the effect," even in cases where intention and, consequently, final causes are involved.[121] Any causal chain between two things or events reduces to an ontologically basic relation of succession as ground and consequence, where the former requires the exercise of force to bring about the latter. This character of causation as a relation of prior grounds and posterior consequences obtains regardless of whether the *relata* are also representations of means and ends, or mere events related in rule-governed temporal succession. In an analysis of a causal series, things are connected as producer and produced in linear temporal sequence, and may be nominally classified further as proximate or remote, or principal or instrumental, or single or conjoint, as the case may be. If the causal series is the realization of a plan represented in a rational mind, however, it is not just a series of causes and effects, but is also produced ideally (*idealiter*), and thus presupposes an intelligent agent to cognize (*praecognoscere*) the effects that would result from certain acts.[122] A proper consideration of the way in which cognition of ends produces action requires passing over from the domain of Physics into those of Psychology and practical philosophy, and ultimately to Natural Theology, or from the sciences of bodies to the sciences of souls.[123]

The notion of an end, consequently, retains only an attenuated significance within

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[121] Ibid. §906.
[122] Ibid. §936.
[123] Ibid. §939n: "Maximi momenti est propositio praesens. Sed plura de iis, quae ad mediorum atque finium notionem spectant, tradentur partim in Psychologia, partim in philosophia practica universali, tanquam genuina doctrina hujus sede."

the ontology of the material world as such, and, continuing a process begun in the sixteenth century, finds its proper explanatory role in the domain of intentional action. Ends just are representations, and therefore presuppose an intellect for their efficacy. Wolff's separation of the roles of ends and efficient causes is expressed tellingly in his rendering of *finis* in German with the cognitively significant term *Absicht* (purpose, intention, aim), while glossing *causa efficiens* simply as *Ursache* (cause). At the same time, the concept of an end, and therewith an intentional ordering of causes as means and ends, remains central for the possibility of construing the world as a *system* of events manifesting divine providence, as a cosmos, rather than as a blind succession from an initial state of matter. The possibility of the world as an ordered totality, such that the significance of each part derives from its place in maintaining the stability of the whole, requires, for Wolff, viewing the world as the product of a designing intelligence, which has ordered the series of efficient causes in such a way as to achieve its ends. If God or Nature does nothing in vain, then the chain of causes must also be regarded as purposively ordered for the realization of a plan represented in a mind.[124]

5. The cosmological order

Accordingly, the categories of efficient cause and final cause find distinct employment in the constitution of the *mundus adspectabilis*. The structure of the world, recall, possesses two dimensions of order: things are connected to one another as successive and as

[124] DMet. §1048.

simultaneous. Whereas the successive order of things consists in their relation as efficient causes and effects, the simultaneous order of things, or their coexistence in community, requires the institution of a connection through "reasons of finality" (*rationes finales*).[125]

Wolff introduces a teleological nexus as constitutive of the world by arguing for the inadequacy of an efficient causal connection to explain the community, or mutual coexistence, of things. In the first place, Wolff observes the limits of dead force (*vi ortus*) to account for spatial order in a system of bodies. That is, when A is the efficient cause of B, then the dead force by which A produces B could only grounds a relation of succession, not one of coexistence. For if A is the efficient cause of B, thus contains the requisite force to bring about a certain state of B, then A must exist before B. However, the productive activity of A does not explain why it then coexists with B, "since with respect to the actuality of B itself, it is just as if A had ceased to exist." Thus, while it is indeed the case that A and B are connected together as cause and effect, when the connection is only due to efficient causation, it could merely have the character of succession, not of simultaneous existence.[126] The thrust of Wolff's argument, specifically, is that efficient causation, understood as a change in size, figure, motion, or position by the transfer of force paradigmatically in an event of impact or collision, does not sufficiently explain the reciprocal existence of stable properties in a system of

[125] Cosm. §31.
[126] Ibid. §27: "*Si rerum coexistentium una est causa efficiens alterius, altera vi ortus cum priori connectitur, quatenus successivae sunt, non quatenus coexistunt…* Si A est causa efficiens ipsius B *per hyp.* in actione ipsius A continetur ratio sufficiens existentiae ipsius B (Ont. §886), consequenter cum A sit prior ipso B (Ont. §907), quatenus post A existit. Enimvero cum per eandem actionem non intelligitur, cur B postea ipsi A coexistat, quoniam respectu actualitatis ipsius B perinde est, ac si A existere desiisset; nulla in A, quatenus est causa efficiens ipsius B, continetur ratio coexistentiae eorum."

interacting things. A parent's generation of an offspring does not explain the continued existence of the parent. The Sun's effect of warming the Earth, likewise, does not account for the continued existence of heat in the Sun. Ultimately, the moving or living force (*vis viva*) in bodies originates in God as the first efficient cause of motion in the world. But explanations of the production of different states in bodies by impact and collision, the kind of explanation rendered in Physics, is limited to what is conceivable as a result of finite, corporeal forces.

In the same vein, Wolff argues that the production of simultaneous, distinct effects by a common cause does not establish a relation of coexistence among effects. The action of the Sun simultaneously produces distinct effects in the stone and the garden soil, producing heat in one and dryness in the other. Insofar as the heat in the stone and in the soil are viewed merely as distinct products of the force of the Sun, their connection to one another as coexisting things remains unexplained.[127] Once again, Wolff's point is that an efficient causal connection is insufficient to explain a thoroughgoing connection of all things, as a community of objects as possible causes and effects of their states. Wolff's commitment to an intelligible account for any state of affairs entails that not only must there be an intelligible explanation for the presence of certain determinations in the stone and the soil, but that there must also be reason for their co-occurrence. No state of affairs in the world can be due to pure chance; hence, the connection of things insofar as they coexist must have a reason.[128] Such a reason cannot be given by an efficient causal connection of successive events; therefore, a connection of simultaneity or coexistence

[127] Cosm. §30n.
[128] Ibid. §96: "*In mundo, etiam adspectabili*, *casus purus dari non potest*."

must require a different kind of connection.

It is worth pausing here to note that Wolff shares with Leibniz (and as we shall see, with Kant) a commitment not only to the unity of organic and inorganic nature, but also to the univocality of explanation. Room for teleological conceptions opens wherever contingent law-governedness appears. Not just the functional arrangements of plant and animal bodies, but also chance agreement of mathematical laws to produce stable organizations of planets, ecological harmonies, and meteorological regularities present occasions to reflect on contingent reasons in nature. As Kant would express the situation later in the century: "A plant, an animal, the regular arrangement of the world's structure (presumably thus also the whole order of nature)—these show clearly that they are possible only according to ideas."[129] The world's structure, as a rule-governed community of distinct objects, requires a representation of the unity in its diverse elements, or an idea of the whole.

While the example of the stone and the soil is perhaps less compelling for the claim that "those things which are connected among one another are dependent on one another for their existence," Wolff's principal examples of the kind of connection he doubts can be fully explained by efficient causal production turn out to be, unsurprisingly, biological.[130] The connection of organs in the human body provides a prime example of things ordered in such a way that one contains the ground for the states and operations of the other. The reason for the connection of the stomach with the gullet

[129] A317/B374.
[130] Cosm. §14.

and the intestines, for instance, consists in the goal-directed activity of the digestive system as a whole, for which each part requires the operation of the others.[131] The parts are organized in such a way that a) each is only possible in relation to the whole (a disemboweled stomach would only be called "stomach" homonymously); and b) that the parts are unified such that not only do the parts determine the whole, but also the whole determines the parts. In the human organism, the organs are possible, *qua* stomach, gullet, or heart, only insofar as each acquires a determinate function in the economy of the body machine. Conversely, the organism as a whole depends on the interconnected suite of functions for its continued existence. The coordinated operation of the system requires appeal to an overall function or purpose, a perfection of the whole, which, Wolff argues, remains unintelligible as a mere succession of events. But Wolff also extends the underlying thought, that things in the observable world acquire their determinations at least partly in terms of their connection to other things, to the inorganic domain as well. Thus, the Sun is, in a sense, for the sake of the Earth, insofar as part of the reason why it is precisely the being it is, or part of the reason for its thoroughgoing determination, consists in its continuous, regular activity with respect to the Earth.[132] Rainfall, similarly, is caught up in a reciprocal causal nexus with the heat taken up by bodies of water, the patterns of wind, the soil upon which it falls, the plants that grow as a result, and the

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[131] Ibid. §12n: "Quodsi ergo gulam, ventriculum & intestina tanquam organa consideres, ex functionibus eorum apparet, cui coexistere debeant. Etenim per gulam in ventriculam cibus demittitur, in ventriculo digetitur, in intestinis chylus a digesto separatur & faeces per ea secernuntur. Quia cibus in ventriculo digeri nequit, nisi in eundem immitatus, gula autem cibo in ventriculum demittendo servit; ex functionibus eorum constat, cur gula cum ventriculo connectatur. Similiter quia cibus in ventriculo digeritur & a digesto in intestinis chylus separatur, ac faeces reliquae per ea excernuntur; ex utriusque organi functionibus intelligitur, cur intestina cum ventriculo connectantur."
[132] Ibid. §11n.

animals that feed on them. Each entity in such a nexus of successive and simultaneous things, for Wolff, exists in a *for-the-sake-of* relation, insofar as their interdependence determines the place of each in the order of nature. From the point of view of knowledge, the complete intelligibility of any part requires knowledge of the reciprocal relations in which it stands to every other part. Thus, since things are not just connected in sequential relations of producer and produced, but also ordered as means and ends, instruments and users, or tools and beneficiaries, a different kind of principle is required.

Tellingly, Wolff does not straightforwardly designate as "final cause" such a principle from which a purposive order of parts arises. Instead, such a connection arises, Wolff writes, from "reasons of finality" (*rationes finales*), or when "an intelligent agent produces the cause on account of an existing or possibly existing effect [*causatum*]." In such a case, the effect is "the end for the sake of which it [the agent] acts" and the cause by which it is produced is a means.[133] A reason of finality, in other words, is a principle of connection by which the successive nexus of efficient causes and their effects unfolds according to an end. In keeping with the later scholastic legacy, such reasons presuppose an intelligent agent, capable of representing means-ends relations. The existence of any mechanical system, insofar as it can be regarded as the realization of a represented intention, thus, is both a result of efficient causes as well as ends.

But Wolff's terminology here betrays his ambivalence concerning the status of the end as cause, for he does not apply the language of "cause" equally to both orders of connection. Instead, he labels the relations of causation and community equivocally as

[133] Ibid. §31.

"causality" and "reasons of finality."[134] One suspects that, even in Wolff's deeply teleological conception of the order of nature, the causal relation that is constitutive of production in the physical world tracks, strictly speaking, the relation of efficient causes. Machines, or composite bodies, are essentially constituted by non-vital or non-spiritual parts, the attributes of which are those of size, figure, position, and motion, and whose modifications are governed by dynamical-mechanical laws of impact and collision. An explanation of the purposive interconnection of material things, as reciprocally ordered to coexist in mutually determinative community, requires the representation of an end or a design. It thus has its ground outside the series of contingent things in the divine mind. While the world is indeed full of God's intentions, insofar as God has directed all things to express a certain part of his own essence, such ends are not, in an important sense, *natural ends*, inasmuch as they are not internally represented by the natural beings that express purposeful order. Instead, they are better understood as *ends of nature*, or ends insofar as they are ends given to natural beings represented by an agent separate from them, namely God.[135] Natural agents such as stones and swallows do indeed possess functional organization, insofar as their perfections follow from their possession of a certain species essence. However, in the absence of representational and judgmental capacities, their functional perfections depend on God's knowledge of their essences. Natural agents are only externally directed to their ends.

Wolff's preference for an external teleology of composite beings represents a deliberate departure from the solution favored by Leibniz. Given the appearance of a

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[134] e.g. Ibid. §32.

[135] To use Kant's terminology from the *Critique of the Power of Judgment*.

purposive connection among things, Wolff could follow Leibniz in ascribing the source of functional order to the existence of souls underlying appearances. For Leibniz, the universal harmony of things is grounded in internal representations of created, soul-like simple substances, the building blocks of Leibnizian reality. The ends of natural things are, for Leibniz, quite literally their own ends, however dimly perceived, and each unified material object—paradigmatically, an organism—is the result of an internal plan represented in its soul. Since Leibnizian substances are causally isolated bearers of primitive representational force, there is no need to posit any real transfer of force or God's re-creative interventions to explain the successive, goal-directed changes in the states of an individual. Aggregates of substances, such as armies or ponds, are likewise rendered intelligible ultimately through the coordination of the representations of the substances from which they result, rather than through any external causal influence. The order of nature, according to Leibniz, is the product of an order immanent in each of the causally isolated, spiritual substances that make up the world, rather than through any real relations between created substances.

Already in the Preface to the Cosmology, however, Wolff signals the irrelevance of the Leibnizian position for his conception of natural order and for the unification of efficient and final causes: "to me it is all the same whether one makes Leibnizian monads the most important things, or condemns and rejects them."[136] Instead, Wolff affirms his commitment to characterizing all change in the physical world as due to laws of motion among separately existing and interacting material parts. Thus, the presumption in

[136] Cosm. *Pref.*: "Mihi enim perinde est, sive quis monades *Leibnitianas* maximi faciat, sive eas damnet atque rejiciat."

judging finite beings, or “those which have the reason for their modifications outside themselves in other things,” and which are or appear to be in causal interaction, is always that they are connected as efficient causes and effects, even if the connection is not easily observable (*non facile observabili*).[137] The appearance of causal interaction through modifications of external, space-filling parts by measurable and predictable changes of force requires judging them as connected in relations of efficient causation. At the same time, wherever things appear to be reciprocal causes of their changes, thus appear to be connected as means and ends, they should be presumed to have been arranged by an intelligent agent in their determinate succession.[138] The appearance of a means-ends connection warrants, for Wolff, investigating the object as if it were the product of design, on pain of abandoning its intelligibility. Thus, with respect to physical events in the narrow sense, the use of teleological reasoning emerges primarily as heuristical. A means-ends connection of physical parts indicates the presence of design and intelligence; consequently, such a system should be investigated as the product of an end. Wolff affirms the limited place of analogical reasoning between the products of nature and of art in Physics:

> when one comes to nature, one must not admit any effects similar to those of art, until one either shows such effects, or from the present [state of affairs] can infer things or effects similar to those of artifacts, that the same causes must obtain in

[137] Ibid. §46.
[138] Ibid. §47: “Etenim si entia finita vel sunt, vel appareant suarum mutationum causae, mutationes unius quoad actualitatem suam vel dependent, vel dependere videntur ab altero, adeoque alia vel habent, vel habere videntur in aliis rationem suarum mutationum.”

nature.[139]

Natural beings may be regarded as products of art only to the extent that they exhibit a causal arrangement similar to that found in artifacts. The paradigms of such cases are organisms. But an element of artifice is intimated in ecological relations between organic and inorganic bodies, in cyclical, self-maintaining meteorological systems, or in the adaptedness of animals and plants to their habitats. At a yet further remove, Wolff regards even the stability and order of large *Weltgebäude* such as the solar system as indicative of intelligent, and intelligible, artifice.

Nevertheless, teleological reasoning also occupies firmer metaphysical ground, albeit by virtue of theological rather than natural philosophical considerations. Since the world as a totality is itself a finite, contingent, composite being, and depends for its existence on God's wise creative act, the teleological order of the world proceeds from an intentional ground outside the natural order. As a distinct science, thus, Teleology emerges properly as physico-theology, or "experimental natural theology," while Physics concerns the essences of corporeal things and the changes possible in them in virtue of their material structure and moving force.[140] The special science of Physiology, meanwhile, straddles the two, and its objects—the parts of animals and plants—involve both mechanical and teleological principles.

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[139] DPhys. §31.
[140] Cosm. §53.

6. The empirical study of nature

The division of the physical world into relations of causality and finality, through which bodies instantiate divinely represented essences and are directed toward their specific functions has implications for the organization of the empirical study of nature, or Physics. A brief remark on the disciplinary label is in order before we proceed with this section.

Wolff's use of the term "physics" (*physica*) carries multiple connotations. With the long Aristotelian tradition, Wolff identifies Physics as the discipline which studies the natural world of change and coming-to-be. But, unlike classical Aristotelianism, Wolffian Physics excludes from its scope the domain of spiritual phenomena, and the principles of change in conscious, natural substances such as human minds. For the philosophical study of created, mentalistic beings, Wolff has the separate discipline of Psychology, the subject matter of which, as *De anima* studies, had previously formed a proper part of Aristotelian physics. In this respect, Wolff's Physics tracks the modern exclusion of psychological phenomena from its subject matter. At the same time, it retains in its ambit the study of what today would be deemed the biological and the ecological. While Wolff accepts a broadly Cartesian separation of the ontologies of mental and physical phenomena, his conception of the physical, like Descartes', still encompasses change in non-mental, living creatures.[141] The parts of Physics which he would label Teleology and

[141] It is only with the second edition of Georg Erhard Hamberger's *Elementa Physices* (1735) that the Physics textbook explicitly excludes the entire doctrine of plants and animals, in addition to humans. (G.E. Hamberger is not to be confused with his father J.A. Hamberger, who was among Wolff's teachers at Jena). Descartes' makes clear his

Physiology reflect these adjustments in the encyclopedia of the sciences.

In one sense, then, "physics" simply refers to the study of bodies, as opposed to the study of mind, whether finite (psychology) or infinite (theology). As such, the term includes in its scope both the metaphysics of bodies, as general or transcendental Cosmology, as well as empirical disciplines such as Mechanics, Statics, Hydrology, Astronomy, Physiology, and Teleology, among others. Among these, Teleology and Physiology have a privileged place. For these sciences, unlike Statics or Hydrology, take their rationale from a division between two kinds of principle of explanation in nature, namely, those of efficient causes, treated in General Physics, and of final causes, treated in Teleology and Physiology. As the study of efficient causal principles of bodies, the discipline of Physics, in a narrower usage, is the empirical study of the effects of bodies in general. It is this sense that informs the subject matter of the volume known as the *German Physics*, or *Vernünftige Gedancken von den Würckungen der Natur* (1723). In the following, I use the word "Physics" to refer to empirical physics, as distinct from the special metaphysics of Cosmology.[142]

Physics and Teleology, thus, are co-equal, highest empirical disciplines under Cosmology. As a general science of bodies, Physics teaches how composite beings follow in succession as causes and effects obeying certain universal laws of motion.

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intention to retain the study of what we now call 'living things' (plants and animals) within the scope of Physics; cf. PP IV.203.

[142] To be sure, the distinction between the two gets blurred. Wolff never wrote a Latin version of the *German Physics* or, for that matter, of the *German Teleology* or *German Physiology*. The Latin *Cosmologia* has much overlap with the first part of the *German Physics* and, as we have seen, makes mention of the science of *Teleologia*.

Teleology, meanwhile, shows how, in a series of efficient causes, one is for the sake of another, or how things are related as means and ends.[143] Physics, in one sense, enjoys priority in the order of explanation over Teleology, inasmuch as the world needs first to be recognized as the product of determinate causal laws, rather than as a series of accidents. The further consideration of the world as a nexus of coexisting things in which "one serves for the use of another," depends on prior knowledge of the laws of productive causation.[144] This priority of Physics over Teleology, however, gets complicated in the case of Physiology, which receives its own book-length treatment in *Vernünfftige Gedancken von dem Gebrauche der Theile in Menschen, Thieren, und Pflantzen*, or the *German Physiology* (1725). On the one hand, Wolff regards Physiology explicitly as a part of Teleology, since it considers natural things not only under the aspect of the relation of cause and effect, but also as reciprocal means and ends.[145] The reason for the separate treatment of the functions of organic parts, Wolff explains, is simply due to its extensive subject matter, so that the *German Physiology* could just as well be considered as the second volume of the *German Teleology*.[146] But on the other hand, Physiology is

[143] Cosm. §35: "Veritas patet per Physicam & Teleologiam *a posteriori*. In Physica enim docetur, quomodo res successivae pendeant a se invicem ut causatum a sua causa: in Teleologia ostenditur, quomodo etiam in serie successivorum unum sit propter alterum, atque adeo inter ea obtineat relatio, quae inter finem & medium intercedit."
[144] Cosm. §53n: "Nexus hic rerum naturalium, quo unum alterius usui inservit, in Teleologia explicatur distinctius." Wolff explicitly affirms the priority of Physics at Disc. prae. §100.
[145] AN §179.
[146] Ibid. §186: "Nachdem ich die Ursachen der Würckungen der natürlichen Dinge erklärte, so komme ich auf die Absichten, die Gott dabey gehabt. Und weil bey dieser Materie sich ein mehreres zu sagen gefunden, als ich anfangs selbst vermeinte; so habe ich in zweyen besonderen Schrifften diese Materie abgehandelt, davon die erste den Nahmen von den natürlichen Dingen, die andere hingegen von dem Gebrauche der Theile in dem Leibe der Menschen, der Thiere und der Pflantzen handelt."

also "that part of Physics which treats of animated bodies," and is also called "animal mechanics," and even "anthropology."[147] That is, Physiology is not only concerned with the recognition of God's ends in nature, but also oriented toward the mechanical operations of a certain class of bodies, namely those capable of self-directed motion. As we shall see, the crucial notion that distinguishes Physiology from the teleological study of the planets or the physical study of neural stimulations is that of health (and sickness). The parts of organic bodies must be regarded as reciprocally organized in such a way as to maintain the corporeal individual in a state of good health. In an important sense, the study of plants and animals requires a constitutive unity of causality and finality, such that their physical operations are also directed toward internal norms of proper function, in addition to realizing God's ends.

6.1. Physics

Although Wolff states his overarching ambitions in the disciplines of Physics and Teleology in complementary fashion, their proper subject matter is sharply delineated. In the Prefaces to both the *German Physics* and the *German Teleology*, Wolff expresses the belief that God has created nature such that one thing is always for the sake of another (*immer eines um des andern willen ist*). Thus, besides enabling human beings "to use nature to our advantage," physical science allows us, more importantly, "to glimpse

[147] Disc. prae §84.

God's hidden majesty in the effects of nature as in a mirror."[148] But these common aims of natural philosophy are realized by distinct procedures. The objects of Physics are the general rules of motion by which bodies are able to yield effects in size, shape, velocity, or spatial position. Physics is strictly concerned, moreover, with the proximate causes (*nächste Ursache*) in the series of events, rather than the ultimate causes lying beyond possible experience. Teleology, by contrast, enjoys the license to speculate from the observed functional interconnection of effects to knowledge of God's intentions and perfections (though it is not, for that reason, a wholly speculative science, as we shall see in §6.2). Physics, for Wolff, is strictly a science of phenomena. Its complementary science of Teleology allows a transition from the physical world to its transcendent ground in the divine mind, while its metaphysical presuppositions—in Cosmology and Ontology—lead back to the source of our physical conceptions in the first principles of human knowledge.

The goal of Physics, accordingly, is to increase distinctness in the knowledge of bodies, or that which is composed out of matter and has a moving force in itself, though without the expectation of "fathoming nature in its depths."[149] The physicist aims to explain the qualities of bodies possible in virtue of their manner of composition and the laws of their mutual interaction. At the center of the physicist's inquiry lies the doctrine of secondary matter (*materia secunda*), the impenetrable and resisting bulk that constitutes bodies appearing in three-dimensional extension and is modified by moving

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[148] DPhys. *Pref.*; DTel. *Pref.*.

[149] DMet. §626; DPhys. §20. The admission that ultimate explanations cannot be found in the study of the physical world is also repeated Disc. prae. §107.

force. In agreement with the leading physics of his day, Wolff's theory of matter is oriented toward the concept of force rather than extension. Following Leibniz's widely-accepted correction of the Cartesian conservation laws, that force (mv^2) rather than quantity of motion (mv) is conserved, the basic theoretical challenge facing Wolff's generation of natural philosophers is to conceptualize matter in terms of force. Leibniz's own proposal to ground derivative forces—*vis viva* and *vis mortua*—in the laws of perception of mind-like substances elicited general dissatisfaction, including from Wolff, as we have seen. Wolff's own doctrine of elements emerges in this context as a theoretical posit of spatially distributed points of force. Interactions of these spatially real, mathematical force-points—which are, admittedly, unknowable from the empirical standpoint of Physics—give rise to the modifications of phenomenal forces expressed in bodies. The theory is, to be sure, underdeveloped: one cannot safely infer whether, for example, Wolff conceives the material extension resulting from the activity of unextended elements as a continuous volume or as an acceleration field.[150] Its motivations in the context of early eighteenth-century physics are nonetheless discernible. Wolffian elements are an idealization designed to give a physical interpretation to a mathematical conception of a continuous distribution of moving force in bodies, which is only partially measurable in experience. Being hypotheses, however, as he emphasizes in the *Preliminary Discourse,* the existence of elements may not be

[150] See Marius Stan, "Rationalist Foundations and the Science of Force," in *The Oxford Handbook of German 18th-Century Philosophy,* eds. Brandon Look and Frederick Beiser (Cambridge: Cambridge University Press, 2016), for a general discussion of the problem of conceiving forces in early Newtonian mechanics.

taken dogmatically, and they remain useful only insofar as they allow facts about bodies to be analyzed in terms of mathematically representable force-points.[151]

Once the physicist accepts the hypothesis of atomistic force-points as the metaphysical origin of moving and resisting force in bodies, she may occupy herself only with the empirically determinable magnitudes of matter and force. Within the category of matter, Wolff introduces a number of nominal distinctions, the particular proportions of which should account for the physical qualities of bodies. The primary distinction is that between the cohering matter (*eigenthümliche Materie; materia cohaerens*), and the fluid or foreign matter (*fremde, flüssige Materie; materia interlabens*) of a body. The quantity of cohering matter determines the primary structural features of a body. Cohering matter is what imparts to a body its solidity and impenetrability.[152] Cohering matter, furthermore, may be relatively more fixed and enduring (*beständig*), thereby nominally playing the role of the attribute of a body that identifies it as being of a certain kind; or, it may be a changeable (*veränderliche*) part of a body's structural matter, or that which sustains modifications.[153] With these distinctions in hand, Wolff defines various physical qualities of bodies—roughness and smoothness, coarseness and tenderness, brittleness and firmness, for example—in terms of the relative quantities of perduring, changeable, and foreign matter.[154] In this way, different qualities of bodies can be conceived as consisting in variable proportions of different kinds of matter, the addition, subtraction,

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[151] Disc. prae. §129. See above, Ch. 4, §3.2 for discussion of Wolff's views on legitimate and illegitimate hypotheses.
[152] DPhys. §13; DMet. §656.
[153] DPhys. §17
[154] Ibid. §§49-52.

and replacement of which results in the variety of observed effects in a body.[155] What makes gold heavier than copper, for example, is a greater proportion of cohering matter in its structure, which gives it more bulk and a denser composition.[156] What is important to bear in mind is that these distinctions remain nominal ones, and proper only to the study of phenomenal objects as conceptualized in the leading science of Wolff's day. They are not deduced from the primary attribute of physical substance.

Complementing cohering matter is fluid matter. The manner of composition of a body's cohering matter leaves variable quantities of interstitial space (*Zwischen-Räumlein*), which are occupied by fluid matter. Wolff's conception of fluid matter retains the seventeenth-century, corpuscularian hypothesis of an actually divided, space-filling, material continuum.[157] The space taken up by a body, which, for Wolff, is likewise a continuum, divides into that occupied by its cohering matter and a certain quantity of foreign or fluid matter, which is greater in lighter bodies and smaller in heavier ones. Whereas the inert, cohering matter accounts for the mass of a body, its moving force is carried by the fluid matter circulating through its interstitial spaces. For instance, the modification of elastic force in a body following a collision event may be conceived as the change in the quantity of fluid matter expelled from the body as a result of its change of shape.[158] The phenomenal expression of the change in resisting force of a body, thus, reduces to the quantity of fluid matter present in it before and after a collision event. The effects of magnetism, Wolff suggests, might also be understood in the same manner

[155] Ibid., §§26-7.
[156] Ibid. §15
[157] Ibid. §62.
[158] Ibid. §66.

through the motion of a fluid matter that could impart magnetic force to a piece of iron.[159] The consequence of Wolff's separate procedures for conceiving metaphysical and phenomenal force is that,

> in the explanation of events in the visible world one does not need primitive force, which is to be invoked in the elements; but instead one may remain with those forces, which can be explained through the movement of a subtle, fluid matter in the empty spaces of bodies.[160]

With his conception of dynamical effects as resulting from the activity of a subtle, continuous matter, Wolff effectively follows an aether model of physical force originating with Descartes. In Part III of the *Principles*, Descartes had proposed a "certain large and very rarefied mass, similar to the air" surrounding the earth and filling the solar system.[161] Descartes conceived of this plenum as constituted by interlocking vortices, whose spinning motion communicated force across distances between gross, interacting bodies. Planets, for instance, could be understood as being carried by the motion of the vortices in the aether as in a whirlpool, which produces their observable gravitational effects. Christiaan Huygens developed the Cartesian hypothesis further, deploying it not only to explain gravitational attraction, but also for a mechanical account of the propagation of light in his 1690 *Treatise on Light*. For Huygens, the action of the

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159 Ibid. §382.
160 DMet. §700: ""Und hieraus erhellet, daß man in Erklärung der Begebenheiten in der sichtbahren Welt nicht nöthig hat sich auf die **ursprüngliche Krafft**, die in denen Elementen ist zuberuffen; sondern nur bey denjenigen Kräfften verbleiben darf, die sich durch die Bewegung einer subtilen flüssigen Materie in dem leeren Raume des Cörpers erklären lassen."
161 PP III.100.

particles composing a stationary aether could be used to explain the transmission of light, which in turn he conceived as a longitudinal wave through a fluid medium.[162] In a similar vein, Leibniz proposed in his 1689 *Tentamen de motuum coelestium causis* a physical interpretation of Newton's mathematical results by conceiving gravitational effects in terms of spinning vortices in a fluid, so that "the whole aether with the planets turns around by the motion of the sun acting around its centre, just like still water whirled around its axis by a stick in the middle of a vessel."[163] For anyone committed to mechanical action by contact, and suspicious of *actio in distans* of occult qualities, variations on the Cartesian solution remained the most promising alternative. Despite Newton's achievement in the *Principia* of 1687, the attraction of a mechanical, fluid plenum as a substrate for the communication of motion remained in place.

In this backdrop, Newton's famous proclamation, in the General Scholium to the 1713 second edition of the *Principia,* not to feign hypotheses, above all that of the vortices, received much attention, both in his own time and in the subsequent history of science. Yet, neither Newton's fervent opposition to Huygens' luminiferous aether, already articulated in the 1706 Latin edition of the *Opticks*, nor his rejection of Cartesian vortices dampened enthusiasm for an aetherial theory of the transmission of force.[164] The

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[162] See Fokko Jan Dijksterhuis, *Lenses and Waves: Christiaan Huygens and the Mathematical Science of Optics in the Seventeenth Century* (Dordrecht: Kluwer, 2006), Ch. 6; and Domenico Bertoloni Meli, *Equivalence and Priority: Newton versus Leibniz* (Oxford: Oxford University Press, 1993), 46-50.
[163] Acta erud. 1689, 83. See Bertoloni Meli, *Equivalence and Priority*, Ch. 7.
[164] In Query 20 of the 1706 *Optice*: "Annon errantes sunt Hypotheses illæ omnes, quibus Lumen in *Pressu* quodam, seu *Motu per Medium fluidum propagato*, consistere fingitur? Nam in his omnibus Hypothesibus phænomena Luminis usque adhuc ita explicarunt

project of mechanizing dynamics, so to speak, continued apace, not least among Newton's own countrymen. From 1718 onward at least, English natural philosophers could draw upon the more tempered speculations of the master himself in the Queries to the second English edition of the *Opticks* concerning an "Aetherial Medium" as the bearer of elastic and magnetic forces.[165] Despite Newton's expressed preference in the *Principia* for an ontology of rigid atoms moving in a void, his followers gradually introduced—or retained from earlier, corpuscularian models—a variety of species of subtle matter to account for dynamical effects. The development of the Newtonian paradigm, from Stephen Hales and John Desaguliers in England to the widely-read Herman Boerhaave on the Continent, had culminated by the 1740s in an ontology of reified airs, fires, fluids, and aethers, which were invoked to explain everything from attraction and repulsion, to electricity and magnetism.[166]

Philosophi, ut ea ex *novis quibusdam* radiorum *modificationibus* oriri posuerint. Quæ est Opinio errans."

[165] Query 18, for example, reads: "Is not the Heat of the warm Room convey'd through the *Vacuum* by the Vibrations of a much subtiler Medium than Air, which after the Air was drawn out remained in the *Vacuum*? And is not this Medium the same with that Medium by which Light is refracted and reflected, and by whose Vibrations Light communicates Heat to Bodies, and is put into Fits of easy Reflexion and easy Transmission? And do not the Vibrations of this Medium in hot Bodies contribute to the intenseness and duration of their Heat? And do not hot Bodies communicate their Heat to continguous cold ones, by the Vibrations of this Medium propagated from them into the cold ones? And is not this Medium exceedingly more rare and subtile than the Air, and exceedingly more elastick and active? And doth it not readily pervade all Bodies? And is it not (by its elastick force) expanded through all the Heavens?" Newton wonders whether the aether, explicitly named from Query 19 onward, could be invoked not only for the transmission of heat, but also for refraction and reflection of rays of light, the motions of the planets, and the neurophysiology of vision.

[166] See Heilbron, *Electricity*, 63-71, for developments toward an aether model of forces in the eighteenth century.

Wolff's own aether model of the endogenous forces of bodies closely tracks these developments in the physics of the time. His engagement with the contemporary natural philosophy is richly documented in his *German Physics*, which assumes the exhaustive catalogue of early modern experimental results recorded in his three-volume *German Experimental Physics* (1721). For Wolff, Physics ought to be oriented toward the leading experimental results for its special ontology. Despite his dissatisfaction with a certain instrumentalism he associates with Newton and some of his followers, who celebrate an attitude of indifference toward ultimate explanations of phenomena and thus for metaphysics, Wolff is, at the same time, suspicious of hypotheses not responsive to experimental practice itself. The difference between the aetherial hypothesis of force and the Leibnizian hypothesis of monads, for Wolff, lies in the fact that the former but not the latter is part of a provisional ontology at the basis of an ongoing effort to construct a mechanical interpretation of nature. While the philosopher must indeed follow reason's demand to speculate about the metaphysical grounds for phenomena, Wolff's preferred method in physical inquiry places constraints on the sources of legitimate speculations. In Wolff's metaphysics, Leibnizian entelechies and scholastic substantial forms are equally rejected as suppositions for the activity and passivity of bodies in favor of an ontology of elemental force-points, designed to underwrite the leading, mechanistic theory of force. This loose anchoring of Physics in general metaphysics, or Ontology, is supplemented through its link, via Teleology, to Natural Theology.

6.2. Teleology

Whereas the aims of Wolff's physics are relatively clear, the methods and objects of Teleology are rather more complicated. In one respect, the discipline of Teleology has the heuristical goal of identifying useful regularities in the natural world. In its office of cataloguing the beneficial properties of plants, insects, and meteorological phenomena, Teleology appears more as a practical art for extending the dominion of human beings over nature, than as a theoretical natural science. But Teleology enjoys a deeper, systematic place in Wolff's philosophy. This consists in its status as "experimental theology" (*Theologia experimentalis*), which provides empirical confirmation of the rational demonstrations of divine attributes given in Natural Theology.[167] As physical theology (or physico-theology, to use another common eighteenth-century label), the certainty of teleological propositions depends on the prior certainty of claims in Physics and Cosmology on the one hand, and in Natural Theology on the other. Teleology presupposes, thus, not just Physics, but also Natural Theology, and specifically the latter's elaboration of concepts of divine perfections, and their legitimate attribution to God.[168] On the assumptions that the world is a manifestation of the divine essence, and God has perfect knowledge of his own essence, thus could be said to have intended the effects that result from his decision to create something rather than nothing, the metaphysician is able to conceive the possibility of a connection of efficient causes in the observable world as conforming to the intentions of a transcendent craftsman. Any

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[167] AN §187.

[168] Disc. prae. §102: "Teleology confirms the knowledge of God which is established in Natural Theology. Therefore, teleology presupposes not only that we have notions of divine perfections, but also that we can demonstrate that these perfections belong to God. Therefore, since this knowledge is established in natural theology, teleology must be treated after natural theology."

certainty that accrues to the descriptions of uses and benefits of natural things, consequently, depends on the prior certainty, first, of efficient causal means for producing observed regularities and, second, of the theological doctrine that the "highest end [*Haupt-Absicht*] of the world is the revelation of the glory of God". It is under these presuppositions that Wolff conceives the project of Teleology:

> We must show for all things that the world is so constructed that one can find clear and distinct grounds from which one can deduce God's perfections… [so] that our understanding may reach a concept of that which is in itself infinite. After that we must investigate, how one thing in the world is always for the sake of another, so that we learn what use one thing in the world has for another, and why each thing occurs.[169]

The structure of the *German Teleology* reflects this division of tasks. Whereas the first part of the book draws evidence from the structure of the universe for the realization of the divine attributes, the second part attends to ecological relations among particular kinds of natural things in order to speculate about their uses for one another. Nowhere in the work, however, does Wolff claim to demonstrate the *existence* of God from observation of the natural world. Nor, indeed, does Wolff argue, on empirical grounds

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[169] DTel. §80: ""Und hieraus ersiehet man die gantze Beschaffenheit unseres gegenwärtigen Vorhabens. Indem wir nemlich die Absichten der natürlichen Dinge erklären wollen; so müssen wir vor allen Dingen zeigen, daß die Welt so eingerichtet ist, daß man darinnen klare und deutliche Gründe findet, daraus man Gottes Vollkommenheiten schliessen und dadurch einigen Begriff von ihnen erlangen kan, so weit es nemlich angehe, daß unser Verstand einen Begriff von dem erreichen mag, was an sich unendlich ist. Darnach müssen wir untersuchen, wie eines in der Welt immer um des andern willen ist, damit wir begreiffen lernen, was eines in der Welt dem andern nutzet, und warum ein jedes geschiehet."

alone, for the legitimacy of attributing to God wisdom, power, or freedom. Thus, paralleling his Physics in important respects, Wolff's Teleology is likewise a science of phenomena. It eschews claims about the existence and attributes of God, and locates its significance as an ancillary enterprise to a special metaphysics of divinity. To that extent, the project of Wolffian physico-theology diverges from that of the famous English natural theologians of the day, such as William Derham, John Clarke, or Cotton Mather, whose efforts Wolff nonetheless applauds.[170] For unlike his English counterparts, Wolff conceives physico-theology merely as confirming the claims of rational religion rather than as providing separate demonstrations of theological tenets from the observation of nature. Wolff's Teleology is largely a didactical and heuristical discipline, serving the strengthening of faith and virtue on the one hand, and the discovery of useful ecological relations on the other.

As *theologia experimentalis,* Teleology illustrates the marks of the divine attributes in the constitution of the world. Modern astronomy supplies a rich store of examples.[171] From the contingency of the series of successive and coexisting things, or from the distinct conceivability of different ways in which space and time could be filled, for instance, intimate to a rational observer that the created world reflects the free choice of God.[172] The possibility of more than one world supports, without conclusively demonstrating, the theological proposition that God is a perfectly free creator. Similarly, the newly discovered vastness of the universe, the immeasurably great number and

[170] Ibid. §36.
[171] Ibid. §35.
[172] Ibid. §11

distances of celestial bodies conveys a sensible idea of the immensity (*Unermesslichkeit*) of God's intellect, a proposition assented to on the basis of faith in revelation and the speculative use of reason in Natural Theology.[173] Furthermore, since the world receives its actuality from God, the immensity of the observable world likewise shows the greatness of God's power.[174] Thus, for Wolff, reflection on the world brings with it empirical conceptions of God's attributes of freedom, wisdom, power, intellect, and immensity. What's more, by drawing attention to the finitude of human cognition, such reflection also serves to occasion a kind of intellectual humility, as well as an impetus to investigate nature further in its details for the sake of morals, insofar as knowledge of nature brings one closer to knowledge of God through knowing his works.[175] What Teleology does not seek, however, are independent, theoretical reasons for the nature of God.

While one may rightly worry about the epistemic weight of the evidence Wolff takes to confirm theological doctrines concerning God's attributes in nature, it is the second part of his Teleology that has been the subject of greater derision. Objecting to such seemingly ludicrous claims as that the cycles of evaporation and precipitation are for the sake of keeping plants healthy, or that the rooster crows at unusual times in order to signal a change in the weather, Cassirer, for instance, charges that Wolff's Teleology rests on a simple category mistake of confusing uses and purposes. Plants may indeed be

[173] Ibid. §23. As an example of the new-found extensity of the universe, Wolff estimates that it would take a person, travelling at four German miles per hour, 2,323,776 years to reach the nearest fixed star (Ibid. §37).
[174] Ibid. §24.
[175] Ibid. §37; §31.

said to use rainfall for their growth, just as human beings might use the rooster's daytime crowing to suspect an impending change in weather. But it is plainly fallacious to reason that the health of plants, or our need to predict weather patterns are the purposes for the sake of which rain falls and roosters crow. The entire *German Teleology*, according to the judgment of its critics, is founded upon this elementary error of conflating accidental uses with essential purposes.[176]

What this criticism misses, however, is a fundamental distinction informing Wolff's teleology, namely between divine intentions, and the uses, purposes, and functions of created things for each other. Metaphysically, for Wolff, every natural event, thing, or state of affairs, insofar as it is a part of the world-machine, is first of all an end represented in the divine mind. Given his theological commitment that the world is the contingent product of a wise creator, every occurrence constitutes an expression of what the craftsman brings about through freely willing or desiring what it represents to itself. In other words, each state of the world results from an intention (*Absicht*).[177] The further distinction between uses and purposes, on Wolff's scheme of created and uncreated reality, is a merely epistemic feature, reflecting a limitation of human cognition to discern the complete truth in the world as it is available in perception. It is not, in metaphysical rigor, an intrinsic property of things themselves. On Wolff's view, God understands distinctly every consequence of that which he brings into existence, including the employment by human beings of spiders for spinning silk, and the benefit extracted by

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[176] Ernst Cassirer, *Kants Leben und Lehre* (Berlin: Bruno Cassirer, 1918), 361; Schönfeld, *Young Kant*, 103-4.
[177] DTel. §1: "die Absicht überhaupt alles dasjenige genennet wird, was ein vernünfftiges und freyes Wesen durch dasjenige, was es will oder begehret, zu erhalten gedencket."

plants from rainfall.[178] Such external purposes of spiders and precipitation, or the utility they render to other beings, consequently, are just as much divine intentions as whatever internal purposes they may have. Unlike a carpenter, who might not intend for her table to be used by a cat as a daybed, God's perfect knowledge of all events precludes such distinctions between the uses and purposes of things. It is precisely for this reason that Wolff's technical German gloss on the Latin *finis* is the cognitively significant word *Absicht*, or intention, a term that subsumes functions, uses, purposes, and ends. For Wolff, while the ideas of the uses or purposes of natural things might be inadequate as the product of human beings' limited epistemic capacities, it is not for that reason entirely void of cognitive content. For, to the extent that order and stability can be discerned in such ideas, they can be presumed to convey some of the reality represented in the divine mind.

Similarly, while Wolff's Teleology has widely been denounced as an egregious example of anthropocentrism, it is striking that Wolff explicitly declares early on in the treatise that "God has not made everything in the world merely to please us."[179] While human beings are certainly entitled to derive benefit and advantage from their environment as is reasonable, such is also the case for non-human creatures, which

[178] Ibid. §237: Wolff here refers to reports of a recent discovery at the French Academy of Sciences for a new use of spiders of great economic potential; Ibid. §143-4.

[179] Ibid. §28. To be sure, an anthropocentric element enters the Teleology, but not insofar as the world is regarded as a system of functionally connected causes and effects. Rather, human beings hold a privileged place as the subjects of divine moral laws, and as those creatures who are capable of recognizing God in the world: "da der Mensch die einige Creatur ist, durch die Gott seine Haupt-Absicht erreichen kan, die er von der Welt gehabt, daß er nemlich als ein Gott erkandt und verehret wird; so ist daraus klar, daß ihn Gott um sein selbst willen gemacht" (ibid. §242).

likewise serve one another in myriad ways. Far from being founded upon a fallacious psychological propensity to view nature as the product of design, a view modern cognitive science knows as "promiscuous teleology," the outlook of the *German Teleology* is instead better understood as presenting a relational or perspectival conception of the natural world.[180] While it is certainly a basic commitment of Wolff's philosophy that the world is the product of design, the explanations catalogued in his Teleology express a view of the natural world as a system of perspectival relations between living things and their environment.[181] The ability of human beings to recognize functional connections between things in the natural world affords them a distinct kind of knowledge than that reached by the discovery of laws of composition and change in bodies. Indeed, it is not only human beings who are able to exploit functional relations between natural kinds for their own ends, but also plants and animals are able to draw utility from the environment. What distinguishes the science of Teleology is not so much the notion of intelligent design of the world as a whole, but rather the notion of things being apt or suited to some use or function by an agent. The conception of the world not merely as a chain of efficient causes, but as a complex web in which efficient causes and their effects can stand in relations as means and ends, or can be for the sake of advantage or utility, offers an additional perspective on the world, which builds on the foundational

[180] The term "promiscuous teleology" is due to Keleman, "Teleological Reasoning."

[181] For a contemporary articulation of such a conception of teleological reasoning as a normative part of the human cognitive apparatus, see Bethany ojalehto, Sandra R. Waxman, and Douglas L. Medin, "Teleological Reasoning about Nature: Intentional Design or Relational Perspectives?" *Trends in Cognitive Science* 17, no. 4 (2013), 170: "Teleological reasoning may not be immature or misguided. Instead, it may reflect young children's ecological perspective-taking abilities and serve as an entry-point for reasoning about socioecological systems of living things, rather than reasoning about isolated, abstracted, and essentialized individual kinds."

account in the mechanical part of Physics.

Wolff's Teleology emerges as a complex enterprise, subserving a number of roles in his programs for theoretical and practical philosophy. As presented in the *German Teleology*, however, it remains throughout a science of the external uses and purposes of natural things, and of the cosmological system as a whole as the realization of the intentions of a divine creator. It does not, in contrast to the prolific eighteenth-century industry of physico-theology, infer the existence and attributes of God from the examination of the functions and structures of particular kinds of being, whether rocks (Lithotheology), bees (Melittotheology), grasshoppers (Akridotheology), or fish (Ichthyotheology);[182] such proofs are wholly a topic for rational, speculative argumentation, which Wolff undertakes extensively in his two Latin volumes of *Theologia naturalis.* Accordingly, it defies D'Alembert's contemporaneous characterization of "the principle of *final causes*" in the popular *Encyclopedia*, as the enterprise of "finding the laws of phenomena through metaphysical principles."[183] Nor does Wolff consider in the *German Teleology* the ends that planets, plants, or animals may have for themselves. It is this inner purposiveness of natural things, in particular of the parts of animals and plants, that presents special problems. The treatment of these topics—which, toward the end of the century would assume their own disciplinary guise as the sciences of life or biology—is the subject of Wolff's *German Physiology*.

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[182] See Schönfeld, *Young Kant*, 102-3, for a sample of some of the authors and texts in this tradition.
[183] D'Alembert, *Encyclopedié*, vol. 2, 789.

6.3. Physiology

As a special part of Teleology, Physiology likewise presupposes the mechanical-dynamical explanations rendered in Physics, as well as the theological proofs of the existence of divine purposes in nature. Throughout the *German Physiology*, Wolff appeals extensively to various texts on the physical sciences to provide general principles of bodies, and also indicates the confirmation of theological conclusions yielded from observation of animal and plant bodies. The distinctness of the subject matter of Physiology originates with the special characteristics of the physical structures it studies. Specifically, while presupposing the providential order of nature, Physiology is concerned further with the internal ends of plants and animals with respect to their own structures, rather than for other beings in their environment.[184] For the parts of plants and animals appear to be arranged in such a way that a) they are reciprocal causes of each other's modifications; b) their structures contain the sufficient reason for their appropriate (*aptum*) activity; so that c) the organism is able to maintain itself by extracting benefit from its environment; in order to d) reach its ultimate end of propagating its species by reproducing another individual of its kind. Organic bodies are paradigm instances of appearances that exhibit a reciprocal arrangement of causal parts, thus are legitimate objects for an application of a design analogy.[185] But, furthermore, the notion of organic structure introduces a conception of internal normativity in a physical being that is underemphasized, if not entirely absent in other parts of Wolffian natural philosophy.

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[184] DPhysio. §219: "Ich rede hier bloß von der Haupt-Absicht, die Gott für die Pflantzen bey ihrer Structur, nicht aber bey den Pflantzen für andere Dinge hat".
[185] Cosm. §47. See above, §4.1.

Organic bodies, both organic parts such as roots and hearts as well as whole organisms, are distinguished by an appropriate activity, or a proper function, for the sake of which its parts are organized in a particular manner. For the explication of organic structure, Wolff deploys a strategy of functional analysis, such that the appropriate activity of an organic body consists in its contribution to the exercise of a capacity of a higher, containing system of which it is a component. Yet, such function-analytic explanations, amenable to a mechanistic conception of nature, are embedded in a non-mechanical account of the divinely instituted ends of organisms to maintain their species through reproducing their kind. In the latter aspect, Wolff deploys an etiological account of the origin of appropriate activities, for the parts of animals and plants ultimately exist due to a divine act *because* of their function in maintaining the health of the individual for the sake of procreation. Wolff, in effect, embeds a mechanical-functional mode of explanation of organic systems within a creationist account of the origins of natural function. Both modes, for Wolff, remain cognitively significant: the one offers a mechanical model of explanation for the operations and effects of organized bodies, while the other seeks an ultimate reason for the existence of functional unities in the actual world.

The essence of an organic body, like that of any other body, consists in structural facts about the manner of composition of its parts. But, unlike inorganic bodies, Wolff specifies the essence of an organic body further as the manner in which its parts are organized for a specific, appropriate activity.[186] Knowledge of the essence of an organic

[186] Ibid. §276: "*Corporis organici essentia consistit in structura ejusdem.* Structura enim est compositio corporis organici (§275), adeoque consistit in eo, quod partes, quae ipsi tanquam corpori organico conveniunt, hoc est, quatenus peculiari cuidam actioni aptum

body requires identifying its proper function, for the reason why its parts are composed in one manner rather than another depends on the activity it is supposed to perform.[187] But, conversely, the structure of an organic body, or the reciprocal causal relations among its parts, contains the sufficient reason for why it is able to carry out that function.[188] That is, once the structural facts of an organic body are known, the execution of its proper function is rendered intelligible. The essence of an eye, for example, consists in the manner in which its parts are arranged for the sake of the activity of seeing. Knowledge of this structure, in turn, explains how it is possible for a being to have the capacity for vision. Consequently, the functional analysis of the parts of an organic structure requires appeal to a larger physical system in which it is one component, and from which it acquires its appropriate activity. While the parts of an eye are trivially connected to all other extended beings in the universe in a relation of community, they enable vision only if they stand in a specific causal connection not just among themselves, but also to other parts of an animal. An eye makes possible the capacity for sight only in a being in which it is connected in a certain way to the brain, the circulatory system, and all the other organic parts requisite for the exercise of the capacity.[189] Only in the context of a larger system possessing certain aims do the individual parts of animals and plants acquire a proper function. The goal of the sciences of anatomy is precisely to explicate the causal contributions of the various reciprocally connected parts constituting plants and

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est (§274), eo modo inter se conjunctae sint, ut corpus ipsum actioni cuidam peculiari aptum evadat."

[187] Ibid. §279.

[188] Ibid. §277.

[189] Ibid. §276n.

animals.[190] In this office, the anatomist's work may readily be compared to that of the mechanist, and the objects of their respective sciences bear a strong analogy. The anatomist can fruitfully treat the structure of the heart as a collection of individually unremarkable parts arranged with respect to the execution of a certain function, just as an engineer constructs a machine press by ordering parts in a way that makes them serviceable for producing certain effects.[191]

A function-analytic explanation presupposes a notion of a good, or healthy state of a body (as well as a bad, or sick state) with reference to which an organic part may be judged to be functioning properly or poorly. Wolff attempts such an analysis of the normativity of physical-mechanical function in two essays entitled "On the Concept of Health," and "On the Concept of Sickness."[192] From a consideration of the definitions of health offered by medical writers including Galen, Daniel Sennert, Hermann Boerhaave, Friedrich Hoffmann, Michael Ettmüller, and Thomas Campanella, Wolff establishes, in the first place, that all writers agree that ascribing health to a part of the human body depends on the recognition of certain proper activities (*Verrichtungen*) of that part.[193] By

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[190] Wolff's conception of function at the structural level of an organic body can be likened to Robert Cummins', "Functional Analysis," influential account of function ascription statements as ascribing a causal role to an entity in the background of some capacity of a system in which the entity is one causal component.
[191] DPhysio. §121.
[192] "Von dem Begriff der Gesundheit" and "Von dem Begriff der Krankheit". Both were originally private lectures given in Marburg, and collected in the *Horae subsecivae Marburgensis* ("Marburg Leisure Hours"). The essays were translated from the Latin into German and published in Wolff's *Gesammelte Kleine Schriften* in 1736.
[193] Wolff understands their positions as follows (KS 335-7):
Galen: health is a natural constitution of all parts, whose dispositions to activities are according to the nature of the source.

contrast, lack of health, or sickness, consists in the inability to execute those same activities.[194] The functional properties possible for any part, furthermore, depend on its structural properties, including its size, figure, and position relative to other parts, which dispose it to perform certain activities rather than others. Importantly, Wolff distances the notion of health from that of a principle of activity—or an Aristotelian nature as an internal principle of change—from which the actuality of the functional dispositions results. While such a *principium activum* must indeed exist, Wolff declares that "in the present case, however, it is all the same what kind this might be."[195] Considered strictly as a body, the organic machine is no different from an artificial machine such as a clock, and its state of good health requires only an appropriate set of dispositions of its parts. Whether such dispositions are exercised by means of an innate entelechy, the direct concourse of God, an *anima mundi,* or a certain "force of composition," is irrelevant to the analysis of a body's state of health or sickness.[196] Just as a clock is said to be

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Sennert: health is a capacity (*Vermögen; potentiam*) of the human body to perform all those acts which are according to its nature.
Boerhaave: health is a capacity (*Fähigkeit; facultas*) of the body by means of which it can perfectly perform all its acts.
Hoffmann: health is the vitality of activities, both of the body as well as of the soul, which originate from the free movement of the fixed and fluid parts as well as from the secretions and excretions of these parts.
Ettmüller: health is the welfare of life (*vitae integritatem*), or the motion or actuality (*actuatione*) of the water-and-wind machine in which the human body consists.
Campanella: health is the enjoyment or pleasure of life, where life is the agreement of the fluid and spiritual parts.

[194] KS 338.

[195] Ibid 340-1. Thus, Wolff distances himself from Aristotelian positions such as those of Ettmüller's or Campanella's (336-7).

[196] In the Cosmology, Wolff defines an organic body as one whose "force of composition" (*vi compositionis*) is appropriate for its peculiar activity (Cosm. §274). The suggestion appears to be that the forces of the elements underlying an organic body are aggregated in such a way as to produce the appearance of a being that exhibits self-

functioning well when its wheels and levers are assembled in a way that enables it to tell time accurately, and functioning poorly when the state of its parts is otherwise, a human body is susceptible to precisely such conditions of good or bad mechanical function.[197] Wolff thus endorses the Galenic position that health "is a certain internal state of the body," in which each part is suited to perform a particular activity, determined by its physical structure, so that the whole is disposed to maintain a certain normal state of activity.[198]

Just as Wolff's mechanical conception of health excludes appeal to a principle of life or activity, it remains equally silent on the reason for the existence of proper function in the parts of plants and animals. Whence the heart acquires the function of pumping blood, or the stomach of digesting food is irrelevant to an analysis of the functions they perform in maintaining an internal state of good health in the animal body. The question of the origin of natural function ultimately takes inquiry beyond Physiology and the

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directed motion, reciprocal organization of parts, and the ability for self-maintenance. Wolff doesn't expand further, however, and the *vi compositionis* remains as mysterious as his general doctrine of elemental force.

[197] KS 344-6. The difference between a natural and artificial machine, for Wolff, is instead a mereological one: a natural machine differs from an artificial one in that each part of the former is itself a functionally articulated structure, whereas in the latter one arrives ultimately at simple physical parts whose causal activities are fully describable in terms of their pushes and pulls. In an organic body, by contrast, every part is itself an organic body, so that analysis never reaches a level of non-functional mechanism (Ibid. 347; DPhysio. §121).

[198] KS 343. In this respect, Wolff may well be regarded as part of a Galenic current in early modern medical writings, shared by some of the authors he mentions in "On the Concept of Health" such as Sennert and Boerhaave, but also other figures he was familiar with such as Descartes and Jean Fernel. For the persistence of the Galenic tradition in early modern medicine, and especially for its influence on Descartes' mechanistic conception of organic function, see Gary Hatfield, "Mechanizing the Sensitive Soul," in *Matter and Form in Early Modern Science and Philosophy*, ed. Gideon Manning, 151–86 (Leiden: Brill, 2012); and Distelzweig, "Use of Usus."

natural sciences into metaphysics and theology. The sufficient reason for why the heart exists in an animal of a certain kind, for instance, lies in the end of such an animal considered as an individual, whole, healthy *finis integer*, rather than simply as a certain structural configuration of its physical parts. Accordingly, Wolff frames the functional analyses of the organs of plants and animals in the *German Physiology* by first affirming the theological position that the facts of human and animal bodies to nourish themselves through food and drink, their ability for locomotion, their possession of sensory organs, or a voice or language, are nothing other than God's ends. The particular manner of composition of the body, or its corporeal essence, is in turn the means with which God achieves his ends.[199] The ultimate end (*Hauptabsicht*) for the animal, human, and plant body is that "it should persist in its life for a certain time and maintain its species, as long as the Earth lasts."[200] The reason that plants and animals possess functionally appropriate parts to extract nourishment, to locomote, or to produce flowers, lies in their fittingness for enabling reproduction, in order that the species may perdure as long as the Earth remains in existence. The heart exists in animals of a certain kind because of its contribution to the maintenance of the species, and thus for an external end in the divine mind.

The end of species preservation, for Wolff, is further grounded in a principle of uniformity. Just as the quantities of matter and force are conserved in nature, so the Earth always contains the same species of plants and animals.[201] The introduction of new forms

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[199] DPhysio. §§1-5.
[200] Ibid. §6.
[201] Ibid. §7; also DMet. §724.

of animals would constitute a break in the ordinary course of nature, and thus a violation of the principle of uniformity. Since God or Nature does nothing in vain, the course of nature must be regarded as ordered such that the same causes could bring about the same effects, so that a certain kind of animal could only result from one of a similar kind that previously existed.[202] The internal, mechanical ends of health and proper function are ultimately only instrumental for the cosmological end of species preservation, which in turn is an expression of rationality and wisdom in the order of nature. Wolff's Teleology and Physiology, thus, exhibit deep theological motivations. Nevertheless, the creationist hypothesis of the origin of natural functions, like the hypothesis of the pre-established harmony or the hypothesis of elemental force-points, earns its philosophical keep by generating fruitful research, and directing inquiry in a way that conforms with practical interests and common sense.

Wolff's Physiology retains primacy for the theological objectives of Teleology, namely, of interpreting functional connections in nature as expressions of divine providence. Unlike Leibniz, however, Wolff's theory of organisms eschews immanent, vital powers for conceiving purposiveness in nature, and instead maintains a broadly Cartesian, mechanical view of bodies as sustained from external forces alone. Wolff shares with other early modern medical writers a mechanical, analytic conception of the functions of the parts of animals, which enjoys independent validity and significance. This status is due partly from the employment of a mechanical notion of function in the

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[202] DPhysio. §7: "daselbst bleiben die Ursachen, von denen sie kommen, und der Lauff der Natur ist so eingerichtet, daß dieselben zu gewisser Zeit vergängliche Dinge von neuem hervor zubringen determiniret werden."

actual practice of physicians, and partly from its agreement with general principles of bodies. At the same time, such explanations find their ultimate ground in the designing intentions of a divine creator to produce a stable world system, from the investigation of which created intelligences could begin to know the divine nature. Like Wolff's Physics, his Physiology remains primarily a science of phenomena, concerned with a precise description of the appearances of a special class of beings, which are acknowledged as governed by the proprietary principles of physical science. In virtue of its status as a branch of Teleology, meanwhile, it draws assumptions from, and provides confirmation of, theological doctrines known from metaphysics as well as faith.[203]

Teleological reasoning occupies a dual aspect in Wolff's philosophical system. As a methodological directive, means-ends reasoning about natural products finds apparent support in the existence of phenomena for which the efficient causal model is inadequate, and which are better explained by appeal to the concept of an end. But it also finds its metaphysical anchor in the idea of God as a wise creator. Indeed, all knowledge of the observable world paves the way for natural theology, or, in Wolff's favorite image, provides a "ladder with which to ascend to God."[204] Knowledge of nature contributes to insight into God's attributes. In an essay titled "On the Knowledge of Divine Attributes

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[203] Physiology is not, however, as Hein van den Berg, "The Wolffian Roots of Kant's Teleology," *Studies in History and Philosophy of Biological and Biomedical Sciences* 44 (2013), 727, claims, a "transcendent" science, any more than Physics or Teleology. Van den Berg rests his claim for the transcendent status of Physiology "in virtue of [its] being grounded in metaphysics and theology". But Physics is equally "grounded" in metaphysics, and both exploits theological assumptions and points toward theological conclusions. At the same time, both Physics and Physiology proceed according to internal norms and principles of inquiry.

[204] DMet. §578: "eine Leiter von der Welt zu Gott hinauf steigen"; §Theo. Nat. I.115n: "Ecce tibi scalam, per quam in Deum ascenditur".

from Nature" (1732), Wolff summarizes the utility of natural philosophy for theology:

> The inner possibility of things, in which their essence consists, leads us to God's understanding and its constitution. The external possibility of the same things leads us to God's will and its constitution. The actuality of these things brings us to knowledge of his power. Their ends and the way in which they are directed to maintain [*erhalten*] their essence, along with the connection of one thing with another, through which that becomes actual in it which is possibly modifiable in it through its essence, helps us to knowledge of God's wisdom. The perfection of things in their kind, the benefit which one receives through its connection with another, and the particular circumstances in which each thing finds itself, secure for us knowledge of God's goodness.[205]

The various perspectives on the study of nature provide clues to the character of the divine attributes reflected in creation. Knowledge of the structure and order of the world reveals things that instantiate intelligible essences. Their harmonious compossibility indicates purpose and design, and their actuality affirms the power of the creator. The mutual serviceability of things further suggests wisdom, or the ordering of ends in such a way that one becomes a means to another. And the capacity of things to reach a state of well-functioning activity appropriate to their species essence signals the universal goodness in all creation.[206]

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[205] "Von der Erkenntniss der göttlichen Eigenschaften aus der Natur", KS 510.
[206] DMet. §914; Psy. rat. §678.

7. *Teleologia rationis divinae*

In the charged religious atmosphere of the early seventeenth century, Christoph Scheibler helped to renovate a traditional, positive conception of the role of metaphysics as handmaiden to theology. Metaphysics, Scheibler urged, should be developed systematically for the sake of clarification of theologically significant concepts, in order better to articulate and defend theological positions. Partially at stake for Scheibler as well as his Calvinist opponents was a concern to secure a rational unity of faith and reason. In one form or another, such a conception of the task of philosophy predominates in early modern Germany, and the concern to employ not only metaphysics, but also mathematics and natural philosophy in service of certainty in theological matters animates several generations of German philosophers from Scheibler to the Wolffian school. A tendency among academics to find in a confessionally-neutral conception of the possibilities of reason the resources to overcome the materially and spiritually destructive wars of religion is widespread. A decade after the Treaty of Westphalia, Clauberg had cautiously ventured the idea that philosophy, or ontology, alone should be "the ground upon which jurisprudence, medicine, and the other arts are built."[207] Several generations later, Wolff epitomizes this tendency by self-consciously following the project to its logical conclusion, so that philosophy becomes a truly universal science that can and ought to give direction to theology, as well as to the other higher faculties of law and medicine. In the guise of Natural Theology, philosophy takes as its regulative ideal nothing less than the articulation of the structure of the divine mind as the ultimate source

[207] Unterschied, 3.

of all possibilities. “God,” Wolff writes, “is the absolutely complete philosopher,” since he knows all universal truths about the rational world (*mundus rationalis*) by an intuitive cognition.[208] Reason coincides with faith *because* God’s creative act, the sole article of faith upon which all churches could agree, epitomizes rational agency.

The rational world, however, stands between the intelligible and sensible worlds. It emerges from a unity of the two by the application of ontological principles to the facts of experience.[209] The application of the first principles of knowledge to the facts of outer experience, to *ens creatum materiali,* yields the metaphysics of bodies, or Cosmology, which structures inquiry into various domains of physical phenomena. Meanwhile, reflection on the facts of inner experience, *ens creatum immateriali*, leads to the elaboration of the parallel metaphysical science of Psychology. And, just as rational reflection on the external world affords a ladder with which to ascend to God, so does reflection on the structures and principles of the human mind yield concepts of the perfections of the divine mind, insofar as it partakes of the divine attributes of knowledge and will. While the human understanding, the power to represent possibilities, is limited materially and formally, unlike the unlimited divine intellect, it is nevertheless only through reflection on the operations of our finite minds that we uncover concepts of

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[208] Theo. nat. I §268: “Deus est philosophus absolute summus”; Theo. nat. I §270: “Deus omnes veritates universales intuitive cognoscit.” See Schneiders, “Deus est Philosophus,” for an illuminating essay on Wolff’s conception of philosophy as centered around this slogan.

[209] The thesis of the marriage of reason and experience finds expression in the Natural Theology as: “Mundus rationalis intelligibili & sensibili totus immersus est” (Theo. nat. I §260).

divine perfections.[210] From indistinct and inadequate notions of substance, activity, unity, being, truth, order, or goodness, finite, rational agents are able to arrive at the idea of an unlimited intellect, which grasps these notions completely through an intuitive, non-symbolic cognition. Even though human knowledge of the rational world remains partial and incomplete, it nonetheless enables, on the basis of analogy, the formation of an idea of a divine intellect as the source of all rational truth.[211]

It is likewise only in the nature of the human soul that we discover a principle of inner purposiveness in the created world. For Wolff, it is through reflection on inner experience that we discover "the capacity of the soul to choose through its own spontaneity from two equally possible things that one which pleases it more."[212] In other words, reflection on the conditions for self-conscious, rational activity discloses to us how a finite mind's rational freedom enables it to act for the sake of what it represents to itself as good. Human experience of acting by desiring to bring to actuality a possible external state of affairs gives rise to the idea of a purposive nature and, consequently, its unlimited and perfected ground in the idea of an infinitely wise creator. For Wolff, however, the purposive character of human activity remains ontologically grounded in the structure of the divine mind, which philosophy seeks to uncover in its theoretical reflections on nature, and the philosopher strives to imitate in her worldly commerce. Divine reason is the archetype which finite reasoners strive to enact.

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[210] Paralleling the essay "Von der Erkenntniss der göttlichen Eigenschaften aus der Natur" is "Anwendung der Naturlehre auf die Erkenntniss des göttlichen Verstandes"; see KS 520-23.
[211] Theo. nat. I §261: "Idea mundi intelligibilis, quae datur in Deo, ideam mundi rationalis includit."
[212] DMet. §§519-20.

It would be among Kant's central concerns to invert this priority of divine ends and human ends, and to overturn a scholastic conception of philosophy as *teleologia rationis divinae* with a new concept of philosophy as *teleologia rationis humanae.*

CHAPTER 6: Cosmology, Physico-Theology, and Kant's Concept of Purposiveness

1. Introduction

Writing to Karl Leonhard Reinhold in December 1787, Kant describes for the first time a tripartite division of philosophy. Each of the three parts, Kant writes,

> has its *a priori* principles, which can be enumerated and for which one can delimit precisely the knowledge that may be based on them: theoretical philosophy, teleology, and practical philosophy.[1]

While the *Critique of Pure Reason* (KrV) constitutes his inquiry into the *a priori* principles of the first part, and the *Critique of the Practical Reason* (KpV) into those of the third part, Kant announces his intention for a third treatise. The topic of Kant's projected, third *Critique* is teleology which, he admits to Reinhold, "is the least rich in *a priori* grounds."

Kant's numbering of teleology among the three highest divisions in philosophy marks a break from the taxonomies of earlier German professors.[2] For Wolff, Teleology appears officially as a part of Physics and thus falls under theoretical philosophy. Wolffian Teleology denotes that part of physics which studies nature under the aspect of ends. At the same time, Wolff accords multiple roles to teleology and recognizes its

[1] 10:515.

[2] For pre-Wolffian taxonomies, specifically of Timmanus Kemener (1520), Ambrosius Reuden (1579), and Michael Wendeler (1647), see Freedman, "Philosophy Instruction," 127-9.

ambiguous place in the encyclopedia of the sciences. Observation of natural adaptations confirms propositions in Natural Theology concerning God's attributes, for instance. But teleological reasoning also enters moral psychology for investigating human actions and passions. Wolff's newly-minted disipline serves a variety of systematic functions across the two major branches of theoretical and practical philosophy.[3] Kant, in effect, relocates teleology from its place in the science of nature to a third branch between theoretical and practical philosophy.

This newfound independence of teleology accurately reflects its systematic roles in Kant's critical philosophy. The Introduction to the *Critique of the Power of Judgment* (KU), Kant's main document on the topic of teleology, identifies the transition from theoretical philosophy of nature to practical philosophy of freedom as one of its central tasks. By adopting a perspective on nature as purposively organized, Kant hopes to offer a glimpse of a unified ground for a kind of thinking not just legitimate, but necessary in both theoretical and moral philosophy. The discovery of a subjective, *a priori,* form of judgment in the human cognitive faculty might allow us to bridge the realms of nature and freedom. Within the philosophy of nature, Kant addresses through the lens of teleological judgment the systematization of empirical physics, and rules for investigating organized forms in nature, paradigmatically plants and animals. And, in the process of discovering a subjectively necessary teleological principle, Kant outlines an influential theory of aesthetic judgment, artistic production, and feelings of beauty and sublimity. It is these roles for teleology—in a system of critical philosophy, in the philosophy of

[3] Disc. prae. §§105-6.

science, and in the theory of aesthetics—that have also occupied most of the scholarship on Kant's teleology.

The variety of topics Kant treats under the third *Critique* has also engendered suspicion about its coherence. It is far from obvious what, if anything, unifies topics as disparate as systematics, judgments of beauty and sublimity, moral arguments for faith, distinctions between intuition and discursivity, and the psychological architecture of the faculties of imagination, feeling, judgment, understanding, and reason. Indeed, many commentators have chosen to read the third *Critique* as an essentially disunified work, a collection of at best distantly connected topics each with its independent philosophical interest.[4] I will not address the question of the unity of the third *Critique* in this dissertation; I presume an internal unity in Kant's texts. Rather, I shall approach the unity of Kant's critical system in each of its three presentations as consisting in a theory of human nature. Each of the three *Critiques*, on this interpretive standpoint, is concerned to give an account of a finite, rational agent insofar as it can be known to itself in

[4] See Rachel Zuckert, *Kant on Beauty and Biology* (Cambridge: Cambridge University Press, 2007), 3-5, for the dispute around the unity of the *Critique of the Power of Judgment*. Her own monograph belongs to recent, unificatory approaches, such as those of Ginsborg, "Aesthetic and Biological Purposiveness," and Angelika Nuzzo, *Kant and the Unity of Reason* (West Lafayette, IN: Purdue University Press, 2005). My own approach accords with the latter, unificationist camp and, in fact, with a tendency among Kant's early interpreters to read each of three *Critiques* as a self-standing presentation of one and the same system: As Rolf-Peter Horstmann, "Why Must There Be a Transcendental Deduction in Kant's Critique of Judgment?" In *Kant's Transcendental Deductions: The Three Critiques and the Opus Postumum,* ed. Eckart Förster (Palo Alto, CA: Stanford University Press, 1989), 158, writes: "Attracted by what they called the results of Kant's philosophy but uneasy about what they took to be the fundamental premises on which these results were based, they chose to regard the three Critiques as three different and in the end inconsistent versions of the conceptual and logical basis of Kant's transcendental Idealism."

experience, thus in its living, embodied, discursive activity. Before turning to Kant's teleology of human nature in the critical period, this chapter focuses on the origins and development of his central teleological concept of purposiveness (*Zweckmässigkeit*), a technical neologism of eighteenth-century German sciences which Kant's usage would cement in the philosophical lexicon.

Accordingly, this chapter begins with the young Kant's interventions in debates situated within the reigning, Wolffian framework. It studies how Kant inherits from the Wolffian tradition a broadly cosmological sense of teleology as designating normative, reciprocal relations among manifolds. In this respect it is in keeping with Wolff's concept of teleology expressed in the locution *eines um des andern willen*, or one thing being for the sake of another. Also like Leibniz and Wolff, teleology, for the early Kant, is deeply tied to a theological concern with providence and a metaphysical concern to account for the lawfulness of the contingent (to use Hannah Ginsborg's apt phrase). That is, it addresses the theological desideratum of securing a role for divine goodness in the governance of nature. Like his predecessors, Kant exploits the familiar strategy of invoking motives of choice to account for the contingent character of particular features in our knowledge of nature—for instance, the observation that even the best-confirmed empirical laws lack the force of logical necessity. At the same time, in accord with the subjectivist turn characteristic of his critical period, Kant begins to identify the principles underlying reciprocal goal-directedness in the nature of the human subject. These principles, importantly, are not merely heuristics for research so that they would gradually become dispensable with increasing technological control over nature. Rather, they are constitutive of the activity of knowledge production, simultaneously expressing limitations of human knowers while supplying procedures for the progress of knowledge.

At the same time, Kant diverges from the Wolffian school in important respects on the question of the ultimate ground of natural order. Unlike his predecessors, Kant comes to reject the theoretical notion of a perfect, intuitive intellect as the source of purposiveness in nature. Kant's call to replace the scholastic concept of philosophy with a "cosmical concept" (*conceptus cosmicus*) could be seen in this light. A cosmical idea of philosophy as a "science of the relation of all cognition to the essential ends of human reason (*teleologia rationis humanae*)" stands in contrast to the scholastic, which we may without infelicity identify with Wolff's idea of philosophy.[5] For Kant's scholastic predecessors, philosophy is, in the limit, a science of the divine mind, and philosophical cognition epitomized in the idea of God as "the absolutely complete philosopher."[6] As Kant sees his historical situation, the scholastic goal of knowing reality as a whole consists merely in a quest for logical completeness represented in the idea of a perfect intellect. The scholastic philosopher certainly seeks to imitate ideals of truth, order, and goodness. But, as this goal is ultimately for the sake of salvation, these ideals are taken to originate and subsist in a divine mind which is, consequently, taken to be the actual object of human inquiry.

One ambition of Kant's revolution is to invert the priority of ends in the scholastic conception of knowledge. The quest for completeness, for Kant, should be construed as

[5] A839/B867.

[6] Theo. nat. I §268: "Deus est philosophus absolute summus." See above, Ch. 5 §7.

being directed not by divine, but rather by human legislation. Consequently, our cognitive activities, including our theoretical inquiries, ought to be reframed in light of the ends prescribed by finite, human, as opposed to infinite, divine, reason as it is available to us for inspection in the experience of ourselves as free agents in nature. The philosopher, Kant writes, does not strive to be an "artist of reason" (*Vernunftkünstler*), someone who crafts an image of reason by attending to an external model (the divine mind). Instead, she ought to be the "legislator of human reason," one who first determines the internal purposes and lawful operations of her capacity for reason.[7]

The chapter is structured as follows. Sections Two and Three trace the persistent centrality of cosmological concerns in Kant's discussions of natural teleology from his early writings to his critical period. The key shift in emphasis from the pre-critical (roughly, up to 1769) to the critical period (1770 to 1790), I argue, is a gradual decoupling of teleological concerns from speculative theology. Whereas the role of teleology in supporting the claims of rational theology figures prominently in early works such as *Universal Natural History* (1755) and *The Only Possible Proof for a Demonstration of the Existence of God* (1763), it recedes from view in later works. Beginning with *Inaugural Dissertation* (1770), teleological concerns become tied to psychological and epistemological problems surrounding the role of formal principles of cognition with respect to the aims of human reason. With respect to theology, Kant's increased focus on the psychological and epistemological conditions of human agency give rise to his project of articulating exclusively moral foundations for faith. In all of

[7] A839/B867. In R 4866, 18:14, Kant explicitly identifies Wolff as an exemplar of the "artist of reason."

this, the cosmological question of the formal, purposive unity of nature remains in place. Section Four takes up the theses of the self-sufficiency of nature and of the normativity of the natural in Kant's rational theological essay of 1763, and highlights Kant's interest in judging natural forms as purposive. Section Five situates the main threads of Kant's early thought concerning teleology in developments among the later Wolffians. Specifically, it shows how Baumgarten and Meier distinguish more precisely formal teleology from final causation, a distinction central to Kant's later formulation of the concept of purposiveness. Section Six moves away from the narrative to elucidate how Kant's later concept of formal purposiveness (*Zweckmässigkeit*) attempts to address his earlier concerns with the problem of contingency. Finally, Section Seven briefly considers the deeper problem of the objective purposiveness of nature, of judging organized beings as naturally end-directed.

This chapter spans the divide between the early and the later Kant. With respect to teleology, the shift from the pre-critical (up to the late-1760s) to the critical period grows out of Kant's dissatisfaction with his early attempts to grapple with the problem of contingent order in nature. Specifically, in his most sustained pre-critical treatment of natural teleology, *The Only Possible Proof for the Existence of God* (1763), Kant lands in a metaphysical view of natural order that veers too close to Spinoza: in his attempt to reconcile rational theology and natural science by grounding the necessity of Newton's mathematical laws in the structure of the divine essence, Kant arrives at a conception of a lifeless, impersonal God as the source of reality, while still leaving much of the contingency of nature—most apparent in the biological realm but not limited to it—

unexplained. In the 1780s, by contrast, Kant directs greater attention to the conditions of normative agency accessible from the standpoint of human, rational activity, as opposed to the Wolffian standard of the perfect, infinite rational agent as the measure of reason. Teleology becomes *teleologia rationis humanae*, the doctrine of the ends of human reason.

In the order of explanation, the method of critique first stumbles upon a distinct, teleological principle of judgment upon reflection on the experience of beauty. Teleology is characteristic of aesthetic judgment of certain natural forms, such as the shape of a flower as beautiful and as the product of design yet without any recognition of a designer. It is distinct from the judgment of artifacts. When we stumble upon a sandcastle at the beach, we immediately judge that the object was purposefully created by a human agent. But, in the case of the flower, we attribute its beauty to nature or the natural process that produced the aesthetically pleasing form. Such paradigmatic judgments of beauty reveal what Kant calls "purposiveness without a purpose," that something exists due to an intention in virtue of expressing formal unity, even though we do not recognize an intention behind it. Yet, the philosophical worth of judgments of purpose as a distinct, characteristic form of human appraisal of experience, lies further in its prospects for underwriting an account of nature as a systematically ordered unity. While teleological judgments are best expressed and available for critical examination in the delimited contexts of aesthetic evaluation, or anatomical science, they occupy a deeper function in human cognition of responding to the ends of reason. Kant certainly puts his discovery of a teleological principle of judging, that knowers with our constitution must judge certain objects or situations as if they were products of intention, separately to aesthetic, scientific, and systematic uses. But the problem of teleology in general arises at a more basic level, specifically, in an envisioned move, natural to human reasoners, from regarding nature as an indefinite series of regular events to one of purposeful connection within that series. Teleological judgment concerns, as Kant describes it in the third *Critique*, the lawfulness or lawlikeness of the contingent, and thus serves a fundamental, natural desire to increase certainty in knowledge.

Teleological judgment also enters from the question of constituting a body of knowledge as a science, that is, to unify its various propositions into a systematic whole. Here, the demand for teleology arises from a tension between understanding the world as deterministically regulated by mathematical laws, and as a normatively law-governed system. Why is nature governed by this set of laws rather than some others? Why is the series of things in experience comprised of this set of objects rather than another? In mereological terms, teleological reasoning marks a distinction between things standing in relations of coordination, in their relation to one another as "complements to a whole" (*ut complementa ad totum*), as opposed to their mere subordination as cause and effect (*ut causatum et causa*).[8] The logical distinction between coordination and subordination tracks a nominal division of sciences, between those which might be regarded as making greater use of teleological principles, and those making less use of it. In the Blomberg Logic, from the early 1770s, Kant identifies historical disciplines as being governed by relations of coordination, while relations of subordination predominate in mathematical

[8] ID 2:390.

disciplines. But all bodies of knowledge require relations of coordination, thus teleological judgment, in order to become sciences, for "in all cognitions that hang together one must first take into consideration the whole rather than its parts."[9] The lawful character of particular cognitions raises the question of their relation to an understanding of the whole of nature. Ultimately, Kant's study of human nature acknowledges perfectibility in knowledge (as well as in action) as the good for human beings, even if turns out to be unattainable in this life. Teleological judgment, as necessary for regarding nature as *cosmos*, as a system rather than as an accidental heap and as directing practical activity toward categorical ends, earns its validity as among the conditions for proper human function, thus for human flourishing.

Finally, a further source of teleological thought in Kant is natural theology, and an entrenched commitment to the goodness of creation. While Kant, along with Hume, is commonly read as an incisive critic of naïve, early modern invocations of cosmological design, his belief that the evident fact of natural order presupposes some kind of intelligence never wavers. Even in the thick of the first *Critique*'s attack on speculative metaphysics, for instance, he takes it to be obvious that, "[a] plant, an animal, the regular arrangement of the world's structure (presumably thus also the whole order of nature) –

[9] BL 24:292. Robert Butts, "Teleology and Scientific Method in Kant's Critique of Judgment," *Nous* 24, no. 1 (1990), 5, observes: "[Kant's] conclusion is that a deep teleological principle operates as an *a priori* presupposition of any scientific inquiry. Teleology subordinates mechanism, while at the same time vindicating its employment. Paradoxically, it is because we must necessarily think of nature as designed that we are justified in applying the principle of mechanism. In the absence of the expectation of order, it is irrational to suppose that the formalism of space/time and the categories can be applied."

these show clearly that they are possible only according to ideas."[10] One aspect of Kant's treatment of natural teleology, consequently, consists in locating the ground of organized structures according to a form or idea. Kant's later position on the topic, in keeping with the project of critique as the "study of our inner nature,"[11] rests in an account of the operations of one of the higher faculties of cognition, the faculty of reflective judgment. More generally, Kant hints at the practical value, at least, of judging organization in external nature as mirrored in the organized character of the cognitive faculty as a whole. A cosmological concept of organization in which every element is for the sake of another could mediate a structural correspondence between the material and formal aspects of human subjectivity. In his critical model of the relation between self and world, Kant preserves a philosophical commitment common to the German scholastic tradition. Just as Wolff maintains that "one can grasp neither the essence of a spirit in general nor of the soul in particular before one understands what a world actually is and what kind of constitution it has," Kant proclaims that "even our inner experience… is possible only under the presupposition of outer experience."[12] The epistemological marriage of reason and experience has a counterpart in their shared commitment to a harmony of the subject and the object as philosophical bedrock.

With these conceptual questions and commitments in view, we can turn to the philosophical scene in Central Europe in the mid-eighteenth century.

[10] A317/B374.
[11] As Kant describes his project in the first *Critique* at A703/B731.
[12] DMet. §540; KrV B275.

2. Materialism and physico-theology in Kant's early cosmology

The problem of natural teleology loomed large in Germany when Kant came of intellectual age. How the world's structure originated, and upon what ground the continued stability of its order rested numbered among the key philosophical challenges bequeathed by the success of Newton's cosmology. The problem shaded into a common concern of the period to reconcile faith with the gathering autonomy of enlightened reason.

One response to these issues had already developed into orthodoxy at Cambridge during Newton's time. For Newton, matter was essentially passive. Regularities among material phenomena owed to forces that remained external to matter itself. The notion of force in the *Principia* effectively served as a placeholder for whatever occupied the causal roles expressed in mathematical laws. The banishment of inner purpose, striving and, in a word, life, from the physical world was accompanied in English theology by a radical voluntarism concerning God's involvement in nature. Anglican theologians at the turn of the eighteenth century found in Newtonian cosmology a suitable complement to their conception of God's will as entirely free of rationalist constraints (compatible with, but not bound to, reason), and the only genuine source of order and change in the created world. God's good pleasure alone, as Samuel Clarke responded to Leibniz, could be a sufficient reason for any natural event or fact. This "holy alliance" between the Church of England and a popular understanding of Newton's achievement yielded a copious literature on natural religion.[13] Authors such as John Ray and William Derham assiduously catalogued specific instances of adaptation as evidence of divine wisdom and providence in the arrangement of creation. Physico-theology, as Derham would call it, extended to all parts of nature, whether mineral, vegetable, or animal—the distinction between organic and inorganic nature remained meaningless from a perspective that viewed all of nature as the uniform product of a single designer. Physico-theology's procedure, however, remained 'idiographic,' or focused on particular signs of order and harmony, from the functionally adapted structure of insect bodies to the benefits of coastal winds.[14]

It is this empirical project that Wolff christened *Teleologia*, and his popular 1724 book on the subject did much to introduce the discipline to a wider German audience. Yet, as we saw in the previous chapter, physical teleology occupies an ambiguous place in Wolff's system. As an empirical science, it does not pretend to establish metaphysical premises. Rather, it merely serves to confirm and provide sensible illustrations of

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[13] See John Gascoigne, *Cambridge in the Age of the Enlightenment* (Cambridge: Cambridge University Press, 1988), for a study of this "holy alliance" between science and theology in Enlightenment England. There were, to be sure, dissenting opinions. Thomas Burnet, for instance, emerged as an influential critic of the idea of an interventionist God in his 1684 *Sacred Theory of the Earth,* 4th ed. (London: John Hooke, 1719), 146: "We think him a better Artist that makes a Clock that strikes regularly at every Hour from the Springs and Wheels which he puts in the Work, than he that hath so made his Clock that he must put his Finger to it every Hour to make it strike."

[14] To be sure, 'idiographic' (to borrow Wilhelm Windelband's term) physico-theology was not limited to England. The discipline also found adherents on the continent, such as the French bishop François de Salignac de la Mothe-Fénelon (*Démonstration de l'existence de Dieu, tireé de la connaissance de la nature*, 1713), and the Dutch mathematician Bernard Nieuwentijd (*L'Existence de Dieu démontrée par les merveilles de la nature*, 1725). Hermann Reimarus' *Abhandlungen von den vornehmsten Wahrheiten der natürlichen Religion* (1755) was perhaps the most popular representative of this tradition in Germany during Kant's time.

doctrines adduced in the metaphysical discipline he calls natural theology. Nonetheless, in the two decades after Wolff's first and only work on physico-theology, a flurry of texts appeared in Germany that ignored Wolff's reluctance to found a science of divinity on empirical teleology alone. Enthusiastic works by, among others, F.C. Lesser (*Lithotheologie* 1735; *Insectotheologie* 1738; *Testaceotheologie* 1744), C.H. Rappold (*Locusta-theologie* 1730), and E.L. Rathlef (*Akridotheologie* 1748) disseminated in the vernacular the Anglican method of basing proofs for the existence and attributes of God upon observations of rocks, locusts, or grasshoppers.

Two challenges to the orthodoxy in natural religion emerged in the 1740s that would deeply shape Kant's approach to cosmological questions. Both innovations were the product of the progressive Friedrich II's renovated Prussian Academy of the Sciences which witnessed an influx of prominent French *philosophes* in this decade. The young monarch installed in 1745 Pierre Louis Maupertuis, a fervent advocate of Newton against Leibniz and Wolff in the *vis viva* controversy, as director of the Academy.[15] Maupertuis' criticisms of the particularist method in natural religion and his alternate approach focusing on the economy and elegance of mathematical laws would directly inform Kant's treatment of physico-theology. But in advance of his main work on the topic, *Essay on Cosmology* (1750), Maupertuis would introduce to Berlin society his eccentric compatriot, Julien Offray de La Mettrie, whose radical materialism would stoke further the flames of a heated debate in the mid-eighteenth century.

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[15] Maupertuis' criticism of Leibnizianism (and Wolffianism) was wide-ranging, and helped engender a popular image of German academic philosophy (both in Germany and in France) as excessively speculative to the point of absurdity; see Barber, *Leibniz in France*, Ch. 9.

The materialist hypothesis, particularly the question of whether human nature might be fully explained by properties of matter, had already produced vigorous responses. Works such as G.F. Meier's *Beweis, dass keine Materie denken könne* (1743), or Martin Knutzen's *Philosophische Abhandlung von der immateriellen Natur der Seele* (1744) sought to uphold the theologically important theses of the immateriality and indestructibility of the soul. La Mettrie would not be the first early modern author to speculate about the possibility of thinking matter or to provoke a response; Hobbes and Locke had prominently raised the question, and renewed interest in Lucretius ensured that a sophisticated materialist cosmology was available to the early modern imagination.[16] Nevertheless, La Mettrie counted among the few to openly advocate that, not only could one usefully study plant, animal, and human bodies as if they were machines, but that in fact there is nothing more to them than a complex organization. A trained physician, La Mettrie first caused uproar in France with the publication of his *Natural History of the Soul* (1745), which was publicly burned and occasioned his expulsion. Even in famously tolerant Holland, where he then took up residence, La Mettrie managed to antagonize institutional powers with the publication of *Man, A Machine* (*L'homme machine*, 1748), a document aptly described as a "materialist manifesto" rather than a mechanical description of the human being in the spirit of

[16] See Wilson, *Epicureanism*, for a study of the role of Lucretius' *De rerum natura* in early modern thought. Materialism had home-grown proponents in Germany as well; Corey W. Dyck, "Materialism in the Mainstream of Early German Philosophy," *British Journal for the History of Philosophy* 24, no. 5 (2016): 897–916, recovers some of these figures. But it is fair to hold that, at mid-century, whatever impact the likes of materialist authors such as Friedrich Wilhelm Stosch or Theodor Ludwig Lau might have had was overshadowed by the French and British connections cultivated by Frederick II.

Descartes' *Treatise on Man*.[17] For La Mettrie, "[a]ll the faculties of the soul depend so much on the proper organization of the brain and of the entire body, since these faculties are obviously just this organized brain itself."[18] Thought, judgment, reflection, and other functions traditionally assigned to the rational soul, La Mettrie argues, can be reduced to the corporeal imagination upon which are painted resemblances of external objects. With his deliberately Epicurean metaphysics, La Mettrie exhorts readers against "contemplating the infinite," for questions about the nature and existence of God are not only beyond our ken, they are also practically worthless. Physico-theology as practiced by Derham, Ray, or Nieuwentijd, in particular, contains nothing but "tedious repetitions… better fitted to fortify than to sap the foundations of atheism."[19] Despite being widely perceived by contemporaries as an atheist and a heretic, La Mettrie found a powerful defender in Friedrich II. In his eulogy upon La Mettrie's death in 1751, the Prussian monarch defended his personal physician against critics: "All those who are not imposed upon by the pious insults of the theologians mourn in La Mettrie a good man and a wise physician."[20]

If La Mettrie had excelled in the role of *provocateur* to the deists, it was Maupertuis who introduced substantive revisions to the project of linking natural science and natural theology. The *Essay on Cosmology* sets out to examine the proper scope of a

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[17] Ann Thomson, *Materialism and Society in the Mid-Eighteenth Century: La Mettrie's Discours Préliminaire* (Genève: Droz, 1981), 42. Friedrich Heer, *Europäische Geistesgeschichte* (Stuttgart: W. Kohlhammer, 1953), 513, pronounces the harsher judgment that La Mettrie represents the barbarization of the Enlightenment.
[18] Julien d'Offray de La Mettrie, *Man a Machine and Man a Plant,* trans. Richard A. Watson and Maya Rybalka (Indianapolis, IN: Hackett, 1994), 59.
[19] Ibid. 54-55.
[20] Cited in Schaffer, "Enlightened Automata," 153.

theology founded upon reason. In this enterprise, it begins from Newton's observation that "the movements of the celestial bodies sufficiently demonstrates the existence of the one who governs them."[21] Unlike the "crowd of physicists after Newton who have found God in stars, in insects, in plants, in water," Maupertuis proposes instead to follow Newton himself in focusing on the orderliness among unities among empirical laws as evidence of choice.[22] One consideration in favor of locating providence in formal unities among laws, according to Maupertuis, rests simply in the notion of a divine creator. For an order instituted by an infinite intellect ought to be exceptionless, whereas the details of insects or flowers reveals instead numberless adjustments to lawful order.[23] No amount of description of natural adaptations can suffice to prove the existence of an infinite power, Maupertuis argues, for these reveal the limitations of the craftsman as much as they attest to his skill.[24] Instead, he proposes to locate the work of providence in certain harmonies between necessary mathematical laws. Foremost among the evidence of formal or mathematical harmony in nature is Maupertuis' discovery of the principle of least (quantity of) action (*principe de la moindre quantité d'action*): that in any physical system the true path of a moving particle is such that it minimizes the quantity of action, or the expenditure of energy from one point to another.[25] With Maupertuis' principle,

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[21] Pierre Maupertuis, *Essai de cosmologie* (Leiden, 1751), 11, citing Newton's *Opticks* III*,* Query 31.
[22] Ibid. 13-16.
[23] Ibid. 55-6.
[24] Ibid. 49-53.
[25] More precisely, action is defined as the average kinetic energy less average potential energy from point A to point B. The actual path of a particle is always the one that minimizes this quantity. Maupertuis defines it as follows: "dans le choc des corps le mouvement se distribue se manière, que la quantité d'action, que suppose le changement arrive, est la plus petite qu'il soit possible. Dans le repos les corps, qui se tiennent en

Newton's laws of motion could be stated in a generalized form, much in the same way as Fermat's principle of least time or Leibniz's principle of most determined path give unified expression to the laws of optics.[26] The teleological character of this discovery—namely, that it posits known termini of motion rather than the initial conditions of particles to derive general laws—leads Maupertuis to proclaim that this principle alone "conforms with the power and wisdom of the creator and orderer [*l'ordonnateur*] of things."[27] This revised, 'nomothetic' procedure,[28] Maupertuis hopes, could lend to natural religion the force of certainty enjoyed by mathematical demonstration, and rescue it from the counter-productive efforts of standard design arguments.

The tendencies represented by La Mettrie and Maupertuis would leave lasting marks on Kant's cosmological thought. Negatively, La Mettrie's unapologetic materialism would warn the young Kant of the dangers to religion posed by an overzealous naturalism. In the Preface to his *Universal Natural History and Theory of the Heavens* (1755), an ambitious work laying out a cosmogony based on the forces of

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équilibre, doivent être tellement situés, que s'il leur arrivait quelque petit mouvement, la quantité d'action serait la moindre" (*Essai de cosmologie*, 105).

[26] Maupertuis's discovery would quickly become the subject of a bitter priority dispute, when his friend and fellow member of the Berlin Academy, Samuel König, published a letter allegedly penned by Leibniz in 1707 describing the principle of least action. Maupertuis took offense at the insinuation of plagiarism and, as president of the Academy, had the backing of most of its members. König was charged with forgery and, having failed to produce the original letters (which have yet to surface to this day) was forced to resign from the Academy. The very public controversy drew in the likes of Voltaire, Leonhard Euler, and Frederick II. The least action principle, which still bears Maupertuis' name, would lead to the foundation of the variational calculus, a set of tools extensively used in classical and quantum physics.

[27] Maupertuis, *Essai de cosmologie*. xix.

[28] Again, to use Windelband's terminology.

attraction and repulsion, Kant preemptively responds to any accusations of impiety his mechanistic account of the origins and development of the universe might occasion:

> If the universe with all its order and beauty is merely an effect of matter left to its general laws of motion, if the blind mechanism of the powers of nature knows how to develop so magnificently and to such perfection all of its own accord: then the proof of the divine Author, which one derives from the sight of the beauty of the universe, is entirely stripped of its power, nature is sufficient in itself, divine government is superfluous, Epicure lives again in the middle of Christendom, and an unholy philosophy tramples faith underfoot, which hands that philosophy a bright light to illuminate it.[29]

Kant acknowledges his common ground with the Epicureans and materialists: that natural forms, from galaxies and planets to plants and animals, emerged from an initial state of matter "universally dispersed." Like the Epicureans, Kant envisages a necessary development of the universe due to natural causes from a first state of chaos. But he departs from the Epicurean picture in regarding the entire mechanical evolution of the universe as resting upon divine intention, rather than on occasional, chance collisions of falling atoms. Chance, for Kant, is a non-starter as an explanation for the origin of forms in nature.[30] To attribute a natural phenomenon to chance is, for Kant as for Leibniz and Wolff, precisely to exclude it from the ambit of science.

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[29] ANg 1:222.
[30] Ibid. 1:226-7. See Schönfeld, *Young Kant*, 110-7, for details of Kant's speculative cosmogony, and the "nebular hypothesis" of the evolution of the universe. See Hans-

With chance ruled out, the relevant cosmological options are a dynamical and an inertial model: whether, on the one hand, God chose those laws of motion which would naturally bring about the most perfect order in the course of time; or whether instead nature has "a complete incapacity for harmony" and requires periodic divine intervention to adjust material forms to one another. The latter view, Kant laments, has become an "almost universal prejudice."[31] Echoing Leibniz's criticisms of the Newtonians, Kant objects that this view of nature as inert and devoid of principles of order turns "the whole of nature into miracles," in which every instance of order has to be explained by appeal to a specific divine intention. On the English method in natural theology, Kant declares, "there will then no longer be any nature; there will be only a god in the machine bringing about the changes of the world."[32] The contrast in the statement reveals the early Kant's commitment to a broadly Aristotelian conception of nature as an active, formal principle. To be nature is to be intrinsically norm-governed, and not to be in need of direction by external intention.

Furthermore, the inertial model depicts nature as in conflict rather than harmony with divine wisdom, and therefore as essentially independent from God. Nature, for Kant, is not a site constantly undergoing, even requiring, sacralization, as implied by Newton's model of a deity intervening to correct the courses of the planets. Thus, although Kant does not consider a fully materialistic account a live option in cosmology, neither does he accept an inert, clockwork view of the world. Kant's goal is to stake out a kind of

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Joachim Waschkies, *Physik und Physikotheologie des jungen Kants* (Amsterdam: Gruner, 1987), for a study of the background sources for Kant's *Universal Natural History*.
[31] ANg. 1:332.
[32] Ibid. 1:333.

naturalism in which the properties and laws of matter play an immanent role in explaining the order of nature, while ultimately having their source in supreme wisdom. Matter and its forces should be effective means for the gradual emergence of a stable cosmos. To rebut the charge of atheism, Kant leverages his dynamical, evolutionary account in service of a theistic proof, for "*a God exists precisely because nature cannot behave in any other than in a regular and orderly manner, even in chaos*."[33] In agreement with Maupertuis, Kant identifies that which is necessary in nature rather than contingent as indicating its divine origin. Kant's belief in the capacity of nature to produce order and harmony receives more sustained defense in his next major work to broach the topic of natural teleology.

3. *The Only Possible Proof* (1763): divine and natural necessity

Kant's most significant treatise on rationalist theology is notable for a number of tensions. The official purpose of the work, as suggested by the title *The Only Possible Proof for a Demonstration of the Existence of God*, is to argue for the unique viability of a new, modal proof for God's existence, one resting on the idea of God as the absolutely necessary ground of all real possibilities. But the *a priori* proof (or proof-ground, *Beweisgrund*) from a consideration of the concept possibility only occupies the first part of the book. The second part ("Concerning the Extensive Usefulness Peculiar to This Mode of Proof in Particular") purports to be an application of the findings of the *a priori*

[33] Ibid. 1:227-28.

proof from possibility for *a posteriori* reflection on God's relation to the natural world. But it is unclear how Kant's discussion of design and purposive unity in natural objects—what he labels a cosmological argument or a physico-theological argument—relates to the official and only possible proof of God as the ground of possibility. Adding to the confusion is the fact that, despite having advanced the modal proof as the "only possible" proof for God's existence, Kant writes of the design argument that this "proof is not only possible, it also wholly deserves to be brought to proper perfection by the concerted efforts of philosophers."[34] (Ironically, this sentence appears in the third part of the work, titled "In Which It Is Shown That There Is No Other Possible Argument in Support of A Demonstration of The Existence of God Save That Which Has Been Adduced"!) The structure of the treatise engenders some puzzlement about its aims and conclusions.

Martin Schönfeld has persuasively argued that the textual unity of *The Only Possible Proof* consists in Kant's broader philosophical project to reconcile metaphysics and theology on the one hand with the new natural science on the other. To this end, according to Schönfeld, Kant "intends to show that the physico-theological and the ontological arguments cohere in their claims such that the consideration of one will necessarily lead to the consideration of the other." On Kant's strategy, the contingent, purposive unity of natural objects has its ground in the laws of nature, which in turn are expressed in the structure of the essences of things. The essences of natural kinds, finally, are exemplified in the divine nature which is the ultimate ground of their possibility. In this way, the internal teleology of created nature Kant had defended in the *Universal*

[34] EmBg. 2:159.

Natural History finds its deeper significance as a bridge from the world of experience, the world studied by Newtonian science, to the metaphysics of divinity. The common, only possible *Beweisgrund* for the two rational paths to God remains the analysis of the conditions of real possibility Kant sketches in part one. This proof-ground, a foundation of premises upon which separate arguments could be constructed, is the unified basis for both the ontological and cosmological arguments. The relation between the two arguments, Schönfeld explains, is that of a proof and a commentary on the proof, respectively.[35]

What remains unsettled, however, is whether Kant succeeds in his intended project to reconcile the *a priori* and *a posteriori* modes of theological proof. There are two worries, each of which ultimately lead Kant to rethink his entire strategy in cosmology and theology. First, Kant's account of possibility as grounded in the structure of the divine essence has a decidedly Spinozistic flavor. In particular, it is questionable whether Kant manages to avoid the specter of necessitarianism; that is, whether Kant's account leaves any room for a meaningful sense in which God's will plays a role in the selection of the laws of the world. The second objection flows from the first. For the necessitarian consequence of the *a priori* proof undermines the aims of the cosmological argument which is supposed to render an explanation of the contingent yet rational order of nature. If the contingent possibilities contained in the essences of natural unities (of objects, of laws) are grounded in the divine essence, Kant needs God's free, rational choice to factor into the consideration of their selection. In the critical period, Kant would

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[35] Schönfeld, *Young Kant*, 194-7.

move toward a richer, more familiar notion of teleology, one of intentions grounded in the structure of human rather than of divine nature. The ontological argument itself would not survive the first *Critique*.

Unlike earlier ontological arguments such as Descartes' or Leibniz's, which had relied on treating existence as one predicate among others contained in the concept of a most complete (perfect) being, Kant conceives of an *ens perfectissimum* as an absolutely necessary requisite for the internal possibility of other beings. What distinguishes his proof from his predecessors' consists in the fact that it proceeds simply from the premise that something is possible, without presupposing any existing thing, whether oneself, other minds, or the world. Its virtue, according to Kant, consists in its being "derived from the internal characteristic mark of absolute necessity," namely its status as the ground of anything else's being metaphysically (not just logically) possible. It thus eschews any appeal to actual existence or even the notion of existence. God's distinctive modal characteristic should be the "cancellation" of all possibilities upon the thought of his non-being. That anything whatsoever is possible is grounded in the divine nature as the source of all simple, positive predicates. As Robert Adams explains, unlike Leibniz's God, who grounds possibilities by thinking them, Kant's God in 1763 grounds possible essences by exemplifying their simple predicates: "Kant's argument is that in order for possibilities to have their "material" content, the primitive positive qualities involved in that content must actually be possessed by some being." This actual being, God, cannot itself be merely possible, or even just conditionally necessary (on some necessary causal law, for instance). Rather, God has to absolutely necessary, such that its negation would extinguish all possibility.[36] Crucially, for God to ground at least certain possibilities by exemplification alone allows that these possibilities need not be grounded in the intentional content of the divine mind. The contrast with Leibniz is again instructive. Kant's God does not, unlike Leibniz's, ground the essences of things by holding them in thought as candidates for actualization. For God to exemplify possibilities is simply for God to furnish the essences of things with their simple positives predicates.

To the materiality condition satisfied by God's exemplification of real predicates, Andrew Chignell adds a second condition of real harmony between those predicates in making up the essences of possible things. The primitive qualities exemplified by God must not only be logically but also metaphysically compatible in virtue of meeting some criteria of co-instantiability. Put another way, real harmony among material (divinely exemplified) predicates requires an absence of what Kant calls "real repugnance", or non-logical repugnance. Kant suggests as examples of real repugnance the predicates 'being extended' and 'having a mind,' insofar as the impenetrability we attribute to bodies cannot be attributed to a subject that has understanding and will.[37]

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[36] EmBg 2:91; Robert Merrihew Adams, "God, Possibility, and Kant," *Faith and Philosophy* 17, no. 4 (2000), 427.

[37] EmBg. 2:85-6. See Andrew Chignell, "Kant, Real Possibility, and the Threat of Spinoza," *Mind* 121, no. 483 (2012), 645-48, who offers further examples such as, 'being water' and 'being XYZ' (where XYZ ≠ H_20), and 'being Cliff Richard' and 'being born to Bill and Hillary Clinton. See Uygar Abaci, "Kant's Only Possible Argument and Chignell's Real Harmony," *Kantian Review* 19, no. 1 (2014): 1–25, and Nicholas Stang, *Kant's Modal Metaphysics* (Oxford: Oxford University Press, 2016), Ch. 5, for further critical reconstructions and analyses of Kant's argument in this text in dialogue with Chignell's and Adams' work.

Kant's possibility proof is ambitious and genuinely novel in the history of rational theology. But the ambivalent character of the work is evident already in its title: on offer is only a "proof-ground" (*Beweisgrund*) for a formal demonstration, rather than an actual proof. The technical notion of a *Beweisgrund*, as Kant explains in his logic lectures, consists of the "essential elements of any proof whatsoever [which] are its matter and form, or the proof-grounds and the consequence."[38] A *Beweisgrund,* in other words, is a set of premises which together constitute the materials for a valid demonstration. Kant carefully points out that the work does not in fact contain such a demonstration.[39] He even expresses skepticism on occasion about creatures like us ever being able to know conclusively the manner in which a supreme being could ground the possibility of real things.[40]

Moreover, despite the official, *a priori* strategy for establishing a *Beweisgrund* for proving God's existence, Kant devotes equal attention to the *a posteriori* mode of physico-theology, of knowing God's existence on the basis of facts of experience. It comes as some surprise to find Kant announcing, upon concluding his discussion of the modal proof that, since experience also teaches us the existence of harmonious unities in nature, the "*a posteriori* mode of cognition will enable us to argue regressively to a single principle all possibility," so that we would "arrive at the self-same fundamental concept

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[38] 9:71.
[39] EmBg. 2:66; Cf. Stang, *Modal Metaphysics*, 129n13.
[40] EmBg. 2:153. Stang, *Modal Metaphysics*, 118, in fact draws this conclusion on Kant's behalf: "The way in which possibilities are grounded in God is literally incomprehensible to us." Chignell, "Real Possibility," 636, notes, however, that Kant retained a favorable estimation of the proof into the 1780s and 1790s, undercutting Stang's mysterian reading of Kant on the matter.

of absolutely necessary existence, from which the *a priori* mode of cognition initially started out."[41] In keeping with this opinion, Kant engages with physico-theology seriously enough not only to criticize its shortcomings, but also to offer revisions to its usual method. In the remainder of this section, I shall first discuss Kant's objections to standard design arguments, and then consider his proposals for revised physico-theology. Historically, the developments documented in *Only Possible Proof* bear the clear influence of Maupertuis in their emphasis on evidence of lawful necessities in nature as opposed to the contingency of its adaptations. Systematically, it reveals Kant's gathering conviction of the self-sufficiency of nature's laws to wrest order from chaos, as well as a recognition that the contingency of natural order might be primitive and irreducible to the ideal of geometrical necessity pursued by seventeenth-century mechanical philosophers.

As Kant understands it, "ordinary," or idiographic physico-theology, proceeds as follows: first, it conceives regular order and functional adaptedness in nature in terms of contingency. Bird wings could have assumed an infinite variety of forms, yet nature appears to have hit upon a structure well-adapted to flight. From such contingent adaptations the existence of wise design is inferred which, combined with reflection on the immensity of the natural world with its diverse forms, is taken as proof of a highest wisdom as its author. Kant acknowledges the advantages of this method. It is easily accessible even to "the most ordinary understanding" in virtue of its strong appeal to

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[41] EmBg. 2:92. The two-part approach to natural theology owes to Wolff's *Theologia naturalis*, which consisted of an *a priori* and an *a posteriori* part. But Kant's treatise, while nominally in this tradition, does not resemble Wolffian tracts in natural theology. It seems unlikely that the structure of the *Only Possible Proof-ground* is forced by the formal requirements of his time.

simple observations, and provides an intuitive, non-theoretical idea of a supernatural creator which fills the soul "with wonder, humility, and reverence."[42] Nevertheless, Kant finds this method lacking in crucial respects.

In the first place, idiographic physico-theology misses the crucial achievement of mathematical physics by failing to appreciate the greater certainty with which its laws predict at least some natural events. By focusing on the contingent adaptations of organic parts and the incidental benefits to human beings of certain ecological facts, this method becomes vulnerable to the most significant result of early modern natural philosophy, namely, its mathematization. This vulnerability becomes especially acute in the inorganic domain. The imputation of reflective fine-tuning to unite the various properties of the atmosphere, which make respiration, air pumps, and evaporation possible, fails to recognize the necessity with which these effects follow from its structure. Likewise, the specific elasticity and pressure of the atmosphere that enable respiration in mammals necessarily allow the construction of pumps, the formation of clouds, and the moderation of daytime and nighttime temperature. In general, Kant objects that, "[j]ust because no other method of judging nature's perfection is admitted except that which involves appeal to the provisions made by wisdom, it follows that any widely extended unity, insofar as it is obviously recognized as necessary, constitutes a dangerous exception."[43] The fact that many disparate effects can be unified under general laws of matter threatens to undermine proofs for divine creation which make essential appeal to contingency.

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[42] Ibid. 2:117. Approval of ordinary physico-theology for these reasons recurs in the first *Critique* at A623/B651.
[43] EmBg. 2:119.

Second, the idiographic method hinders scientific research by preemptively blocking the search for unified, mechanical explanations. It engenders a tendency to attribute any striking adaptation or ecological provision to a special, divine institution. By way of psychological diagnosis, Kant ascribes this tendency to one of two roots: either one assumes without justification that nature is incapable of producing order, or one fears that the production of order through nature's own forces and laws would be tantamount to admitting the operation of blind chance. The unfortunate consequence is a "humiliated reason" which furnishes "the lazy with an advantage over the tireless inquirer… under the pretext of piety."[44] Indeed, no less an investigator than Newton, Kant laments, fell victim to a fear of denying providence when he sought an explanation for the flattening of the Earth's sphere at its poles in a special divine intention rather than striving for a mechanical account in the effects of the Earth's axial rotation.

Finally, the ordinary method of physico-theology, Kant objects, can at best support the concept of a craftsman who establishes connections among preexisting materials, much like a clockmaker or a carpenter. But such a craftsman is necessarily constrained by the inherent limitations of the available materials: "He orders and forms matter, but He does not produce or create it." Consequently, this method is inadequate if one wished to prove the existence of a creator rather than a mere architect of the world.[45] Despite its shortcomings, however, Kant continues to regard the *a posteriori* mode of

[44] Ibid. 2:119.
[45] Ibid. 2:122-3. A charge, once again, echoed in the critical period: A627/B655.

rational theology to be "most in harmony both with the dignity and with the weakness of the human understanding," and therefore worth trying to revise rather than to reject.[46]

The key revision Kant proposes for physico-theology bears the direct influence of Maupertuis' reflections in the latter's *Essay on Cosmology*: that lawful necessity furnishes better reasons than particular contingencies for inferring a wise creator of matter as well as of its diverse forms. For the necessary production of orderly and useful effects through multiple laws of matter indicates a unified ground of the harmony of those laws. Moreover, the ground of such a harmony of laws must possess wisdom, or the ability to know exactly the effects resulting from the combination of multiples forms in a material substrate. But in contrast to Aristotle who grounds in God only the forms of nature but not their matter, and in keeping with the Christian conception of God's creative act*,* Kant recognizes the demand to ground in God the possibility of matter itself which would be capable of assuming forms. In other words, on the constraint that the required proof should be of a God who creates *ex nihilo*, the unity of purpose in matter cannot be separate from the unity of its forms. The necessary unity of the laws of matter, according to Kant, must be grounded in the possibilities of material things. Thus,

> there must be a Wise Being, in the absence of which none of these natural things would themselves be possible, and in which, as in a great ground, the essences of such a multiplicity of natural things are united into such regular relations. But then it is clear that not only the manner of their connection, but the things

[46] EmBg. 2:123.

> themselves, are possible only in virtue of this Being. It is this argument which first reveals the complete dependency of nature upon God.[47]

If physico-theology is to avoid the error of imagining God merely as a great architect but not as a true creator of nature, it has to conceive of the laws of order as essential to the natures of created things. God has to be seen as a singular ground of the possibility of hylomorphic beings rather than as a repository of forms to be imposed upon an independent material substrate. The law-governed explanations of mathematical physics provide a promising avenue for securing such grounds of necessary unity in virtue of their power to unify disparate phenomena. It is the lawful, necessitarian character of physical explanation, one suspects, which Kant has in mind in his remark in the Preface that his intention "has been focused on the method of using natural science to attain cognition of God."[48] In parallel with the *a priori*, modal proof, Kant's *a posteriori* proof for the existence of God seeks the ground of a necessary order among essences. The difference lies in the epistemic access to these essences. In the *a posteriori* mode, the premises are partly in the form of nomic regularities, those established paradigmatically in mathematical physics.

Maupertuis' discovery of the least action principle supplies Kant with his prime example of such unities among laws of matter. The derivation of the laws of rest and motion from a single principle of economy, Kant argues, "enables us to subsume the effects produced by matter, irrespective of the great differences which these effects may

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[47] Ibid. 2:125.
[48] Ibid. 2:68.

have in themselves, under a universal formula which expresses a relation to appropriatenes, beauty, and harmony."[49] Maupertuis' principle and the particular laws it unites presupposes a specific constitution of matter, namely, as a space-filling, impenetrable quantity moved by forces of attraction and repulsion. At the same time, the method employed in this unification does not depend on any experimental results or hypotheses. Being purely mathematical, yet dealing with laws of matter, it transfers the necessity characteristic of mathematical demonstrations to an empirical unity. Following Maupertuis, Kant takes this harmony of the most general laws of matter to indicate more distinctly than any contingent—that is, not mathematically explicable arrangements—a highest ground of nature. Kant gives further indications of the character of these laws. Unsurprisingly, the list of candidate universal laws of nature is familiar from Leibniz's "laws of final causes": the principle of simplicity, of which Maupertuis' principle is a specific expression; and, among the laws of motion, the principle of equality of cause and effect, whether in the resultant velocities of colliding bodies, and the conservation of *vis viva*. Such general principles of order, Kant writes, establish "an admirable community… among the essences of created things." These essences harmonize "spontaneously," that is, they "contain within themselves an agreement which is extensive and necessary, and which aims at the perfection of the whole."[50] The natural world, for Kant, is not an inert work of divine art. Rather, its principles of order are immanent in its necessary causal laws, whose ontological ground is the divine nature.

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[49] Ibid. 2:99.
[50] Ibid. 2:131.

Kant's revised, Maupertuis-inspired, nomothetic method of physico-theology yields several recommendations. First, in the observation of any natural adaptation one must seek its deeper ground in more general causal laws, and thus subsume the particular, contingent effect under a universal, necessary rule. This methodological directive, Kant advises, should extend to the organic domain as well, so that even in the structure of organic parts such as an eye one must assume a single, underlying disposition which has received varied material expressions, and which is the ultimate target of inquiry. Anticipating a central function of the principle of purposiveness, which in 1790 Kant would ascribe to the faculty of reflective judgment, Kant here proposes a rule of judgment for cases in which a particular unity is given while a universal concept for it is lacking. The revised method directs the understanding to find a universal for a particular in which we immediately discern a formal unity of parts even though we are lacking a suitable concept under which to subsume it. In the limit, Kant envisions bringing the entirety of nature under a single law of order, which alone would befit the idea of a highest being as its ground.[51] As illustration of the revised method, Kant appends a précis of his speculative account in *Universal Natural History* of the origin and development of the cosmos on the assumption of an initial state of chaos, together with the laws of attraction and repulsion operating on impenetrable, space-filling matter.

More contentiously, Kant highlights the distinction between two kinds of grounds in a divine being. Order assumed to obtain through artifice, through a special choice for

[51] Ibid. 2:126.

the sake of a specific result, supports an inference to the "wisdom of an Author." By contrast,

> an essential and necessary unity, which is to be found in the laws of nature, will be employed to infer the existence of a Wise Being, construed as the ground of this unity. The latter inference, however, will be mediated, not by the wisdom of this Being, but by that in him which must harmonize with that wisdom.[52]

Whereas contingent adaptations support an inference to one of God's primitive attributes, his wisdom, a necessary unity among laws of nature involves, in addition, all the other attributes which jointly exemplify the essences of created things. A ground in divine choice alone would be insufficient to explain the potency of nature's universal laws. Nomothetic physico-theology, by contrast, locates God's existence (or rather, any possible argument thereto) in lawful and hence necessary relations. These relations are grounded in the essences expressed through his simple predicates which jointly ground the possibility of an order of nature, hence also of the actual order. Reflection on the necessary character of the fundamental laws of nature leads from the side of experience to a *Beweisgrund* for the self-same idea of God that Kant arrives at in his modal proof, namely, as the ground of nature in virtue of being the necessary ground of the possibility of matter and its laws.

The general thrust of Kant's arguments in both the *a priori* and *a posteriori* modes would give pause to readers in his own time. Perhaps the most notable of these is

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[52] Ibid. 2:126.

Friedrich Heinrich Jacobi, who in the 1780s would become the central antagonist for rationalist thinkers such as Moses Mendelssohn whom he would accuse of Spinozism (a by-word for atheism at the time). By his own admission, Jacobi first arrived at his conviction that Spinozistic necessitarianism, with its inevitable denial of providence and moral purpose in creation, is the logical outcome of all speculative metaphysics by reading Kant's 1763 essay. Kant's emphasis on the absolute necessity of God's nature certainly suggests such a conclusion. As Chignell observes, "the necessary being that falls out of the pre-critical proof looks more like Spinoza's extended *natura naturans* than the independent and personal creator-God of Christianity."[53] Despite Kant's persistent criticisms of Spinoza's conception of God as blindly emanating the universe, his own strategy in his early period runs into difficulties similar to Leibniz's lifelong struggle with the specter of necessitarianism.

Moreover, it remains unclear whether Kant's nomothetic physico-theology survives his own requirements for a theistic proof. Specifically, the relation of God as creator as opposed to architect or craftsman remains insufficiently developed. Kant's thought appears to be that, in exemplifying the simple positive predicates of reality, God grounds the possibility of the actual world as a law-governed unity of form and matter. Created nature, therefore, can be properly understood as a limited expression of divine nature rather than as an independent, formless mass which a divine artisan forces into shape. Nevertheless, this underdetermines the manner in which God creates, or brings to actuality, in addition to representing or exemplifying the world. Where Leibniz could

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[53] Chignell, "Real Possibility," 637.

appeal to a model of divine causation that depends on the intentional content of God's thoughts about possible worlds, Kant's strategy of grounding possibilities directly in the divine essence appears to exclude the kind of free choice tradtionally sought for the creator God of Christianity. It leaves open, for instance, necessary emanation as a live option. Without adequately dismissing the Spinozistic threat, Kant's proposal to ground contingent adaptations in nature as expressions of divine providence remains unsatisfactory.

In the end, Kant is silent on the question of the manner of God's creation. While an analogy with human action through conscious desire and representation of an intended goal offers some handle on divine creation, it is inadequate to the philosophical task. For, as Kant has stressed, the craftsman model can only account for the form but not the materiality of creation. What the physico-theological argument in conjunction with the modal proof provides, then, is the idea of God as grounding the possibility of a lawful order of created nature by expressing it in his own nature. A lawfully ordered harmony of essences in the divine nature has its limited, somehow actualized counterpart, in the world of experience.

4. Divine and natural self-sufficiency

Yet, Kant's labor upon the central topic in rational theology is not without philosophical fruit. One upshot of the revisions to both the ontological and the teleological arguments for theism, in Kant's mind, is a shift in emphasis in the philosophical concept of the

Highest Being (*höchste Wesen*). Whereas traditionally God has been understood in general as an infinite being, Kant proposes all-sufficiency (*Allgenugsamkeit*) as a better notion to place at the conceptual core of the idea of God. Infinity is a fundamentally mathematical concept signifying the relation of one magnitude to another. Not only does relating God's cognition as infinite compared to human cognition, for example, presuppose a homogeneity between their cognitive acts, it fails to express precisely God's ontological priority. While the idea of the infinite, of a magnitude that we cannot form a sensible idea of but which we nonetheless approach through sensibility, "stirs the emotions" and "fills the soul with astonishment," a more proper conception of God is that of a self-sufficient being, or one which is the ground of all possibilities and therefore without itself in need of ontological supports.

Divine self-sufficiency is mirrored in the self-sufficiency of nature. Obviously, created nature is not absolutely necessary like its divine ground. But to substantiate the autonomy of the natural world and, consequently, of natural science, is a central goal of *Only Possible Proof*. Kant expresses this clearly toward the end of Section II which treats physico-theology. He writes:

> I shall have achieved my purpose, as far as this book is concerned, if, with confidence established in the regularity and order which may issue from the universal laws of nature, the reader opens up a wider field to natural philosophy, and can be induced to recognize the possibility of an explanation such as the one offered here, or one like it, and to acknowledge the compatibility of that

explanation with knowledge of a wise God.[54]

Kant's objectives are, first, to engender confidence in the enterprise of natural science and the adequacy of its lawful explanations; and second, to show its harmony with belief in divine providence. The *a priori* and *a posteriori* theistic arguments should correctly be interpreted as designed to secure the independence of nature and the new methods for its investigation just as much as they aim to advance rational theology. Kant's specific attack on voluntarist appeals to God's wisdom in grounding reality takes Leibniz's strategy a step further. Whereas Leibniz conceived God's creative act as following a distinct volition to create the best of all possible worlds with which he hoped to escape the snares of Spinozism, Kant treats the divine attributes as grounding features of possibilities simply by exemplifying them in the divine nature. Kant replaces Leibniz's quasi-psychological model of an intellectual representation toward which the divine will, guided by the principle of the best, inclines.[55] In its place, Kant's argument for the manner in which God grounds possibilities involves only a relation of expression which provides human knowers with the materials for thinking possibilities, in particular those

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[54] EmBg. 2:148.

[55] To be sure, Leibniz offers competing accounts of divine creation, including a kind of emanationist view even as late as the *Monadology*, for example in §47: "all created or derivative monads are products, and are generated, so to speak, by continual fulgurations of the divinity from moment to moment." There are also textually compelling readings of Leibniz according to which essences (or concepts of possible individuals as well as possible worlds) necessarily result from (are grounded in) God's being; see, e.g. André Robinet, *Architectonique disjonctive* (Paris: Vrin, 1986); Daniel Fouke, "Emanation and Perfections of Being: Divine Causation and the Autonomy of Nature in Leibniz," *Archiv für Geschichte der Philosophie* 76, no. 2 (1994): 168–94. In Leibniz's language from the "Discourse", for example, that the eternal truths of metaphysics and geometry are "consequences of his understanding," the use of understanding could reasonably be read as a placeholder for the necessary act by which the divine being gives rise to possibilities.

possibilities available through natural phenomena. As Kant's account remains opaque on the matter of God's causal relation to the world, it offers him fewer resources to seek explanations of nature beyond its spatio-temporal and causal boundaries. The seductive interpretive possibility arises that perhaps it was, in part, the tenuous character of Kant's envisioned bridge linking natural and divine realities, and the *a posteriori* and *a priori* proofs, that led him toward transcendental idealism.

To be sure, Kant clearly believes that God's decree to create the best possible world involved a choice. He freely endorses a Leibnizian position that "God's decree included a world in which everything… satisfied the rule of the best," and that this was the reason "God considered it worthy of His choice."[56] But the psychological picture plays no part in his philosophical arguments. An adequate philosophical proof of the existence of God must show God to be the ground of possibility simply in virtue of his being. God's thoughts and choices play no role in his grounding all reality.

Just as the divine nature does not stand in need of anything outside itself in order to be complete and perfect, created nature, on the condition of the exemplification of its primitive predicates and the necessary connections among its forms in the divine nature, does not require external, causal intervention:

> The forces of nature and the causal laws which govern them contain the ground of an order of nature. This order of nature, insofar as it embraces a complex harmony in a necessary unity, has the effect of turning the combination of much perfection

[56] EmBg. 2:109. Cf. "Optimism," 2:35.

in *one* ground into a law.[57]

A natural event, for Kant, satisfies two conditions. First, it is such that its efficient cause is a natural force of attraction or repulsion. And second, its causality, or the manner in which properties of the cause (the force) produce a change in the effect, accords with conditions of natural causality.[58] The spontaneous shattering of a window without actual contact with a force-bearing projectile would count as a supernatural event, because it would violate a rule of natural causality governing such a case, namely, that impressed force be transmitted through successive places in a material continuum. A stick's sudden transformation into a snake would likewise violate constraints on natural efficient causality. The set of conditions governing natural causality together constitute a single ground which underwrites the possibility of what Kant calls the order of nature. Insofar as this single ground combines a multitude of consequences by necessity rather than by choice, it is a lawful ground. Events in contravention of the conditions of lawful necessity would, consequently, constitute a *non-natural* or supernatural order. While Kant does not categorically rule out the possibility of supernatural events, his concern is to establish as

[57] EmBg. 2:107.

[58] The notion of casuality in the Wolffian tradition, recall, has the following definition: "That reason contained in the cause, why the effect [*causatum*] exists simpliciter or exists in such a way" (Ont. §884); "the nexus between the cause and the effect [*causatum*], insofar as it is attributed to the cause" (Met. §313). Kant follows this definition in his lectures, which were based on Baumgarten: "the determination of a cause by which it becomes a cause, of the determination of the relation of a thing as cause to a determined effect" (Met. Mrong. 29:893). The causality of a cause is that which explains the connection between a cause and an effect with reference to properties of the cause. The causality of a stone's (cause) breaking a window (effect) is the force the stone imparts to the window which determines it to shatter. The causality of a doctor's (cause) curing sickness (effect) is her medical skill (knowledge of disease, the use of instruments, and so on). It is distinct from the notion of dependency, which is the contribution of the effect to a causal nexus (the window's fragility, the disease's susceptibility to the cure).

a philosophical precept that "one must concede to the things of nature a possibility… of producing their effects in accordance with universal laws."[59] The idea of nature here is at root the idea of conformity of phenomena to law. But, unlike in the *Critique of Pure Reason,* the ultimate source of nature's lawfulness lies in a theological conception of an absolutely necessary ground of possibility. It is in virtue of being exemplified in the divine nature that created nature acquires a measure of power and the capacity to produce its effects without particular divine intention. The bird builds its nest, not as an archer directs an arrow to its target, but as its own nature guides it toward the fulfilment of its specific ends.

In the same way, the actual world exhibits another one of the divine attributes, that of goodness. Goodness in the natural order, however, does not obtain in virtue of nature's lawfulness. The laws of nature are the means by which natural order arises, whereas "the good is to be found in the attainment of the end alone."[60] The perfection of nature, for which its laws serve as means, consists in the perfection of its effects. Thus, on the suppositions that the natural world is a reflection of divine nature, and the harmony of created beings reflect the harmonious combinations of divine attributes such as power and goodness, Kant is committed to recognizing a measure of perfection in nature's effects. The course of nature and its efficient causal laws have goodness derived in proportion to the goodness of their effects: "Thus, a thing is not good simply because it occurs in accordance with the course of nature. Rather is it the case that the course of

[59] EmBg. 2:115.
[60] Ibid. 2:108.

nature is good in virtue of the fact that that which issues from it is good."[61]

Kant at this early stage of his career is committed to the goodness of whatever exists by nature. What's more, Kant locates natural goodness in the essences of the beings which so exist due to natural necessity. Unlike Suárez and Wolff, for instance, for whom only that which exists through the spontaneity of a rational agent can be properly said to result from a final cause, Kant does not ground the goodness of natural effects in divine intentions. It is not in virtue of being cognized by God as good that a natural fact acquires its value. Rather, the goodness of the natural rests on an ontological argument which entails the inclusion of the good in any possible world that could be produced by means of a lawful necessity in the combination of divine attributes. It is because the idea of a highest being, as the ground of the being of possibilities, involves the simple predicate of goodness that everything which depends on it for its reality inherits goodness in some finite degree. In contrast to both an intellectualist picture (such as Suárez's) and a voluntarist picture (such as Newton's), Kant adopts a position on which the end-directedness of created nature depends thinly on its being a limitation of God's nature. For Kant, the question of how the laws of nature produce effects appropriate to the production of goodness cannot be answered satisfactorily by appealing to God's choice in ordering nature with perfect foresight. The deeper problem from Kant's strongly rationalistic standpoint is this: "how could it even have been possible to unite such great perfection in a single combination of world-events according to universal laws?"[62] The laws of nature merely have the status of effective means—in fact, the optimal means, on

[61] Ibid. 2:109.
[62] Ibid. 2:110.

the assumption that God would create the best—for the creation of natural goodness.

It is far from obvious that Kant has a decisive answer to his own stringent demand for sufficient reasons in this matter. Rather, his reflections convey the development of a methodological precept to treat every stable, regular phenomenon as if it were part of the natural order and, therefore, for the sake of some end. Kant's remarks on one of Newton's adjustments to his planetary model is revealing:

> Even if, as Newton maintained, it is naturally inevitable that a system such as the solar system will eventually run down and arrive at a state of complete stagnation and universal rest, I would not follow him in adding that it is necessary that God should restore it again by means of miraculous intervention. For, since it is an outcome to which nature is of necessity destined as a result of its essential laws, I assume from this that it is also good. This final state of the solar system ought not to strike us as a loss to be lamented, for we are ignorant of the measurelessness of the nature.[63]

Newton was mistaken in speculating that God would periodically correct for the deviations of planetary orbits from those predicted by Kepler's laws because he had a confused notion of the goodness God transfers to nature. In effect, Kant charges Newton of having the priority of natural normativity the wrong way around. Instead of treating God's creation as good in itself, Newton takes the mathematical laws of nature to be the ends for the sake of which God acts. It is no part of God's purpose, on Newton's picture,

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[63] Ibid. 2:110.

to create beings that manifest goodness in their own natures. Rather, nature's perfection requires its continued conformity to certain mathematical laws, deviation from which consequently counts as imperfection in need of correction. For Kant, by contrast, the assumption that nature is good in virtue of being grounded in the divine essence means that deviations from any extant model of nature merely indicate a weakness of that model. The failure of the Newtonian world-picture to account for the observed eccentricity in Mercury's orbit, for example, is a recalcitrant datum and an occasion for further reflection upon the assumptions of the model, not as evidence of any deformity in nature itself.

One outcome of Kant's two-part proof and commentary for an argument for the existence of God is a kind of methodological naturalism. By anchoring an hylomorphic ontology of nature as constituted by both formal species essences and matter and its laws in an extramundane divine being, Kant aims to "open up a wider field for natural philosophy." This consists in focusing the interpretation of the new natural sciences upon the discovery of empirical laws and the formal structures of natural kinds, and away from their ground in divine purposes. The field of natural science becomes wider inasmuch as we do not preemptively limit the extent of nature's potentialities. Anomalies and outliers are problems for the ongoing task of inquiry into nature, not occasions to speculate about non-natural causes. The domain of the non-natural, for Kant, excludes not just the supernatural but, more fundamentally, the non-law-governed. For it is not just God's free volitions that are beyond the pale of naturalistic explanation, but also certain conceptions of matter that do not accord with the framework of the new physics. The Epicurean view of material nature as intrinsically prone to random generation of forms is just as non-naturalistic as Newton's appeal to divine intervention to correct the course of the planets. Similarly, the vitalistic materialism of figures such as La Mettrie or the Comte de Buffon is equally outside the bounds of the natural. La Mettrie, recall, had dogmatically asserted the reducibility of all rational thought to the activity of vital forces in matter. The more sophisticated speculations of Buffon, meanwhile, attributed to matter psychological capacities of memory and judgment. Buffon introduces the notion of an internal mold (*moule intérieur*), a primitive form inhering in matter which recreates faintly remembered properties of species forms. He envisions the internal mold as a germ shaping matter from within to produce functionally adapted organic parts. The internal mold itself is passive, and is only acted upon by vital, "penetrating forces," distinct from the external forces familiar to physics. Being internal, they also remain unknowable to us, except on an analogy with psychological processes. What's objectionable here, from Kant's point of view, is the introduction of the possibility of matter disobeying its own laws.[64]

A negative consequence of *Only Possible Proof*, as we saw in the previous section, is the specter of Spinozism, of God as a lifeless structure of formal attributes playing the role of *natura naturans*. In this situation we can discern the origins of Kant's notion of purposiveness which would later find its full expression as a subjective principle for interpreting nature's forms.

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[64] For details of Buffon's epigenetic theory, see Jacques Roger, *The Life Sciences in Eighteenth-Century French Thought* (Stanford: Stanford University Press, 1998), Ch. 9.

5. Teleology between the early Kant and the later Wolffians

Kant's precept to regard every natural event, every effect produced in accordance with the nature of things, as good in virtue of being grounded in God's essence connects with a further methodological directive: "in investigating the causes of certain effects one must pay careful attention to maintaining the unity of nature as far as possible."[65] The unity of nature grounds the possibility of a unified science of nature. The directive to seek unified causes creates a further challenge, however, of incorporating the living world which presents the most difficulty for systematic inclusion in a world as conceived by mathematical physics. While human imaginations are excited by the recognition of harmony and precision in the structure of snowflakes, these can nonetheless be conceived adequately as incidental effects governed by general laws of matter. The unity among the diverse effects of inorganic matter, in other words, is necessary given the structure and laws of matter—appeal to a designing intention is superfluous. The case is different with harmony in organic forms, for here the laws of matter seem inadequate to the explanatory task. The kind of unity among the parts of an eye which makes it adapted for seeing stubbornly resists a forward-looking causal account in terms of mechanical laws. From Kant's cosmological assumption of an initial distribution of matter in space out of which, by the action of attractive and repulsive forces, stable configurations of galaxies, stars, and planets arise, it seems too great a coincidence that certain parts of matter should have formed precisely to enable vision, much less that functionally adapted forms should be reproduced exactly in successive generations. Organisms exhibit, as Kant recognizes, a

[65] EmBg. 2:113.

contingent rather than a necessary unity and, consequently, present a challenge to the explanatory sufficiency of nature's necessary laws.

But while the problem of contingent unity, or of a unity of purpose, appears clearest in the case of organisms, it is not unique to them. As we saw in *Universal Natural History*, Kant's dialectical interests demand that his picture of nature's immanent, dynamical striving toward order should be grounded in an idea of the whole of creation. Natural history—unless we are to see it with the Epicurean as a series of accidents, or with the Spinozist as a merely ontologically but not purposefully necessary series—must be guided by a representation of the ultimate end of nature for the sake of which God creates anything whatsoever. Even at the most fundamental cosmological level, then, the fact that matter and its forces are constituted thus-and-so, and produce the actual series of effects in the history of the universe, have to be brought under an idea of the cosmos as a coordination of things and not just a deterministic subordination. Just like the structure of an eye, and the structure of the sighted animal, the structure of the universe, by Kant's lights, requires a formal ground which comprehends the parts of nature in a whole of nature, or the diversity of nature in its unity. Formal purposiveness is evident, to Kant, in nature as a totality as well as in its paradigms of organization. But although Kant introduces a teleological element into the Newtonian model by conceiving matter as actually endowed with the capacities (forces) to strive toward greater perfection, it lacks the normativity Kant needs for his own philosophical targets. The reality of mechanical forces in matter left to its own devices does not account, except by accident, for the ends of rational and moral progress toward which Kant's optimism requires it to proceed. And as we saw earlier, it is precisely to ward off the Lucretian specter that Kant attaches to his dynamical cosmology a theological origin in divine wisdom.

Yet, in order to reach that richer sense of normativity Kant cannot appeal to divine intentions as Wolff had done. For Kant accepts a restriction, which Wolff did not, on the concept of an end: something is end-directed only if it is related to some use for an agent. Being self-sufficient, God is not in need of anything, and hence could not have any use for the events he brings about in nature. If there is purposive agency in nature, its source must lie in non-self-sufficient things which aim toward the satisfaction of their needs or the perfection of their being. Kant's conceptual frame here owes to Baumgarten's revised treatment of the end and its subordination to the category of utility.

Baumgarten's treatment of causation in his *Metaphysica* (1739) is notable for its departure from Wolff in its treatment of the end (*finis*). Upon concluding his discussion of the efficient cause, by now well-established as the most important species of cause, Baumgarten introduces the category of utility (*utilitas*) as a strictly respective sense of goodness (*bonitas respectiva*).[66] That is, utility is necessarily relative to an agent who would use (or abuse) an object. Baumgarten defines 'end' in terms of utility: "If one uses or abuses something to actualize what seems good to oneself [*ad bonum sibi visum actuandum*], then this very thing which appears good to the agent is called end [*finis, Zweck*]." The end is thus the "principle of use or abuse, thus the final cause (*causa finalis*). Baumgarten further defines intention (*Intentio, Absicht*) as the representation of

[66] Met. §336.

the end or final cause.[67]

These passages represent a small but, for our purposes, significant step in the evolution of the German philosophical lexicon, as well as in the genesis of the concept of 'purposiveness' (*Zweckmässigkeit*) familiar to readers of Kant's *Critique of the Power of Judgment*. Wolff had translated the Latin *finis* with the cognitively significant word *Absicht*, which is most straightforwardly interpreted as 'intention' or 'plan'. In his scheme the generic meaning of end-directedness took the sense of a cognized good for the sake of which an agent acts. God, as a perfectly rational intellect, consequently takes the role of the ground of all end-directedness through his intentions (*Absichten*). To be an end in nature, whether a cock's crowing or a bird's nest-building, is ultimately to be an effect intended by God. Insofar as the series of changeable things that constitute nature in its totality is an expression of the divine essence, the uses finite agents make of their created environments are to be seen as God's intentions on their behalf.

By contrast, Baumgarten distinguishes the generic concept of end from the concept of intention. In glossing the scholastic term *finis* as *Zweck,* Baumgarten interprets it as 'aim,' thus as more neutral with respect to the involvement of judgment and explicitly distinct from the narrower notion of 'intention' (*Absicht*) as a represented aim of action.[68] An the aim of an activity, *Zweck* signifies the aimed-at object's apparent

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[67] Ibid. §341.
[68] The *Historisches Wörterbuch der Biologie* (Stuttgart: J.B. Metzler, 2011), 278, makes the following etymological note on the term '*Zweck'*: "Etymologically, the word 'Zweck' designates the nail on which a target is hanged or which is placed in the middle of the target. For this reason, *Zwecke* refer to acts, which aim at something, which thus have a definite target point."

utility or usefulness for the agent. The object itself, however, exists in the world separately from the representation, and is only called an end in virtue of its apparent utility, thus in respect to the agent: "*this very thing* which appears good to the agent is called end." The intention, for Baumgarten, designates a moment in the end-directed act, namely, the representation of utility in some state or object in the world as good-for-the-agent. The intention does not pick out the being of the intended object in the world, as is the case with Wolff's identification of useful regularities in nature with God's intentions. Rather, the intention picks out the act by which a finite agent directs itself to a possible use something could have in the world. Further, since God is not a finite agent, consequently not in want of anything, Baumgarten's analysis precludes identifying the usefulness of something in nature for a creature with God's intentions. Something could be a natural *Zweck* only if it is of such a kind as to render utility to an agent. Natural ends, therefore, are specifically ends of creatures. Baumgarten's crucial move, in effect, is to distinguish God's providential care for the world from the ecological use created agents might make of things in the world.

By separating the end-directedness of actions by intentions from the ends of the actions, Baumgarten opens up the prospect for a recovery of the kind of distinction between deliberative and non-deliberative teleology that Aristotle draws in *Physics* II.5: "Some [of the things that come to be for the sake of something] are in accordance with intention, others not… Things that are for the sake of something include whatever may be done as a result of thought or of nature."[69] Aristotle identifies nature, in addition to

[69] *Physics* II.5 196b18-30.

thought or intention, as grounding a separate class of purposive effects. Nature's goal-directed productions, for Aristotle, are distinct from an artisan's in virtue of being non-deliberative. Whereas a carpenter might build a house based on a blueprint using appropriately chosen means, a bird builds its nest guided simply by instinct or nature. For something such as a nest to exist by nature, for Aristotle, is for it to exist without the mediation of thought, and yet for the sake of real utility or value.

At the same time, Baumgarten's treatment of ends and intentions retains an ambivalence which prevents him from fullly recovering Aristotle's natural teleology. The conceptual space opened up between deliberative end-directed actions—those by intention—and the mere existence of ends which are nevertheless causally efficacious is left unoccupied. If the end is the use or possible use of something for the sake of actualizing an apparent good-for-an-agent, by what other means besides intention could such an end be reached? More directly, the question can be posed as: could an end be grasped sensitively or non-discursively, thus without requiring that the agent acting for its sake access the end through the exercise of rational cognition and will? Baumgarten does not answer the question in the affirmative, any more than Wolff did or Kant would. It is not much of an exaggeration to suppose the history of early modern teleology in Germany as consisting in incomplete approaches to Aristotle's view. Leibniz, perhaps, comes closest, but is never entirely unequivocal about granting to natural substances true goodness-directedness.

Baumgarten's student, Georg Friedrich Meier, teases apart the different moments in teleological judgment more clearly. Specifically, Meier isolates the notion of something's having an end or being directed toward an end (*zu einem Zwecke eingerichtet sein*) from, on the one hand, the condition of something's being the object of an intention and, on the other, of its being an instrument and thus of utility toward an end.[70] A clock is said to have an end, and operate according to an end, namely, that of telling time. One does not say, however, that a clock is aware of its end. In general, to act (*handeln*) for the sake of an end is thought to require that the end appear to an agent as good: "we say, the end [*Zweck*] is something, which appears good to a thinking being." But Meier is reluctant to reject as mistaken the "common experience" (*tägliche Erfahrung*) which teaches that non-rational animals also act for ends. The cognitivist bias, he suspects, is usually assumed without proof, even though it is the case, as he also recognizes, end-directed activity is most clearly analyzed in intentional, human action. To clarify the situation, he distinguishes between 1) the thinking being, which sets the end for itself or another being; 2) that which appears good to a thinking being; and 3) that which a thinking being uses (or misuses) to reach the end. The end (*Zweck*), specifically, is to be identified with (2), the object of an agent's intention. The end-directed agent and the instrumentality or utility of any act or object involved in a teleological process are conceptually distinct from the relation of these to a good, real or not. In other words, Meier treats *Zweck* as a feature of objects which is conceptually separable from any process in which they might be involved.

While Meier doesn't use the language here (nor does Baumgarten in his treatment), we can discern a distinction between the formal teleology of an essence from

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[70] Met. Meier §266.

the final causality of a nature. Real objects, characterized by determinate structures of properties or predicates, have true teleological essences: what it is to be heart or an oak is to have a set of properties, at least some of which are necessarily related to one another as means and ends. The organs (instruments) of all and only those things which are oak trees constitute a natural structure, a universal kind of being. And it is necessary for something to be an oak tree that its parts occupy definite, reciprocal relations among themselves. Thus, roots or leaves, as parts of the essence of an oak tree, have ends, or are end-directed. Their characteristic activities, however, only get expressed in their natures, or insofar as actual oak trees develop from acorns, draw nutrients from the soil, and photosynthesize. Where finite observers of nature are inclined to introduce the language or intentions and thought is in accounting for natural processes, or the essences of natural things insofar as they are in act. To explain how roots could carry out adaptive functions in the complex structure of a tree, we are led by an analogy from how human nature expresses its essential ends in everyday life. Yet, our inability to explain the natural activity of non-human organisms does not undermine the conceptual practice of describing plants and animals as having teleological essences.

An ambivalence between formal and final causal teleology, between teleologically structured essences and purposive agency, is characteristic of the period. Leibniz tries to retain both, but emphasizes the latter: his fundamental ontology is populated by internally goal-directed, active substances, each constituting a unique, lowest species, the form of which the individual substance strives to express. Essences and individuals, strictly, coincide for Leibniz. Importantly, the Leibnizian doctrine of individuals as complete concepts, thus as constituting their own essences, was never picked up in the Wolffian school. Wolff's interest, as we have seen in previous chapters, lies primarily in characterizing the general ontological conditions underlying the essences of natural substances, whether physical or psychological. Created, natural substances manifest teleological essences but their conceptions only subsist in and are fully known to God's perfect intellect. With his strong embrace of the clockwork view of creation, Wolff accepts that all of nature is directed as an arrow is directed by an archer. His science of Teleology only studies the passing phenomena of nature under the aspect of ends; its object is not the true source of teleology in Wolff's system, namely, the formal essences cognized by God. At the same time, by treating as intentions (*Absichten*) all varieties of processes one might characterize teleologically, Wolff blurs the distinction between formal ends and final causes. Baumgarten and Meier represent a step toward the clarification of this distinction, which would be essential not only for Kant but also for the influential, eighteenth- and nineteenth-century German morphological and embryological traditions in the life sciences. Natural forms could be conceptualized teleologically even while we remain skeptical about the possibility of their generation from non-intentional causal forces.[71]

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[71] Peter McLaughlin, *Kant's Critique of Teleology in Biological Explanation* (Edwin Mellen, 1991), 44-50, emphasizes the later Kant's interest in teleology as consisting largely in formal rather than final causation, even though he deploys the language of *causa finalis*. For the influence of Kant's theory of teleological judgment on German biology, and by means of the German tradition, on Darwin, see Robert Richards, *The Romantic Conception of Life* (Chicago: University of Chicago Press, 2002), esp. Pts. II and IV.

Baumgarten's and Meier's terminological and conceptual adjustments make possible an account of natural teleology in which judging natural beings as having purposive structure is bracketed off from the question of the activity of such structures. In his new technical term, *Zweckmässigkeit,* Kant would distinguish the issues of the formal purposiveness of natural forms from the objective purposiveness of natural beings. For Kant, the question of purposive form in nature originates in the recognition of its contingency, that nature's laws and kinds could be conceived in radically different ways. The problem of objective purposiveness, meanwhile, is the insoluble problem of grasping how beings other than ourselves could determine their own activity according to ends. The next section breaks the narrative of the young Kant's struggle with the intellectual forces of the eighteenth century in order to focus on the theoretical lessons he may have learned concerning formal teleology.

6. Contingency and formal purposiveness

A narrower focus on formal teleology would lead Kant to identify a subjectively valid concept of purposiveness as necessary for the possibility of empirical judgment. As subjectively valid, purposiveness is formal, and makes a legitimate claim on our rational practices as agents. But, by recognizing the validity of its formal, subjective aspect, we are also able to see why its claim to objectivity must remain problematic or indeterminate. While we are entitled to judge contingent, organized forms in nature as purposive, we may not judge these formally purposive beings as also possessing active, purposive natures. Purposiveness as a legitimate form of judgment has its root in the problem of contingency, a problem which is peculiar to finite, discursive thinkers such as ourselves. Kant's treatment of the concept in the third *Critique*, and especially in its two Introductions, resumes a problem which occupies much of *Only Possible Proof*. In this section I freely draw on texts from across Kant's so-called pre-critical and critical periods. I also juxtapose Kant's views with Leibniz's in particular.

Purposiveness in the form of an object requires already having the general cognitive conditions for objecthood in place. Beyond the simple achievement of having in view a stable world of spatio-temporal, causally interacting objects, all particular judgments about natural phenomena are intrinsically purposive for human reasoners, inasmuch as they involve selectively attending to some features of phenomena rather than others, guided by an interest in bringing these into a background conceptual framework. Formal purposiveness is constitutive of our lived judgmental practices, because it is how we rationally manage contingencies in natural experience. The qualification of *lived* judgmental practices, rather than the capacity to judge *tout court* as purposive is important. For the categorical principles of judgment familiar from Kant's critical analysis of what is necessary to have experience at all—the causal law, the law of conservation of substance, the causal closure of the universe, the determinacy of extensive and intensive magnitudes (I will say more about these principles in the next chapter)—are objectively valid for nature, without qualification. If it is possible for me to form a judgment about an object or event, it must be constituted by the most general or transcendental principles of nature, which are also judged as necessary. There is no contingency in whether a particular empirical event is subject to the causal law, even though we might not yet know the particular causal rule governing it. In all subsequent investigations of a domain of objective phenomena, then, we must deal with the possibility that it might be adequately describable by multiple hypotheses. Indeed, from a purely logical point of view, an infinite number of logically distinct hypotheses are empirically equivalent. Yet, such radical indeterminacy is not borne out by the actual, historical course taken by science. There are clear episodes of progress in knowledge, and calling these into doubt would be tantamount to sophistry. Kant introduces the principle of purposiveness in the third *Critique* to deal with exactly this philosophical predicament:

> For *unity of nature in time and space* and the unity of experience possible for us are identical, since the former is a totality of mere appearances (kinds of representations), which can have its objective reality only in experience, which, as itself a system in accordance with empirical laws, must be possible for us if one is to think of the former as a system (as must indeed be done). Thus it is a subjectively necessary transcendental *presupposition* that such a disturbingly unbounded diversity of empirical laws and heterogeneity of natural forms does not pertain to nature, rather than nature itself, through the affinity of particular laws under more general ones, qualifies for an experience, as an empirical system.[72]

The "transcendental presupposition" (*transcendentale Voraussetzung*), a "*dunkle Denkfigur*" which has also troubled readers of Kant's first *Critique*, is Kant's principle of

[72] EE 20:209.

purposiveness: that *"nature specifies its general laws into empirical ones, in accordance with the form of a logical system, in behalf of the power of judgment.*"[73] Its appearance in 1790, in an inventory of the original and necessary conceptual apparatus of human cognition, is the culmination of Kant's engagement with the problem of contingency in nature's laws and forms. As a subjectively valid principle of judging for our faculty of cognition, purposiveness expresses the standpoint that human reasoners must adopt in order to reduce disorder in their knowledge of nature. The principle of purposiveness does not, however, confer necessity on any judgment, even though cognition in general operates under the demand that the true laws of nature, whatever these might be, must, inasmuch as they have the status of *laws*, be necessary. In other words, purposive judgment furnishes a rational procedure in matters that remain contingent for finite, discursive thinkers like us. Its ground in Kant's critical theory of the cognitive faculties lies in his famous distinction in §§76-77 of the third *Critique* between an intuitive and a discursive intellect.

The link between the distinctive character of discursivity and the ineliminable fact of contingency as a feature of human knowledge can be discerned in Kant's thesis, which begins to appear from the mid-1760s, that absolute or real contingency is a primitive feature of experience, specifically of free moral actions. In *Only Possible Proof*, as we have seen, Kant distinguishes between logical and real contingency. Contingency in the logical or nominal sense (*zufällig nach der Worterklärung*) merely picks out that which is

[73] EE 20:216. "*Dunkle Denkfigur*" is how Rolf-Peter Horstmann, "Der Anhang zur Transzendentalen Dialektik," in *Kritik der Reinen Vernunft,* eds. Georg Mohr and Marcus Willaschek (Berlin: Akademie Verlag, 1998), 532, glosses Kant's strange term, "transcendental presupposition."

possible in itself, or a predication the opposite of which does not contradict the subject. For example, a triangle's property of being right-angled is contingent—it could also be acute or obtuse while remaining a triangle. Real contingency (*zufällig im Realverstande*), by contrast, is subject to a stronger condition: it is "that of which the non-being can be thought; that is to say… that of which the cancellation [*Aufhebung*] is not the cancellation of all that can be thought."[74] Real contingency goes beyond internal consistency in requiring that the logically possible being should not entail the existence of anything. Put differently, real contingency expresses the idea that the non-existence of some possible being, say, Sherlock Holmes, does not cancel all that can be coherently thought in the idea of a detective who lives on Baker Street. Something is really contingent, then, just in case its logically consistent predicates do not entail its existence. A really contingent being requires in addition to its full set of predicates a further, determining ground for its actuality.

Real contingency is also what Kant calls in some notes from the same period "absolute contingency" (*schlecterdings Zufälligkeit*). As commentators have observed, Kant's commitment to real or absolute contingency follows upon a turn toward voluntarism, that genuine moral action requires an absence of determining grounds, or sufficient reasons, as understood by Leibniz or Wolff.[75] In notes from the 1760s, Kant understands absolute contingency (like absolute necessity) negatively as that which we

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[74] EmBg 2:83.

[75] Beatrice Longuenesse, "Kant's Deconstruction of the Principle of Sufficient Reason," in *Kant on the Human Standpoint,* 117–42 (Cambridge: Cambridge University Press, 2005); Desmond Hogan, "Kant's Copernican Turn and the Rationalist Tradition," in *The Cambridge Companion to Kant's Critique of Pure Reason,* ed. Paul Guyer, 21–40 (New York: Cambridge University Press, 2010).

cannot conceptually represent to ourselves, free action being the prime example of such an unrepresentable contingency.[76] If freedom should be "a capacity to first initiate a state," as Kant sometimes puts it, that is, to produce consequences not sufficiently determined by prior states of the world but by instead requiring the will of a rational agent, then it has to be such as to lack antecedent determining conditions.[77] In other words, it has to be unconditioned, and therefore can only be thought problematically, not determinately. The assumption at work here is that we can only represent, or form determinate thoughts about, objects, or events, or states of affairs that have antecedent conditions. Where such conditions are lacking, our thought remains indeterminate.

Kant's claim here is not that the problematic character of a genuinely free action amounts to a miraculous interruption of the course of nature. Rather, its theoretically problematic status arises from the side of cognition: "The difficulty is not *secundum possibilitatem fiendi*, rather *cognoscendi*."[78] Our capacity for understanding, insight, or comprehension (*erkennen, einsehen, begreifen*) of contingencies and necessities is such that it requires conditions or grounds that must be given in experience. What is given in experience, however, is never a first beginning but always a continuation of a series of conditions stretching back indefinitely. If there is to be genuinely free action, and thus genuine morality, then it must be regarded as incomprehensible to an understanding like ours. That "freedom from all external necessitation of our power of choice" is real, Kant

[76] R 3717, 17:260: "All necessity and contingency which we can represent to ourselves is conditioned. The unconditioned is thought problematically. Neither of them can be thought as absolutely contingent (e.g., free action) or as absolutely necessary."
[77] R 4338, 17:511.
[78] R 4338, 17:511.

firmly maintains, "is clear through experience," and, even though its possibility cannot be given a theoretical deduction, it is attested in our consciousness of the moral law as a "fact of reason."[79]

Kant's attempt to thread a middle path between intellectualism and voluntarism requires him to place an important restriction on Leibniz's principle of sufficient reason. The primary domain of PSR now is its specific status as the causal law. Indeed, in the first *Critique* Kant controversially glosses his proof of the principle that every event has a cause (the Second Analogy) as a proof of the PSR: "the principle of sufficient reason is the ground of possible experience, namely the objective cognition of appearances with regard to their relation in the successive series of time."[80] The demand for theoretical explanations, that is, for explanations that have the structure of rational inferences from antecedently given grounds to their hypothetically necessary consequences,[81] is limited to the domain in which determining grounds are available to us, namely, in spatio-temporal experience of causally interacting material substances. Unlike Leibniz, for whom the PSR applies even to the moral determination of God's will to create, Kant denies that free moral actions, whether God's or creatures', have determining grounds at all. This is partly because Kant, in effect, redefines what it is for something to be a reason or ground cognizable by us. For something to be a reason for discursive knowers, thus also for

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[79] R 4338, 17:510; KprV 5:33; MM 6:252.
[80] A201/B246.
[81] Cf. DWL 776: "All inferences of reason ought to give necessity to their conclusion." By inferences of reason is meant categorical, hypothetical, and disjunctive. Induction and analogy are inferences of the power of judgment.

something to be a sufficient reason for us, it is necessary that it should be a set of empirical conditions under the constraints of transcendental laws of nature.

In distinguishing nominal from real contingency, and placing the latter beyond the pale of sufficient reasons, Kant departs from Leibniz's formal theory of contingency. Recall that Leibniz offers a formal account of contingency as infinite analyzability: a proposition is contingent just in case it does not have an analysis of terms that reduces it to an identity.[82] We can see now that Kant's principle of sufficient reason (or, rather, causes) embeds a notion of contingency as infinite analyzability. The contingency of nature's empirical laws, for instance, is in part a consequence of the infinite chain of conditions that our understanding must run through in order to fit all possible cases exactly under any particular law. We lack, unlike Leibniz's God, an infallible vision of the necessary connection between infinitely complex subjects and predicates. For Leibniz, while God cannot perform the impossible task of reducing to an identity statement an infinitely analyzable proposition, God can see the connection between the subject and predicate terms through direct, intellectual intuition.[83] Contingency in our knowledge of empirical laws amounts to the problem of ascribing necessity to inductive generalizations, given the theoretical possibility of defeaters. Even if we assent to the universally valid thesis that every event must have a cause (or even the stronger thesis

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[82] See above, Ch. 3, *Interlude*.

[83] "On Freedom" (ca. 1689), A VI.4 1658; L 266: "[C]ontingent or infinite truths [are] subject to the knowledge of God and known by him, not by demonstration—for this would involve contradiction—but by an infallible vision. But this vision of God must not be thought of as a kind of empirical knowledge, as if he saw anything in the things distinct from himself, but as *a priori* knowledge in which he grasps the reasons for truths."

that every event has a covering causal law), actual experience underdetermines the specification of any particular law. In formulating empirical laws, consequently, we remain bound to the use of those "mutilated inferences of reason," namely, induction and analogy, which can never yield identical propositions by reduction in a finite number of steps. Given the limitations of our empirically-conditioned understanding, however, these non-necessity-conferring inferences of the power of judgment become indispensable.[84] Empirical laws are formally contingent insofar as they lack an actual demonstration which would satisfy that demand, even as they aspire to lawfulness insofar as they contain, *qua* laws, the demand of universality and necessity upon some domain of phenomena. The kind of contingency involved in empirical laws is formal rather than material inasmuch as it arises from a feature of human cognition, rather than from the nature of whatever it is that affects our faculties. Imputing real (material) contingency to nature itself—to assert, for instance, that leaps in space and time are possible, or that something could happen by sheer chance—on the basis of contingency arising from non-demonstrative inductions or analogies would be to clumsily transgress the bounds of reason.

But recall, also, that Leibniz offers another (material) theory of contingency: that the contingent is that whose non-existence is possible in itself. This view finds its way in Kant's idea of real or absolute contingency. The root of contingency, on Leibniz's material theory, lies in the moral inclination of God's will toward actualizing the best of all possible worlds. Contingency here consists, first, in the circumstance that God's

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[84] Heschel Logic, 110; DWL, 777.

thoughts of possible worlds remain inert, or incapable of determining (willing) themselves into existence. The logically possible worlds in God's intellect require an external determining ground which is supplied by his free will. From God's free act to create the best possible world, contingency flows to creatures. Similarly, for Kant, real contingency is not merely a logical or formal property of objects, facts, or propositions, but an ontological feature rooted in the conditions for their actuality. What makes something really contingent is that its non-existence can be coherently thought without thereby annihilating all thought about it (the object, or fact, or proposition). Where Kant departs from Leibniz is in denying that sufficient determining grounds for moving something from possibility to existence obtain in noumenal reality, in the sort of region in which God's moral inclination occurs and in which we act when we act in self-conscious accordance with the moral law. Moral reasons, for Kant, are of a fundamentally different kind; namely, they have the form of imperatives. They are not analyzable into subjects and predicates and thus synthesizable into syllogistic chains. At the same time, with his denial Kant does not mean to deny that anything truly exists, so that, for all we know, experience might just be a well-ordered dream. Rather, Kant intends to deny the possibility the knowledge of first beginnings, of a free act of creation of a state of affairs insufficiently conditioned by prior states of affairs. The only grounds we can cognize, or grounds by which we could infer the actuality of something that was previously only possible, are grounds in the realm of appearances, or physical causes. There is indeed real and not just nominal contingency, but it obtains outside the realm of phenomena and its root lies in a free subject's grasp of the moral law within her. In the realm of appearances, for Kant as for Leibniz, only a formal notion of contingency as infinite analyzability holds.

We can now place Kant's treatment of Leibnizian contingency in his project of investigating the nature of human cognition, specifically in the distinction between discursive and intuitive intellects. Once again, though, it is useful to begin with Leibniz. As just noted, in his formal theory of contingency, Leibniz appeals to God's infallible vision as a mode of grasping contingent truths by which God has sufficient reason to choose the uniquely best among infinitely many possible worlds. Elsewhere, Leibniz explicates such vision in the notion of an intuitive knowledge or cognition (*cognitio intuitiva*). In "Meditations on Knowledge, Truth, and Ideas" (1684), Leibniz defines intuitive cognition as the capacity to grasp immediately, or in a single mental act, the manifold marks of a complex notion. Such a cognition is intuitive, in the first place, insofar as it is immediate, that is, it does not require abstracting away any of the marks in order to represent the object of thought. The immediacy of the cognition further implies that it cannot be attained by successively gathering necessary and sufficient marks of the concept, but instead that all of its constitutive marks should be present in thought at once. The sufficiency of the cognition of conceptual marks also means that such cognition does not require elements to be given from other sources, for the object is thought in all its detail in virtue of what is contained in its concept alone. Leibniz expresses skepticism that we could ever have this kind of cognition. Given the limitations of our processing capacities, we have to make use of signs and symbols to stand in for complex properties and notions, whose definitions we exclude for the sake of convenience. One feature of the finitude of our intellect is that adequate cognition—or when cognition is such that all the marks of an object are distinctly known, or "when analysis has been carried to completion"—is rarely, if ever, attained (Leibniz tentatively suggests that knowledge of numbers might approach adequacy).[85] What we do reach is greater or lesser degrees of distinctness in our cognition of conceptual marks which allows us to discriminate objects into kinds, to devise tests to identify new properties, and to refine our system of concepts by making further distinctions among properties or property-clusters.

One salient feature of this kind of cognitive activity is its serial character, that the intellect has to run through a series of marks to identify similarities and differences on the basis of which to make groupings. A second feature is the incompleteness of such cognition with respect to everything that can be thought about the object considered as an individual. The kind of conceptual operation involved in discursive thought presupposes an imperfection in the current state of cognition, the awareness that greater distinctness remains possible, or that analysis has not yet reached completion. A third characteristic of discursivity emerging with Leibniz is the requirement of an extra-intellectual condition for thought. Unlike in intuitive cognition in which the intellect immediately grasps all truths about an object just by considering its concept, a discursive intellect requires a source of material for thought which it cannot produce from its own reflection on concepts. Thus, Leibniz admits that, given our finite state, "the external senses are necessary for our thinking, and that if we did not have any, we would not think."[86] While sensible content is not sufficient to establish the truth of any proposition (for truth

[85] AG 24.
[86] Letter to Sophie Charlotte (1702), AG 191.

consists in the analytic containment of predicate in subject) it is a contingent feature of our cognitive capacities that we must, nevertheless, rely on less distinct, sensorily-conditioned content to make progress in conceptual knowledge.

The discursive character of the human understanding gives rise to formal contingency in knowledge of nature and its laws. In the absence of an adequate grasp of the essence of a thing, we are constrained to use induction from past cases to formulate general hypotheses about rules governing perceived change. These partial expressions of regularities among perceived states of affairs are contingent in themselves. For, despite their robustness across cases, or predictive success, or even elegance, they resist the force of necessity which can only be conferred through a finite proof based on the principle of contradiction. Since particular empirical laws remain bound up in the infinite complexity of created things, and our intellects cannot grasp infinitely complex truths adequately, such laws remain contingent in Leibniz's formal sense. But, for Leibniz, they are also contingent in a further sense, namely, insofar as the laws instantiated in the perceptions of the set of individuals constituting the actual world are contingent upon God's free, moral decision to create. In fact, all the laws of of the world, from the most general law of the series to any particular empirical law, and even the moral law divinely commanded for self-conscious minds, are equally contingent in virtue of requiring for their reality, or their objective validity in an actual world of things, an act of divine will. The sufficient reason for the inclination of God's will, meanwhile, consists in its perfect agreement with the highest good and its capacity to recognize the most goodness in the concept of one possible world among many.

Contingency in a Leibnizean world thus arises from the freedom of the divine will, a freedom understood as the absence of determination from absolute necessity of the sort encountered in logical proof. The contingent reasons moving God's will and flowing to the natural and moral orders are ones that "incline, rather than necessitate."[87] These inclining reasons are of a kind for which discursivity is inadequate. Instead, they require a kind of intellectual intuition. Yet, contingent, motivating reasons remain reasons, and as such are objects for an understanding in general, even if not for one like ours. For Leibniz, the formal or logical character of contingency in nature's laws is similar to that for moral laws, and the ground of both lie in the motives for divine choice. By contrast, Kant sharply distinguishes the formal element of contingency in our knowledge of nature from the absolute contingency grounded in the reality of human freedom.

Throughout the critical period, Kant contrasts the human mode of discursive understanding with intellectual intuition or an intuitive understanding. The most sustained treatment of the distinction occurs in §§76-77 of the *Critique of the Power of Judgment*.[88] Across his texts Kant gives several characterizations of the distinction, and scholars have disputed whether any one or a subset of these uniquely captures Kant's intent.[89] Here, I will set aside the question of whether Kant always conveys a single

[87] "On the Radical Origination of Things," (1697) L 486; "Fifth Letter to Clarke", L 697.
[88] E.g. B135; A256/B312; Proleg. 4:317; KprV 5:99; KU 5:401-10; "On a Discovery" 8:216; "What Real Progress" 20:267; Met. Pölitz 28:328-9. Kant frequently, but not always, describes God's intellect as intuitive. Crucially, in §§76-77 of the third *Critique*, he never states the contrast as one between a human and a divine intellect, but only between our understanding and a different one defined negatively with respect to ours.
[89] For some recent discussions, see Kenneth R. Westphal, "Kant, Hegel, and the Fate of 'the' Intuitive Intellect." In *The Reception of Kant's Critical Philosophy*, ed. Sally Sedgwick, 283–305 (Cambridge: Cambridge University Press, 2000); Eckart Förster, *The*

distinction with these labels. Instead, I will focus on those features which bear directly on the formally contingent character of our knowledge of nature and to the real contingency due to the activity of a free will it leaves possible.

Kant describes the distinction between our discursive understanding and the idea of a possible, intuitive one, in at least the following ways: first, an intuitive understanding knows noumenal objects, whereas a discursive one cannot; that is, possible theoretical knowledge for knowers like us is restricted to appearances, and cannot, in principle, reach behind the appearances to the natures of things. An intuitive understanding would be such that it would know supersensible things by directly grasping them as things in themselves.[90]

On a second characterization, an intuitive understanding creates or actualizes its objects in thinking them, whereas a discursive one does not. Kant sometimes speaks of an intuitive understanding as productive, such that in thinking about an object it also produces the object itself; consequently, for an intuitive understanding there is no distinction between a merely possible object and an actual one.[91] Such an understanding, Kant tells us, while an understanding in the most general sense of being a faculty of

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Twenty-Five Years of Philosophy, trans. Brady Bowman (Cambridge, MA: Harvard University Press, 2012); Jessica Leech, "Making Modal Distinctions: Kant on the Possible, the Actual, and the Intuitive Understanding," *Kantian Review* 19 (2014): 339–65; Reed Winegar, "Kant on God's Intuitive Understanding: Interpreting §76's Modal Claims," *Kantian Review* 22 (2017): 305–29. The interpretive challenge is complicated by the divergent uses to which Fichte, Schelling, and Hegel put Kant's idea of intellectual intuition, as, for instance, a subject's immediate self-consciousness of its activity (Fichte), for a bare acquaintance of a subject to its mental acts (Schelling), or for a non-conceptual grasping (the early Hegel).

[90] E.g. KprV 5:99.

[91] KU 5:401-2.

concepts, lacks both concepts and sensible intuitions in our, discursive sense.[92] For neither would its intuitions be vehicles for categorizable content, nor its concepts categories in need of data. For us, conceptual thought remains empty, or without relation to objects, which have to be given separately in intuitions.

Third, an intuitive understanding cognizes from the whole to its parts, whereas a discursive one goes from parts to wholes.[93] In Kant's terms, our understanding has the feature that, in causal reasoning, for instance, it moves from the "analytical universal" to the particular case. An analytical universal, in Kant's logical terminology, is formed by abstracting from differences and, as a result, such a concept occurs as a constituent of all concepts falling under it, as is the case with our ordinary empirical concepts. For example, all species of trees have as a constituent of their meaning the analytically universal concept 'tree.' In representing objects using such concepts, the representation of the parts of the object (its particular constituent concepts) precedes the representation of the whole (the concept of the object). By contrast, in what Kant calls a synthetic universal, the constituent concepts are thought together as a whole, thus collectively in the concept of the object rather than distributively under the genus of diverse species. The parts are represented in virtue of a representation of the totality. It is a feature of our discursive understanding that our capacity to form concepts proceeds by abstraction from

[92] It is important to note that an intuitive understanding remains an *understanding*, hence a faculty of concepts. It is not a non-conceptual faculty of pure, object-giving intuitions, as some commentators maintain (e.g. Winegar, "God's Intuitive Understanding"). Rather, it is a faculty in whose states the distinctive character of intuition (as vehicle for acquaintance to object) and the distinctive character of conception (as function of logical synthesis) are unified, so that in one and the same mental act the whole object is given as actual and is thought as synthetic unity.
[93] KU 5:406-7.

marks and construction of conceptual hierarchies that group kinds of object on the basis of qualitative similarity relations. The validity of our conceptual representations, consequently, depends on the contingent correspondence between the series of marks thought under them, and the observational evidence gathered from experience of the particulars thought through them. An intuitive understanding, by contrast, would understand the essence of any individual thing by grasping in its concept the logical relations among its constituent parts.[94]

Contingency in the knowledge of nature's laws and in its system of natural kinds follows directly from the second and third of these senses of discursivity. For one thing, as a non-productive faculty, the representations of a discursive understanding require an external source of content for their validity. The possible objects or states inferrable from a conceptual representation depend for their actuality on a suitable presentation in sensibility. Bridging the gap between cognition of possibility in the concept and of its actuality in intuition remains a contingent matter for a discursive understanding. For another, in being restricted to forming concepts by abstraction, our cognition necessarily proceeds from parts—constituents of the meaning of a concept—to a whole—the complete network of constituents and their inferential relations. Since such a serial process of concept formation and refinement can go on indefinitely, given the infinite

[94] It is the failure to recognize this limitation, according to Kant, which leads us to erroneously assent to the idea of a concrete individual encompassing in itself all of reality: "That we… hypostatize this idea of a sum total of all reality, however, comes about because we dialectically transform the distributive unity of the use of the understanding in experience, into the collective unity of a whole of experience; and from this whole of appearances we think up an individual thing containing in itself all empirical reality" (A582-3/B610-1).

complexity of material conditions for a natural object or fact, the validity of any system of natural kinds or of empirical laws (any theory) could only remain contingent for us. In the absence of an intuitive insight into the whole of nature, the systems of nature thought by a discursive understanding always remain open to revision. Yet, since a categorial understanding like ours legislates that nature should be a law-governed series of appearances, its provisional systems of empirical laws and concepts nevertheless stake a claim to lawfulness. Nature, understood materially as a sum total of appearances, must be conceived as law-governed, even though any particular specification of nature's laws we are capable of remains contingent with respect to what nature might be in itself.[95] It is a peculiar feature of our cognitive condition that we must conceive nature as a lawful totality and yet never be in a position to know it as such.

Real, or absolute, contingency, meanwhile, is closely tied to the incapacity of discursivity to know noumenal things. In particular, Kant focuses attention on one of the three noumenal items which he identifies as the ultimate objects of metaphysics: freedom of the will (the other two being God and the immortality of the soul).[96] In contrast to Leibniz, for whom the root of contingency lies in God's rational motives for action, Kant identifies genuine contingency with actions whose motivating reasons are inexplicable with the resources of our understanding. Real contingency, specifically, is a feature of agency, in fact of spontaneous activity, which entails the creation of a reality

[95] Cf. R 5552, 18:219-20: "The understanding prescribes the law to nature, but one that does not reach farther than the form of appearances, which grounds the possibility of experience in general. For this must be in conformity with nature as object of empirical cognition, for otherwise it would not be nature for us."
[96] E.g. A798/B826.

unconditioned by prior circumstances. Knowing the possibility of such activity is ruled out for a discursive understanding since it is limited to thinking from grounds or conditions to other grounds or conditions. Were we to possess intuitive cognition, Kant suggests in the *Critique of Practical Reason*, what we would know is the ground in spontaneity that results in a series of actions evaluable on the basis of the moral law:

> If… we were capable of another view [i.e. from ours], namely an intellectual intuition of the [human being] (which is certainly not given to us and in place of which we have only the rational concept), then we would become aware that this whole chain of appearances, with respect to all that the moral law is concerned with, depends upon the spontaneity of the subject as a thing in itself, for the determination of which no physical explanation can be given.[97]

The chain of moral actions is really contingent, in one sense, in virtue of being outside the scope of physical explanation. That is, the grounds of a free action are inaccessible to an understanding like ours. Yet, Kant suggests another root of contingency, namely, "the spontaneity of the subject as a thing in itself," which an intuitive intellect would identify, in cognizing the whole human being, as the ground of the subject's actions. Negatively, then, Kant conceives real contingency as a consequence of our ignorance of things in themselves. Positively, however, through the device of a hypothetical intuitive understanding, he suggests a close dependence of genuinely unconditioned, contingent realities on the power of spontaneity at the heart of his conception of the human subject. What it is for something to be absolutely contingent is for it to be produced from the free,

[97] KprV 5:99.

internal activity of a subject undetermined by external causes. What's more, we recognize spontaneity in ourselves when we take ourselves to act in accordance with the moral law. Yet, this capacity for moral self-consciousness, which conveys an intimation of the supersensible in ourselves, remains beyond our capacity for conceptual knowledge, thus for integration into a system of concepts and relations that could support inferences. Absolute contingency, from the point of view of human cognition, remains, unlike physical determination, a merely negative notion. From the point of view of action, its reality in human life cannot be denied, on pain of denying the demands of practical rationality, or the fact that we are aware of ourselves as setting goals, making plans, and acting for the sake of ends.[98]

7. The objective purposiveness of nature

The task of dealing with contingency in Kant's third *Critique* falls to the reflective activity of judging nature purposively, in accordance with certain subjectively valid rules for systematizing nature's laws in an ideal unity. The principle of reflective judging is valid for particular natural forms as well, especially those which paradigmatically exhibit

[98] KprV 5:30: "I ask… from what our *cognition* of the unconditionally practical *starts*, whether from freedom or from the practical law. It cannot start from freedom, for we can neither be immediately conscious of this, since the first concept of it is negative, nor can we conclude to it from experience, since experience lets us cognize only the law of appearances and hence the mechanism of nature, the direct opposite of freedom. It is therefore the *moral law*, of which we become immediately conscious (as soon as we draw up maxims of the will for ourselves), that *first* offers itself to us and, inasmuch as reason presents it as a determining ground not to be outweighed by any sensible conditions and indeed quite independent of them, leads directly to the concept of freedom."

contingency in their appearances, such as organisms. Yet, the subjective validity of formal purposiveness does not allow a transition to judging nature as objectively purposive. That is, we are not licensed to move from judging an animal's structure as formally teleological to judging the animal's nature teleologically, thus to regard it as acting for the sake of internally given ends in the way we experience ourselves to act for moral ends. For Kant, the only principle of purposive activity we know in nature belongs to our own nature as free, practically rational subjects acting on the basis of conscious representations and desires. But nothing we know from experience or have critically established as legitimate epistemic practice warrants imputing similar agential capacities to non-human creatures. At the same time, insofar as we wish to have any handle on purposive appearances, we have no choice but to imagine the actuality of natural teleological forms on the only model available to us, namely, of design and intention as known from first-personal experience.

If taken objectively, purposiveness implies conceptual causality. Kant defines an end in general as

> the object of a concept insofar as the latter is regarded as the cause of the former (the real ground of its possibility); and the causality of a *concept* with regard to its *object* is purposiveness (*forma finalis*). Thus, where not merely the cognition of an object but the object itself (its form or existence) as an effect is thought of as possible only through a concept of the latter, there one thinks of an end.[99]

[99] KU 5:219-20.

The end (*Zweck*), following Baumgarten and Meier, is the object of a concept, insofar as the concept contains the real ground of the possibility of the end. That is, the end is an object of thought insofar as it is the object of an intention in which the conditions of its actuality are cognized. The relation between the concept and the object in cases of end-directed action is that of production and, in fact, rule-governed production. The end cannot be thought of as possible without a concept, thus a rule, in accordance with which it would exist and to the conceptually-given conditions of which it should conform. To judge a heart as an end, therefore, is to make a normative claim that such an object has the ground of its possibility in its concept, which governs how it ought to be.[100] What Kant calls purposiveness (*Zweckmässigkeit*), here without qualification, is the normative causality of a concept. An object that could only exist in accordance with conditions of how it ought to be as prescribed through a rule or concept is called an end or a purpose (*Zweck*). The tools we use in everyday life are all of this sort: bread knives which ought to cut bread, word processors which ought not to crash abruptly. Should such an object exist by nature, thus not by the industry of human artisans, it should be called a natural

[100] I agree with the prevailing view of Kant's concept of purposiveness as intrinsically normative in this sense of expressing conditions for proper function; see, e.g., Ginsborg, "Aesthetic and Biological Purposiveness"; McLaughlin, *Functions*, 209; Giorgio Tonelli, "Von den verschiedenen Bedeutungen des Wortes Zweckmässigkeit in der Kritik der Urteilskraft," *Kant-Studien* 49 (1957): 154–66; Zuckert, *Beauty and Biology*, 79; Klaus Düsing, *Die Teleologie in Kants Weltbegriff* (Bonn: Bouvier, 1968), 97. Recently, Thomas Teufel, "Kant's Non-Teleological Conception of Purposiveness," *Kant-Studien* 102, no. 2 (2011): 232–52, has pushed against this reading, arguing that Kant's concept of purposiveness is etiological designed to explain the causal link between artifacts and the concepts guiding their production only. As he puts its, Kantian purposiveness is "backward-looking" rather than "forward-looking" and, hence, it is "non-teleological." I disagree with Teufel, who incorrectly assumes an exclusive disjunction between etiology and normativity. For Kant, etiological conditions of conceptual production also impart normative conditions governing future activity, especially in the case of natural kinds, which are Kant's primary interest with his concept of purposiveness.

end or natural purpose. The domain of such naturally purposive beings, paradigmatically plants and animals, entices us to extend the merely formal use of purposiveness in judging the structures of organized beings to judging their inner natures. That is, in asking how purposive forms could arise and operate in nature, we are led to wonder whether a principle of purposive agency as we experience in our own freedom could be operative behind the appearance of conceptual form in the natural world. Reason is led to speculate, consequently, not only about vital principles in plants and animals, but also about the spiritual governance of the world, and even of the possibility of a form of the cosmos as a whole.

There is a certain peculiarity in the circumstance that we are compelled to frame for ourselves purposive order in nature, yet unable to grasp such purposiveness. Kant's critical investigation of the cognitive faculty could well be approached as a diagnosis of this condition for the sake of understanding human nature and its prospects.

CHAPTER 7: "The Thinking Self in Life": Teleology in Kant's Critique of Human Nature

1. Introduction

One of the definitive slogans in Kant's *Critique of Pure Reason* assigns a coordinate status to perception and conception in the production of knowledge: "Thoughts without content are empty, intuitions without concepts are blind." In an oft-repeated narrative in the history of philosophy, first advanced by Kant himself, Kant overcomes an opposition between sensualists (such as Epicurus and Locke) and intellectualists (Plato in antiquity, Leibniz in modernity). The former had tried to reduce all reality to sense impressions or constructions therefrom; the latter went in the other direction to intellectualize appearances as merely confused conceptions, and cast the senses as essentially misleading. Kant takes his Copernican Revolution to consist in bridging this gulf by reconceiving reality as first emerging through the joint activity of the senses and the intellect. Accordingly, the matter of sensation only becomes meaningful for us once it is brought under a conceptual form supplied by the understanding.

The literature on Kant's theory of cognition has been occupied in large measure with working out the details of the contributions of sensibility and understanding—what is sometimes called the 'two-factor' view of knowledge. It therefore comes as a surprise, in the final paragraph of the first major division of the *Critique*, the Transcendental Doctrine of Elements, to find Kant writing that "all human cognition [*Erkenntniß*] begins with intuitions, goes from there to concepts, and ends in ideas."[1] In much of Kant's positive story about synthetic *a priori* cognition, there is little evident concern with the third element, the ideas of reason. The ideas, as Kant defines them, are "concepts of reason."[2] But unlike concepts of the understanding, which are restricted in their application to the domain of appearances, ideas are not limited to categorizing experience. Specifically, in contrast to his treatment of intuitions and concepts, Kant's primary concern with the ideas of reason, in particular those of God, the soul, and the world as a totality, is to expose their deceptive character, and to diagnose the fallacies in which rationalist philosophers have been ensnared as a result. Only in a short appendix at the culmination of his assault on the speculative metaphysics of theology, cosmology, and psychology does Kant sketch a positive, regulative function for these transgressive beings of reason. Unfortunately, Kant's account of the positive epistemic status of non-empirical, and non-empirically conditioned elements—elements that are neither sensations nor restricted to judgments about sensible content—has left many readers of the Appendix to the Transcendental Dialectic unconvinced. It has proven similarly difficult to reconcile with Kant's basic epistemological restrictions his treatment of the ideas of nature's systematicity, and of maxims such as that nature does nothing in vain, in the theory of reflective judgment he develops in the *Critique of the Poer of Judgment* (1790).

The object of this chapter is to overcome the interpretive challenges by motivating an organical view of Kant's epistemology. The position I advocate is a version of

[1] A702/B730.
[2] A310/B367.

conceptualism: that there is no objective, conscious experience without the involvement of conceptual capacities. There is no merely material representational content; all objective representation requires form supplied by the mind. But the view developed in this chapter goes beyond the conceptualism debate as it has unfolded in recent scholarship by discovering greater complexity on the formal side of cognition and in its relation to sensory data.[3] Specifically, I argue that cognition (*Erkenntniß*) in Kant's first *Critique* account requires at least three independent sources or principles (*Quellen*; *principia*): sensibility, understanding, and reason. The third of these is the least well-articulated in the text, its most explicit discussion appearing as an afterthought. Yet, closer attention reveals a role for rational ideas woven throughout Kant's discussion of the conditions for knowledge. Briefly, the proper activity of reason serves as a metacondition for first-order knowledge, insofar as Kant maintains that without the ideas of reason "no understanding at all would obtain."[4] The possibility of applying the concepts of cause or substance to objects of experience, in other words, already

[3] For a survey of the conceptualism debate, see Colin McLear, "The Kantian (Non)Conceptualism Debate," *Philosophy Compass* 9 (2014): 769–90. Recent conceptualist readings of Kant include Hannah Ginsborg, "Empirical Concepts and the Content of Experience," *European Journal of Philosophy* 14 (2006): 349–72; Stefanie Grüne, *Blinde Anschauung: Die Rolle von Begriffen in Kants Theorie sinnlicher Synthesis* (Frankfurt am Main: Klostermann, 2009); and Thomas Land, "Kantian Conceptualism," in *Rethinking Epistemology,* Vol. 1, eds. Günter Abel and James Conant, 197–239 (Berlin: De Gruyter, 2011). For opposing views, which find Kant committed to the existence of non-conceptual, objective sensory contents, see Peter Rohs, "Bezieht sich nach Kant die Anschauung unmittelbar auf Gegenstände?" In *Akte des IX Internationalen Kant-Kongresses, Vol II,* eds. Ralph Schumacher, Rolf-Peter Horstmann, and Volker Gerhardt, 214–28 (Berlin and New York: De Gruyter, 2001); Robert Hanna, "Kant and Nonconceptual Content," *European Journal of Philosophy* 13 (2005): 247–90; and Lucy Allais, "Non-Conceptual Content and the Representation of Space," *Journal of the History of Philosophy* 47 (2009): 383–413.

[4] A654/B682.

presupposes an ideal order and coherence that outstrips any such guarantee contained in either sensibility or understanding. While the categories of cause and substance are the immediate requisites for interpreting perceptions, these depend in turn on uninstantiable ideas of systematicity, genus, species, and continuity. Kant frames his discussion of the ideas with the following question: "Does reason in itself, i.e. pure reason, contain *a priori* synthetic principles and rules, and in what might such principles consist?"[5] In the conclusion to the Transcendental Dialectic, Kant offers an affirmative, albeit underdeveloped answer. "The completion of the critical business of pure reason," as he describes the purpose of the Appendix to the Transcendental Dialectic (henceforth, Appendix), requires identifying a legitimate role for the ideas of reason, and thereby establishing a kind of "objective validity" for them.[6] My present task is to articulate Kant's account of that role. I first address the role of reason within Kant's influential theory of cognition as developed in the first *Critique*, and then connect it to Kant's theory of organicity in the third *Critique*.

The chapter proceeds as follows: in Section Two, I focus on some persistent textual puzzles arising from Kant's treatment of rationalist principles in the Appendix. Section Three takes up a question central to the puzzle, namely, how regulative ideas, Kant's official designation for the ideas of reason, can enjoy transcendental or necessary

5 A306/B363.

6 A670/B698. Kant qualifies the claim by stating that the ideas have "objective but indeterminate validity [*objektive aber unbestimmte Gültigkeit*]" (A663/B691). For that reason, Kant offers as well a "deduction" of the ideas, albeit one which will, he warns, not be as decisive as the deduction of the categories. Kant's official deduction of the ideas at A670/B698) has widely been deemed unsatisfactory and I shall not address it any further. My focus instead will be Kant's other arguments in support of the (qualified) objective validity of rational ideas.

status. I argue that, far from there being a fatal ambiguity in the meaning of 'transcendental' in the first *Critique*, as some commentators have maintained, we can retain a unitary notion that permits a necessary function for regulative principles. The key here lies in discerning an inherently relational or context-dependent sense to the terms 'constitutive' and 'regulative'. Section Four then addresses this necessary involvement of reason's ideas in the operation of the understanding and elaborates Kant's controversial claim that without the ideas of reason "no understanding at all would obtain."[7] With the reciprocal relation between the operations of reason and understanding in view, we are able to see why Kant grants an *a priori* status to reason's principles and, thus, to understand his cryptic claim that the ideas of reason have "objective, but indeterminate validity." The chapter then moves beyond the confines of the first *Critique.* Section Five highlights the deeper connection in Kant's thought between rationality and end-directed agency. The section details Kant's account of the conditions for proper, natural function as exhibited in a certain kind of structure, which we find in organic forms in nature. Section Six argues that Kant's theory of the cognitive faculties, especially as we find it in the third *Critique,* meets Kant's analytic conditions for organicity. There is an important analogy between the structure of organic bodies and the structure of the human mind. This analogy leads to the possibility of studying human nature as a hylomorphic unity, but also why plants and animals can only be studied as if they constituted such unities. This is the topic of Section Seven.

[7] A654/B682.

The chapter is oriented around two Kantian *Leitfaden*. The first is Kant's famous call in the closing pages of the first *Critique* to reform philosophy as a science of the essential ends of human reason, or as a teleology of human reason.[8] The second is a less-noticed suggestion toward the end of the third *Critique* to reconceive rational psychology—hitherto one of the prime targets of Kant's criticisms of scholastic metaphysics—as a kind of anthropology, or the knowledge of "our thinking self in life."[9] The two can be connected, and provide a bifocal perspective on Kant's revolution in philosophy. Briefly, Kant's program to move philosophy from its scholastic mode to a "cosmopolitan" mode requires identifying its core subject matter as the nature of the human being, as a purposive, practically and theoretically rational agent. The goal of philosophy is not, for Kant, knowledge of the perfect, divine nature but the finite, human nature. The essence and nature of the human subject cannot be known to us other than in the life of this subject as an embodied agent in the world. As the study of the nature of a simultaneously psychological and physical being, a kind of hylomorphic unity of formal and material elements, Kant's critical philosophy becomes an anthropology, a doctrine of the human being. In fact, in a reflection from the gestational period of his critical system, Kant fittingly uses the label "transcendental anthropology" (*Anthropologia transscendentalis*) to describe the activity of "self-knowledge of understanding and reason."[10] And, in a revealing passage from his lectures on logic, Kant explains the respect in which philosophy as anthropology stands to theoretical and practical philosophy. For while philosophy in the "cosmopolitan sense" can be organized along his

[8] A839/B867.
[9] KU 5:461.
[10] R 903 (1776-78), 15:395.

three celebrated questions—What can I know? What ought I to do? What may I hope?—each of these relates to a fourth, more basic question: What is the human being?[11] The idea of a human teleology is central to the project of critique as a study of human nature and, from the standpoint of human nature, as the study of nature in general.

We begin in the next section with a reexamination of the epistemology of the first *Critique*, in order to rehabilitate the normative function of reason in the production of knowledge. Kant's short and controversial text on the topic, as mentioned, is the Appendix to the Transcendental Dialectic.

2. The textual situation of the Appendix to the Transcendental Dialectic

The Appendix has long troubled readers of the *Critique of Pure Reason*. Kant's purpose in the main text of the Dialectic is largely negative; he aims to undercut rationalist metaphysical theses by exposing the ideas upon which they rest as illusory. The moral of Kant's attack on metaphysics as practiced in the Wolffian school seems to be that, whereas the joint operation of perceptual and conceptual capacities is necessary for ordinary empirical cognition, the activity of reason is essentially deceptive. The quest for ultimate explanations beyond the field of possible experience produces ideas which can neither be proven nor disproven by empirical resources.

Yet, after several hundred pages of diagnosing the misleading character of these ideas and, consequently, of the metaphysical disciplines founded upon them, Kant

[11] JL 9:25.

abruptly turns to the legitimate and even indispensable employment of the principle underlying each of these ideas. This principle, according to Kant, prescribes systematic unity to any body of knowledge that aspires to the status of science. By demanding unity among empirical concepts, reason's activity seeks to transform knowledge from an aggregate into "a system interconnected in accordance with necessary laws."[12] This process involves idealizations and the framing of hypotheses that exceed the evidence. It requires projecting an order onto nature, one which is nonetheless supposed to serve as a basis for testing the truth of first-order empirical claims.[13] Once we take the Appendix into account, Kant's overall strategy in the Transcendental Dialectic appears to be to strip away the speculative accretions of metaphysical pseudo-sciences in order to uncover the pure forms of those rational principles proper and necessary to yield knowledge.

Puzzlement arises on account of the uneasy relation of Kant's positive claims on behalf of the ideas of reason to some of his central, and most enduring, epistemological theses. For one thing, granting objective validity to principles such as systematicity appears to violate Kant's restriction that any objectively valid concept should have conditions of exemplification or empirical instantiation. Indeed, it is this condition that Kant wishes to respect when he suggests at the beginning of the Transcendental Dialectic that the rational demand to seek unity among empirical laws "does not prescribe any law to objects… but rather is merely a subjective law of economy for the provision of our understanding."[14] Similarly, in the Appendix itself Kant asserts that, "the transcendental

[12] A645/B673.
[13] A646-7/B674-5.
[14] A306/B362.

ideas are never of constitutive use, so that the concepts of certain objects would thereby be given."[15] In such passages, Kant appears to restrict reason's proclivities toward unity and completeness to the status of expedient tools for easing our cognitive burdens, rather than as adding to knowledge of the world.

More generally, a strong reading of Kant's positive construal of the ideas in the Appendix (as he sometimes invites us to do), appears to be flatly inconsistent with the rest of his epistemology, as scholars have long noted.[16] Some recent commentators, while not dismissing outright Kant's attempt to salvage reason's misleading acts have nevertheless concluded that the guiding role Kant wishes to ascribe to these ideas would in any case be redundant in light of the resources he allocates to the empirically-bounded understanding.[17] Even sympathetic readers of the Appendix have expressed

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[15] A644/B672.

[16] This has been the judgment of, among others, Norman Kemp Smith, *A Commentary to Kant's Critique of Pure Reason,* 2nd ed. (New York: Humanities Press, 1962), 547; Bennett, *Kant's Dialectic*, 274ff; Philip Kitcher, "Projecting the Order of Nature," in *Kant's Philosophy of Physical Science,* ed. R.E. Butts (Dordrecht: Reidel, 1986), 213; and Paul Guyer, "Reason and Reflective Judgment: Kant on the Significance of Systematicity," *Nous* 24, no. 1 (1990), 33. Returning to the problem of according a necessary status to the principle of systematicity, Paul Guyer, *Kant* (London and New York, Routledge, 2014), Ch. 4, takes the discussion beyond the first *Critique* to the *Metaphysical Foundations of Natural Science* and the third *Critique*, yet without claiming to substantiate Kant's suggestion in the Appendix (and elsewhere) that regulative principles are more than just heuristics. Theodore A. Gracyk, "Kant's Doctrine of Heuristics: An Interpretation of the Ideas of Reason," *The Modern Schoolman* 68, no. 3 (1991): 191–210, gives an updated version of the heuristical reading of Kantian ideas in terms of the dichotomy between algorithms and heuristics in recent philosophy of science, but doesn't shed light on the more basic question of their validity or legitimacy in inquiry. Where the Appendix has posed trouble for systematic interpretations of the first *Critique*, it has proved independently valuable for philosophers of science, who have drawn inspiration from Kant's methodological reflections.

[17] Beátrice Longuenesse, "The Transcendental Ideal and the Unity of the Critical System," in *Kant on the Human Standpoint* (Cambridge: Cambridge University Press,

dissatisfaction with Kant's overall discussion.[18] Perhaps the most thorough available interpretation, Michelle Grier's, requires accepting the troubling consequence that a basic, global state of cognitive illusion is a necessary condition for successful empirical cognition. As she describes the situation, "the regulative function of the principle of systematic unity is itself parasitic upon the transcendental and illusory postulation that nature, as an object of our knowledge, is already given as a complete whole."[19] To many readers who have otherwise been convinced by Kant's distinctions between the firm epistemic standings of empirically instantiable concepts on the one hand, and mere speculative beings of reasons on the other, or between concepts necessary to constitute empirical objects and merely regulative guidelines for their further classification and study, Kant's own promotion of the claims of pure reason is unsettling.[20]

2005), 233, for instance, suggests that the Analytic of Concepts and Principles together with its appendix—the Amphiboly chapter—suffice to secure the kind of systematicity Kant wants for the world of empirical objects.

[18] Horstmann, "Der Anhang," 544, in an insightful and charitable study of the internal tensions arising from the Appendix, nevertheless confesses that Kant's account of the regulative role of the ideas of reason is anything but convincing. Less charitable is Rudolf Zocher, "Zu Kants Transzendentaler Deduktion der Ideen der reinen Vernunft," *Zeitschrift für philosophische Forschung* 12, no. 1 (1958), 58: "It is thus the lack of unity in the conception of the ideas, or – if one wishes to judge more sharply – rather a rupture (*Bruch*) in the Kantian doctrine of ideas itself, which explain the incompleteness of the deduction [of the ideas] and the unsteadiness in the formulation of the statements about their meaning and their possibility."

[19] Michelle Grier, "Kant on the Illusion of a Systematic Unity of Knowledge," *History of Philosophy Quarterly* 14, no. 1 (1997), 275. She rescues the positive function of the ideas of reason by, first, distinguishing between transcendental illusion (the ideas of God, the world as a totality, the soul) and the fallacies resulting from them (the Antinomies and Paralogisms, for example), and second, by construing the ideas of reason as necessary illusions for the successful use of the understanding; in other words, effective empirical cognition depends on a fundamental state of cognitive error.

[20] Lara Ostaric, "Kant's Account of Nature's Systematicity and the Unity of Theoretical and Practical Reason," *Inquiry* 52, no. 2 (2009): 155–78, outlines a promising approach

Within the confines of his critical epistemology, Kant is acutely aware of the main conundrum: how is it that merely logical (or methodological) ideas of reason, such as that of systematicity, can seem to have transcendental status, and even a kind of indeterminate, yet objective validity, though one cannot provide for them a transcendental deduction of the sort he has offered for the pure concepts of cause, substance, or necessity? He writes:

> What is strange about these principles, and what alone concerns us, is this: that they seem to be transcendental, and even though they contain mere ideas to be followed in the empirical use of reason, which reason can follow only asymptotically, as it were, i.e., merely by approximation, without ever reaching them, yet these principles, as synthetic propositions *a priori,* nevertheless have objective but indeterminate validity, and serve as a rule of possible experience, and can even be used with good success, as heuristic principles, in actually elaborating it; and yet one cannot bring about a transcendental deduction of them, which, as has been proved above, is always impossible in regard to ideas.[21]

Our first task then is to disentangle the tensions expressed in this passage in order to make better sense of Kant's picture of the relation between the contributions of reason, understanding, and sensibility toward knowledge. Contrary to some commentators, I argue in the next section that, within the framework of the *Critique of Pure Reason,* Kant

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for integrating Kant's claims on behalf of nature's systematicity in his critical philosophy as a whole, which requires recognizing practical purposiveness as involved in every act of theoretical cognition. I am sympathetic to her agenda, and see my interpretation of the Appendix in the context of the first *Critique* as compatible with her program.

[21] A663/B691.

can coherently maintain that the principle of systematicity, and its subordinate principles of homogeneity, specification, and continuity, have a transcendental status and thus are necessary for cognition. The key is to recognize that, for Kant, knowledge of nature requires two kinds of truth evaluability, or two ways for a proposition to be in agreement with its object: the first depends on the application of concepts to the sensory manifold in such a way that the conditions for an object's exemplification are satisfied; in other words, the first kind of truth evaluability amounts to a traditional definition of truth as the correspondence of thought to its object. The second kind of truth evaluability, meanwhile, depends on the coherence of objective thoughts (cognitions) so that relations among them could be judged true or false. This latter kind of truth evaluability, however, presupposes a definite order and structure in a world of cognizable objects, which is only made possible by the principle of systematicity. The discussion in the Appendix, and therewith the completion of Kant's critical study of cognition, reveals the principles underlying the illusory ideas of reason as serving a genuinely necessary function.

3. Systematicity as a transcendental principle

Kant's various glosses on the term 'transcendental' do not at first sight inspire confidence in the stability of the notion in Kant's writings. Indeed, some commentators have denied that the term has a single meaning across his critical philosophy.[22] Against the pessimistic

[22] Peter McLaughlin, "Transcendental Presuppositions and Ideas of Reason," *Kant Studien* 105, no. 4 (2014), 557, for instance, suggests that the meaning of 'transcendental'

view, I believe we can make progress in extracting a consistent meaning at the core of Kant's distinctions between 'transcendental' and 'logical', and between 'transcendental' and 'metaphysical'.

In general, a Kantian transcendental item, whether a concept or a principle, is one that specifies the conditions under which an object could be part of experience at all. This core sense of an item as defining the conditions for objecthood is found in the Introduction to the first *Critique*: "I call all cognition transcendental that is occupied not so much with objects, but rather with our *a priori* concepts of objects in general";[23] and in the third *Critique*: "A transcendental principle is one through which the universal *a priori* condition under which alone things can become objects of our cognition at all is represented."[24] As the latter formulation makes clear, transcendental status belongs to an item that is necessary, not so much for the material character of one or another kind of object, but for having any object in view at all. It is a principle without which we would not have any epistemic contact with a world of objects.[25]

In Kant's epistemology, the title is paradigmatically reserved for those object-constituting principles which prescribe that any possible object of cognition must take up spatial extent, possess definite degrees of secondary qualities, persist through alterations

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shifts, not just from the first *Critique* to the third, but even within the first *Critique* from the Transcendental Analytic to the Appendix.

[23] A11/B25.

[24] KU 5:181. And in a contemporaneous reflection: "Transcendental philosophy concerns not the objects, but rather the human mind according to the principles [*Quellen*] from which *a priori* cognition originates in it" (R 4873, 18:016).

[25] Horstmann, "Der Anhang," 530, glosses a transcendental state of affairs (*ein transzendentaler Sachverhalt*) as one that "fixes conditions which must necessarily be satisfied by an object, if it is to be an object of experience at all for us."

in those properties, that those alterations should have determinate causes, and that the object stand in thoroughgoing connection with other possible objects. Yet, Kant also ascribes the label to the regulative idea of systematicity, the causality of moral agents through freedom (in the second *Critique*), and the subjective principle of purposiveness stipulating that nature is adapted to our cognitive faculties (third *Critique*).[26] In Kant's mind, at least, it appears that transcendental principles can be either constitutive or regulative, which invites a closer examination of this further distinction. As it turns out, Kant's notion of 'regulative' is nuanced enough to allow even non-empirical principles such as systematicity and continuity to stake a claim on the general conditions for objectivity.

The constitutive/regulative distinction first appears in Kant's primary statement of transcendental principles: the four groups of synthetic principles of the understanding—the Axioms, Anticipations, Analogies, and Postulates—which underwrite objective, empirical cognition. Kant labels the mathematical principles (the Axioms of Intuition and Anticipations of Perception) 'constitutive'. These principles ground the applicability of mathematics to appearances: any possible object of experience must be such as to have

[26] KprV 5:3: "With this faculty [of pure practical reason] transcendental freedom is also established, taken indeed in that absolute sense in which speculative reason needed it, in its use of the concept of causality." KU 5:180: "since universal laws of nature have their ground in our understanding, which prescribes them to nature… the particular empirical laws, in regard to that which is left undetermined in them by the former, must be considered in terms of the sort of unity they would have if an understanding (even if not ours) had likewise given them for the sake of our faculty of cognition in order to make possible a system of experience in accordance with particular laws of nature." Kant states the principle of purposiveness less awkwardly in the unpublished, First Introduction to the third *Critique* (EE 20:216): "Nature specifies its general laws into empirical ones, in accordance with the form of a logical system, in behalf of the power of judgment."

determinate extension in space and determinate degrees of perceptible qualities. The objective validity of these principles consists in their role in grounding the possibility of specifying truth conditions for judgments of objects *qua* magnitudes. These principles enable judgments concerning measurable, empirically verifiable, properties of objects.

By contrast, Kant accords a regulative status to the three Analogies of Experience. That is, the principles of the determination of objects in time as perduring substances (persistence), as causes and effects (succession), and as reciprocally interacting objects (simultaneity) "will not be valid of the objects (of the appearances) constitutively but merely regulatively."[27] What distinguishes this group of principles, Kant explains, is that they concern the existence of appearances and their relations to one another, rather than their perceived extensive and intensive magnitudes. Whereas the mathematical, constitutive principles of experience ground the possibility of judging a table as having definite spatial dimensions, or its hue as having a definite degree of saturation, the principles of persistence, succession, and simultaneity make it possible to situate the table as a member of a world. In other words, the regulative, analogical principles underwrite the possibility of discovering in a material object such as a table a definite causal history, stable relations with chairs, floors, and humans, and conditions of decay and destruction. The reason for this difference lies in the circumstance that relations of causal connection or temporal persistence cannot be subjected to rules of mathematical construction. That is, intuitions corresponding to the causal principle or the principle of conservation of substance cannot be exhibited *a priori,* as Kant maintains is the case for geometrical

[27] A180/B222.

concepts. Unlike, for example, the spatial bounds of a material object, which can be exhibited in a scale drawing, the properties of persistence through time or causal connection cannot be exhibited as metrical properties of any singular object because they are not susceptible to rules of non-analogical construction.[28] Such principles are required rather for the possibility of regarding objects as parts of a system or collectivity, and thus ground our activity of formulating testable, empirical generalizations through induction or analogy. Consequently, Kant tells us, "these principles [the Analogies]… can yield nothing but merely regulative principles."[29]

Kant's discussion involves a technical distinction between a mathematical and a philosophical analogy, only the former of which supplies rules for exact constructions of objects as carried out by geometers. Unlike a mathematical analogy, where an unknown magnitude can be calculated from known magnitudes together with the identity of their relations, a philosophical analogy only gives the relation to an unknown member, but not that member (or object) itself. The principle of causal determination indicates that there must be a temporally prior cause responsible for the occurence of a given effect, but does

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[28] See Lisa Shabel, "Kant's Philosophy of Mathematics," in *The Cambridge Companion to Kant and Modern Philosophy,* ed. Paul Guyer (New York: Cambridge University Press, 2006), 97-113, for a discussion of Kant's thesis that mathematical cognition is distinguished from philosophical in virtue of being produced by the construction, rather than analysis, of its concepts (A713/B714). Summarizing Kant's position, she writes: "Kant conceives mathematics to have a unique ability to define its concepts by constructing them, which amounts to exhibiting their content in the form of a singular representation, or intuition. In producing a figure in intuition, the mathematician defines a mathematical concept by constructing an individual figure to correspond to that concept" (99). For Kant, while the concept 'triangle', for instance, has an analytic definition as 'rectilinear figure contained by three straight lines', its construction requires the further production of a singular representation of such a figure, a demand that underwrites the Euclidean geometer's use of diagrams to prove theorems.

[29] A179/B222.

not specify the causally efficacious object. Instead, the causal principle only provides “a rule for seeking it [the object] in experience.”[30] The Analogies do not ground assertions about the measurable properties of objects (their spatial extent and qualitative intensity), but rather provide constraints for the kinds of object that would fit a coherent story of the world as it appears to us. At the same time, by stipulating the structural or relational conditions that possible objects must meet in order to be part of this story, these principles take their place among the conditions that make empirical judgments possible, and thus warrant the title ‘transcendental’.

It bears emphasizing that the objective validity of these regulative principles cannot consist, as it does for the constitutive mathematical principles, in furnishing truth conditions for judgments of appearances as intuited magnitudes. Their legitimate employment instead rests in the provision of a different kind of validity condition, namely, conditions through which empirical objects could be judged to stand in relations requisite for their membership in a system of nature. Considerations of systematicity are, thus, already implicit in Kant’s account of the empirically restricted principles of the understanding. Perceived objects must one and all constitute a causally interconnected community of individuals, or belong to a world. Judgments concerning this community—what Kant calls judgments of experience—are of a kind that express relations of force, situation, and duration among its elements. Such inquiry into nature, considered

[30] A179/B222. As Kant explains further in the *Jäsche Logik*: “In the inference according to analogy, however, identity of the ground (*par ratio*) is not required. In accordance with analogy we infer only rational inhabitants of the moon, not men. Also, one cannot infer according to analogy beyond the *tertium comparationis*” (JL 9:133).

materially as the sum total of objects of experience, depends on both the mathematical principles and the discursive ones, which, in the *Prolegomena to any Future Metaphysics*, Kant identifies as making up the "philosophical part of pure cognition of nature."[31] The formation of empirical nature as an object of cognition already presupposes regulative as well as constitutive transcendental principles.

This distinction of constitutive and regulative principles recurs immediately following the Appendix passage with which we started. Having stated the main worry—that the principle of systematicity seems to be transcendental even though it contains merely heuristic guidelines for empirical inquiry—Kant now reminds the reader that the dynamical principles of the understanding are "merely regulative principles of intuition," whereas the mathematical ones are "constitutive in regard to intuition." Yet, he continues: "Despite this, the dynamical laws [i.e., the Analogies] we are thinking of are still constitutive in regard to experience, since they make possible *a priori* the concepts without which there is no experience."[32] Kant's key move here is to distinguish the status of the Analogies with respect to *intuition*, from their status with respect to *experience*. As applied to intuitions, the Analogies serve a merely regulative role, since they are not the kind of proposition that could provide a rule for mathematical construction. The *a priori* principle that every alteration in time has a cause does not allow us to represent *a priori* any particular causal law. As applied to experience as an interconnected system of spatial objects, however, the Analogies do have a constitutive role, for the possibility of a

[31] Proleg. 4:295.
[32] A664/B692.

connected whole of empirical cognitions presupposes exactly the kind of relational principle whose formal conditions they express.

The Analogies, thus, have a dual character, and their expression as 'constitutive' or 'regulative' depends on their role with respect to the cognition of singular appearances as opposed to the connected experience of a world. Yet, this dual character should not in the least call into question their status as transcendental principles, in the strictest sense of that term. They are transcendental in Kant's core sense of the term in virtue of having to do with conditions for our conceptual or discursive handle on empirical objects. The designation of a principle as constitutive or regulative changes in relation to the context of cognition. In individuating objects in sense perception, certain *a priori* principles count as constitutive and others as regulative; with respect to the form of all experience, principles of the understanding that were regulative become constitutive. These terms, in other words, do not have absolute senses but only relative ones. Equating being transcendental with being object-constituting, and then restricting it to principles of the understanding, is at best misleading and at worst false.[33]

4. Reason and understanding

Just as sensibility forms the object of the understanding's legitimate activity, reason, the source of potentially illusory ideas, directs itself to the understanding as its object: "The

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[33] The corollary, that 'transcendental' and 'regulative' are mutually exclusive designations, is a widely held and equally misleading opinion; Henry Allison, *Kant's Transcendental Idealism: An Interpretation and Defense* (New Haven: Yale University Press, 2004), 424, notes this fact about the literature.

understanding constitutes an object for reason, just as sensibility does for the understanding."[34] In what sense are the acts of the understanding *objects* for reason's ideas?

4.1. Systematicity and the possibility of empirical knowledge

As Kant repeats clearly, notions such as that nature forms a systematic unity, or that there should be a maximal diversity under a minimum of rules in the order of natural kinds, cannot be constitutive with respect to empirical concepts "because for them no corresponding schema of sensibility can be given, and therefore they can have no object *in concreto*."[35] Kant's point is that rational ideas of a system of empirical laws, or of a hierarchy of natural kinds, fail to satisfy the spatial and temporal conditions of application enjoyed by the concepts of cause or substance. Whereas causal models of spatio-temporal objects can be constructed in the imagination (or on a whiteboard, or in a computer program) and tested against empirical data, the Linnaean tree of life, for instance, resists any such procedure. It provides only a second-order classification scheme based on outward resemblances among organisms, not a causal model for testing and predicting their behaviors. Lacking any direct application to spatially localizable and qualitatively determinable objects, these ideas can only be regulative with regard to experience. Any relation of reason to an empirical object must be indirect; it could only obtain insofar as reason could influence and govern the first order conceptual operations

[34] A654/B682.
[35] A664/B692.

on sensible objects. In this latter employment, though, Kant ascribes to the principle of systematicity a profound function indeed:

> For the law of reason to seek unity is necessary, since without it we would have no reason, and without that, no coherent use of the understanding, and, lacking that, no sufficient mark of empirical truth; thus in regard to the latter we simply have to presuppose the systematic unity of nature as objectively valid and necessary.[36]

This passage requires unpacking. But first, it must be borne in mind that, for Kant, the demand for systematic unity in experience such that a coherent (*zusammenhängend*) and maximally unified worldview is rendered, is simply the essence of reason. To curb that demand would be contrary to the nature of reason, which, Kant assumes, serves some good and beneficial function and is not just a repository of illusions.[37] Indeed, the Appendix as a whole begins with a blunt assertion of confidence in the goodness of our natural cognitive endowments: “Everything grounded in the nature of our powers must be purposive and consistent with their correct use, if only we can guard against a certain misunderstanding and find out their proper direction.”[38] The maxim, for one thing, just expresses the central orientation of Kant’s project of critique: to determine the boundaries and limits of the mind’s capacities. The fact that human reason finds itself naturally in possession of certain acts indicates to Kant the presence of a use proper to them, even if

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[36] A651/B679.
[37] A669/B697.
[38] A642-3/B670-1.

they frequently lead us astray. Nothing natural to the human mind can be wholly a source of error.

It is easy to dismiss this commitment as a mere historical relic distorting Kant's thought, a prejudice of his age rather than a principled philosophical thesis.[39] The old Aristotelian doctrine of the normativity of the natural is indeed a common inheritance of early modern German philosophy, preserved in manuals of metaphysics from Christoph Scheibler and Johann Scharf through Christian Wolff and Alexander Baumgarten. This thesis also appears implicitly and explicitly across Kant's corpus. In particular, it underwrites Kant's assumption at the beginning of the Appendix that whatever exists by nature is good and purposeful. Any being that is a source of truth, or that could become a genuine object of cognition, has desirability or goodness in some measure. Since the ideas of reason are natural to the human mind, they must have some beneficial use.

But one cannot straightforwardly charge Kant with having assumed the thesis unreflectively. Kant's invocation of the view that whatever exists by nature is purposeful and good across a variety of texts in his corpus suggests that he might not be a mere victim of philosophical tradition but an active participant in it.[40] In these contexts, an

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[39] W.H. Walsh, *Kant's Criticism of Metaphysics* (Edinburgh: Edinburgh University Press, 1975), 173, levels this charge against Kant's claim that whatever is natural must have a proper function.

[40] The first proposition of Kant's *Idea for a Universal History with Cosmopolitan Intent* states a version of the Aristotelian dictum that "nature does nothing in vain" (8:18). In the *Conjectural Beginning of Human History,* Kant identifies all that issues from nature as good (being the work of God), in contrast to that which has its source in freedom as evil (being the work of human beings) (8:115). In the *Only Possible Proof*, from his precritical period, Kant dwells on the question of the goodness of the natural at length,

important distinction emerges between formal and material senses of the term ‘nature’. Whereas Kant typically glosses material nature as “the sum total of all appearances (*natura materialiter spectata*),”[41] he frequently contrasts the notion with one of nature considered formally (*formaliter*) as the “connection of determinations of a thing in accordance with an inner principle of causality.”[42] It is in this sense, Kant writes, that we speak of the nature of fluid matter or of the nature of fire as internal sources of a substance’s characteristic activities. Nature considered formally draws close to the notion of nature or essence as it had been understood in the scholastic Aristotelian tradition, as an active power governed by internal conditions of proper function. For some effect to be natural in the formal sense, Kant explains in “The End of All Things” (1794), is precisely for it to “[follow] necessarily according to laws of a certain order of whatever sort, hence also the moral order (hence not always the physical order).”[43] And in the A-edition Transcendental Deduction, Kant makes an equivalence between nature and order as part of a dramatic claim about the active contribution of the subject in producing experience: “we ourselves bring into the appearances that order and regularity in them that we call nature.”[44] The natural, for Kant, is not opposed to the non-material or non-physical, but to the arbitrary or non-lawful. It is this adjectival sense which Kant seems to invoke in speaking of the nature of our cognitive powers as purposive and adapted to their proper functions. Not just the understanding and sensibility in virtue of their relation to empirical

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and argues that “the course of nature is good in virtue of the fact that that which issues from it is good” (EmBg 2:109).

41 B163.

42 A418/B446; Proleg. 4:295-6.

43 8:334n.

44 A125.

objects, but also reason with its characteristic acts has its own proper nature and conditions of lawful operation. Without doing violence to Kant's framework, we cannot dismiss out of hand his assumption that reason and its ideas are just as much part of a natural, rule-governed order as empirically real objects such as trees or planets.

With the assumption that rational ideas must have some beneficial employment, Kant now argues that, were reason to be negated, there could be no coherent use of the understanding, and *consequently* no criterion for the truth or falsity of empirical cognitions. In other words, the first-order task of constructing a world of material objects about which judgments of truth and falsity could be made depends on a higher-order legislation that those objects conform to a systematic hierarchy of forms. The criteria for the truth of empirical judgments consist at least in part in their coherence as a system, and not just on the correspondence of particular cognitions with their objects. For this reason, Kant supplements his oft-repeated definition of truth as "the agreement of cognition with its object"[45] with a coherence criterion as necessary (but not sufficient) for empirical truth, such that we must presuppose the systematic unity of material nature as objectively valid and necessary.[46] Thus, Kant insists at the start of the paragraph of which the

[45] e.g. A58/B82; A157/B197; A642/B670.
[46] Cf. Proleg. 4:290: "The difference between truth and dream, however, is not decided through the quality of the representations that are referred to objects, for they are the same in both, but through their connection according to the rules that determine the connection of representations in the concept of an object, and how far they can or cannot stand together in one experience." As Michael Friedman, "Causal Laws and the Foundations of Natural Science," in *Cambridge Companion to Kant,* ed. Paul Guyer (Cambridge: Cambridge University Press, 1992), 189, points out, however, systematic form or coherence alone is insufficient to ground the necessity of laws to which scientific knowledge aspires, though he doesn't say what more needs to be added. Andrew Chignell, "Modal Motivations for Noumenal Ignorance: Knowledge, Cognition, and

previous, block-quoted passage is the conclusion that "it cannot even be seen how there could be a logical principle of rational unity among rules unless a transcendental principle is presupposed."[47] Logical principles, in Kant's usage, only recommend a procedure for dealing with concepts without making claims about what is in fact the case in the world. By tying the formally correct use of the principle of systematicity to a claim about the world, Kant implicates reason's idea of a determinate natural order and hierarchy as belonging to the necessary conditions of experience. If the understanding's formal classifications of empirical laws and concepts is not to be an empty play, we must suppose that the rational directive by which it engages in such theorizing tracks a feature of the order of nature itself.

The principle of systematicity, moreover, is transcendental in a deeper sense, for Kant uncovers the "transcendental presupposition" of systematicity in the logical capacity for organizing concepts in genera and species such that the division of concepts allows a diversity of kinds in an underlying unity. The principle of genera requires that a common conceptual form discoverable by human cognition be presupposed among the manifold variability of empirical content; without this principle, there would be no basis for judgments of similarity between two concepts. In the same way, the principle of species grounds the possibility of dividing concepts on the basis of differences to yield subspecies. As is the case with the principle of the systematic unity of nature, Kant

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Coherence," *Kant-Studien* 105, no. 4 (2014), 593, proposes to include positive coherence among the constraints on Kant's analysis of knowledge: "To know a proposition involves not just having foundationalist-style probabilistic grounds for it and being able to cite those grounds; one also has to be able to *prove* that the possibility of the objects it refers to positively coheres with the rest of our general picture of the world."

[47] A650/B678.

claims that the principles of homogeneity and specification, although merely logical, nevertheless must have some purchase over the order of nature.[48] For if it were possible for nature to be so disordered or variable as to exclude stable similarities and differences in its forms altogether, then even "the logical law of genera would not obtain at all, no concept of a genus, nor any other universal concept, indeed no understanding at all would obtain, since it is the understanding that has to do with such concepts."[49] Equally grave is the declaration that, "we have an understanding only under the presupposition of varieties in nature, just as we have one only under the condition that nature's objects have in themselves a sameness of kind."[50]

Interpreting these passages in their early modern context, we can see Kant as being concerned to establish the possibility of real natural kinds, even if our epistemic limitations preclude ever arriving once and for all at final criteria for class (or species) membership. In this respect Kant stands in agreement with Leibniz, and in opposition to a Lockean rejection of the reality of natural kinds in favor of conventional or pragmatic classifications of nature's forms. For even if the infinite complexity of material formations places their inner constitution out of our reach, the possibility of progress in understanding nature—and Kant certainly regards the historical movement of, say, cosmological thought from Copernicus to Newton, or the reduction of all chemical salts to two basic categories of alkalis and acids, as progress—requires giving assent to

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[48] A654/B682; A656/B684.

[49] A654/B682. Kant expresses a similar thought on behalf of what he calls "principles of harmony" (*principia convenientiae*) in the *Inaugural Dissertation* of 1770: "*if we abandoned them* [principles of harmony]*, our understanding would scarcely be able to make any judgments about a given object at all*" (ID 2:418).

[50] A657/B685.

rational principles which, strictly, go beyond the field of possible experience. To think the possibility of real natural kinds, the principles of homogeneity and specification have to be regarded as transcendental; that is, they must be valid not just for subjective convenience but for an intersubjective world of objects itself. In the case of chemical analysis, Kant observes that, contrary to first appearances, the reduction of kinds to two basic categories is not “merely a device of reason for achieving economy.” Instead, he distinguishes the “selfish aim” of convenience from “the idea, in accordance with which everyone presupposes that this unity of reason conforms to nature itself; and here reason does not beg but commands.”[51] In striving to know nature, we seek unity not for the sake of subjective convenience, but because it ranks as a rule for the possibility of experience.

This thought appears more forcefully in the Architectonic of Pure Reason chapter of the first *Critique’s* Doctrine of Method. There, Kant argues that in order for a body of knowledge to constitute genuine science, its cognitions must be regarded as an articulated whole rather than a heap or a rhapsody. Architectonic unity, unlike a “technical unity” in service of merely contingent aims, can never arise empirically but only through a rational organizing principle, a *focus imaginarius*, which provides a scheme for the formal division of a whole into its parts.[52] Just as rays of light converge at an imaginary point lying behind the surface of the mirror to produce a coherent image, a scientific picture of nature requires a unifying principle beyond the data of experience. Ideas of reason that could bring such coherence to knowledge, however, implicitly presuppose that the order expressed in the ideal system actually obtains in nature, or is objectively valid for

[51] A653/B681.
[52] A833/B861.

appearances, and not simply a taxonomic aid. Put another way, when we take into account the full resources of the cognitive faculties, concepts of empirical objects could, and should, be interpreted as tracking a real taxonomy of natural kinds. In this sense, the principles of species and genera are non-optional presuppositions of any body of knowledge that aspires to the status of a science.

Finally, even without the desideratum of grounding a real hierarchy of natural kinds, Kant regards the principles of reason as transcendental in a still deeper sense, namely, as *a priori* conditions of any use of the understanding as a faculty of concepts. In this respect, the transcendental status of the principles of reason rests in the mere consideration of the notion of a concept and its sphere. Concepts are universals, and the very form of a universal representation is constituted by the logical notions of genus and species, for these are presupposed in the act of identifying similarities and differences between concepts. On this line of thought, Kant's entire project of articulating the structure and activity of the understanding requires positing principles of generic and specific divisions in a field of concepts. The aim of knowledge is partly to discover those clusters of properties that mark objects as members of a natural class. Kant's realist commitment to the possibility of objective correspondence between the conceptual and sensible domains, which he aims to shore up with his discussion of reason's legitimate interest in empirical cognition, has its deep foundations, in keeping with the spirit of critique, in the organized structure of the cognitive faculties themselves. Kant's picture of the mind is not one in which empirical perception and cognition could operate in isolation from ideas of order, unity, or harmony. Rather, just as the capacities of the understanding would remain unactualized in the absence of sense experience, they would be exercised in vain without direction from the progressive interests of reason.[53]

With their role in making possible any conceptual cognition whatsoever, reason's ideas seem to be implicated globally, and not just limited to the higher reaches of theoretical natural science. In fact, Kant suggests that the ideas of genera, species, and continuity figure even in everyday judgments about medium-sized objects in the Introduction to the *Critique of the Power of Judgment.* He writes:

> To be sure, we no longer detect any noticeable pleasure in the comprehensibility of nature and the unity of its division into genera and species, by means of which alone empirical concepts are possible through which we cognize it in its particular laws; but it must certainly have been there in its time, and only because the most common experience would not be possible without it has it gradually become mixed up with mere cognition and is no longer specially noticed.[54]

We aren't struck by cognition of instances of long-established knowledge because these have become part of common experience. Certain sorts of empirical unities have become transparent to us, in the way that written and spoken words in natural language are

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[53] Reinhard Brandt, "The Deductions in the Critique of Judgment: Comments on Hampshire and Horstmann," in *Kant's Transcendental Deductions*, ed. Eckart Förster (Stanford: Stanford University Press, 1989), 179, nicely sums up the situation: "without concepts, intuitions remain blind; without ideas, concepts are incoherent and useless." There is a suggestion here of an organical model of the cognitive faculties, such that the operation of each is in certain respects for the sake of the others. Breitenbach, *Analogie,* 85, develops this idea in more detail, noting that Kant presents reason "as an organized unity, whose parts are reciprocally dependent on one another and are to be understood only in relation to the whole."

[54] KU 5:187.

transparent to fluent readers and speakers. Just as we don't have to attend to linguistic signs in order to immediately grasp the meanings they convey, we don't take special notice of well-confirmed judgments about nature. But the psychological fact that I don't notice the presupposition of a divisibility of nature into distinct kinds of object does not undercut the conceptual demand that these are requisites for the possibility of empirical cognition. Objective judgment about tables and chairs, for Kant, involves rational ideas just as much as judgments about the unity of the laws of planetary motion.

This brings us to the next stage in the puzzle of transcendental ideas. Since reason has no direct relation to sensibility, and Kant has taught that objectively valid cognition of nature is restricted to appearances in space and time, in what sense do the ideas of reason make claims to knowledge of nature at all? With what right, that is to say, does the principle of the systematic unity of nature stake its claim on empirical cognition?

4.2. "Objective but indeterminate validity"

Kant introduces the locution "objective, but indeterminate validity" to express the sense in which ideas of reason have a legitimate use as necessary conditions of empirical cognition even while lacking sensible instances. To understand this claim requires attending further to Kant's conception of the relation between reason and understanding.

As we have seen, Kant writes that "the understanding constitutes an object for reason just as sensibility does for the understanding."[55] The manner in which the understanding is an object for reason is analogous to the way in which sensibility is an object for the understanding. Just as the proper function of the understanding consists in determining the conditions under which sensory data yield objects for cognition, the task of reason is to institute order among the concepts of the understanding. The crucial difference between the two consists in the circumstance that, whereas sensible schemata—procedures for the exemplification or construction of empirical objects in time—can be formulated for the pure concepts of 'cause' or 'substance', they are lacking for the ideas of reason. Were such procedures not to obtain in the former case, the validity of the concepts of the understanding would remain unsettled; one would not be able to judge at all whether the categories legitimately apply to the sensory manifold, thus with what right those concepts make claims about the character of appearances. In a structurally similar way, according to Kant, reason requires some intermediary which could play the role of a schema for it to exercise its proper function with respect to the understanding. But the nature of empirical cognition does not furnish a ground for such a schema. We do not possess a spatialized, mechanical or mathematical procedure by which we could classify concepts *a priori* in a system of kinds. Nothing in the field of empirical objects indicates a thoroughgoing hierarchy of natural kinds among them, or a guarantee of continuity in the transitions between their forms. The best that is available to reason to mediate its relation to the understanding, Kant writes, is "an analogue of such a schema… which is the idea of a maximum of division and unification of the

[55] A664/B692.

understanding's cognition in one principle."[56] This analogue of a schema, while not contributing to the constitution of any empirical object, which would require its possible exemplification in intuition, nevertheless establishes a relation of reason to the understanding with respect to the latter's dealings with objects. Specifically, the analogue imposes a condition that dictates the procedure to be followed in the organization of experience, namely, to seek that classification of empirical concepts which yields the maximum diversity of species under one principle. Unlike a rule for classifying a sensory presentation under a concept, however, as when I judge a certain appearance to be a tree, this rational procedure prescribes a projected unity, an idealized unity of laws or concepts that exceeds the bounds of empirical data.

Accordingly, one might reasonably wonder why a mere procedure for classifying concepts should somehow apply to the objects themselves. Once again, Kant's restrictions on the limits of possible knowledge appear to be under attack with the interference of a speculative urge to peer beyond the horizons of observable and measurable phenomena. One way to read Kant's discussion of the "analogue of a schema" alongside the Analytic of Concepts and Principles in a way that would maintain a clear separation between reason and empirically conditioned understanding would be to divide the epistemological process in two stages. In the first stage, sensory data would be worked up into empirical concepts through a rule-governed synthesis. Then in the second stage, the systematization of those already constituted empirical concepts would proceed according to maxims of economy and diversity. Thus, while the first stage would

[56] A665/B693.

properly be ‘objective’, inasmuch as it would track sensory presentations, the second stage would properly be deemed ‘subjective’, since it would lack a direct connection to empirically real objects.

Such a two-stage model does not seem to be what Kant has in mind. Far from being applied *post hoc* to the concepts of the understanding, Kant construes his rational principles as immanently guiding the operations of the understanding. The ideas of reason are not imposed upon the understanding from without, as it were, but play a necessary role in the production of experience by providing formal guidance at all times in empirical synthesis.[57] In fact, Kant already suggests as much in the Postulates section of the Analytic of Principles, where he identifies four scholastic principles of harmony or convenience as *a priori* laws of nature: “Nothing happens through a mere accident” (*in mundo non datur casus*); “No necessity in nature is blind, but is rather conditioned, consequently comprehensible necessity” (*in mundo non datur fatum*); “there are no leaps in the series of appearances” (*in mundo non datur saltus*); “there is no gap or cleft between two appearances” (*in mundo non datur hiatus*).[58] The last two, in fact, are expressions of the principle of continuity, which results from combining the laws of

[57] Michelle Grier, *Kant’s Doctrine of Transcendental Illusion* (Cambridge: Cambridge University Press, 2001), 277, recognizes this circumstance: “it is clear that this subjective condition of thought is, as it were, “always already” presented to us in its objective form.”
[58] A228-9/B280-2. Kant had identified a slightly different list of such *principia convenientiae* already in the *Inaugural Dissertation* (2:418). In the third *Critique*, they are relocated to the *a priori* principle of purposiveness in the faculty of judgment: “All of the stock formulae: nature takes the shortest route – she does nothing in vain – she makes no leaps in the manifold of forms (*continuum formarum*) – she is rich in species but sparing with genera, etc. – are nothing other than this very same transcendental expression of the power of judgment in establishing a principle for experience as a system and hence for its own needs” (EE 20:210).

genera and species, and immanently constrain empirical cognition. Already in the Analytic, Kant thus acknowledges the role of such optimality principles in the operation of the understanding with respect to appearances: "they are all united simply in this, that they do not permit anything in empirical synthesis that could violate or infringe the understanding and the continuous connection of all appearances, i.e., the unity of its concepts."[59] The discussion in the Appendix, in other words, merely resumes this thesis concerning the legitimate activity of reason in the production of empirical knowledge.

Now, Kant illustrates the immanent, guiding function of the ideas of reason through the use of the law of continuity in an actual progression in the history of early modern science: that of the refinement of the model of planetary orbits from a circular model in Copernicus to an elliptical one in Kepler and Newton. Kant tells us that the principle of affinity (*Verwandtschaft*), or the continuity of the manifold arising from uniting the principles of species and genera, "concerns not merely the things, but even more the mere properties and powers of things."[60] The principle of continuity governs, according to Kant, the search for causal properties which sustain empirical laws. But in this searching function, the principle does not generate a unique law. Rather, it guides the construction of a series of possible empirical laws differentiated in such a way as to yield the densest possible order among them. It is this presupposition that Kant finds at work in the historical movement of astronomical theory by which the model of circular planetary orbits was superseded by a model of elliptical orbits for planets, parabolic paths for comets, and, perhaps in the future, might lead to hyperbolic paths for yet undiscovered

[59] A229/B282.
[60] A662/B690.

objects. The adjustment from circular to elliptical orbits required a "correction of experience" (*Berichtigung*), by taking into account variation in the data that defied the accepted circular model. But this correction did not take place arbitrarily. Rather:

> if, e.g., the course of the planets is given to us as circular through a still not fully corrected experience, and we find variations, then we suppose these variations to consist in an orbit that can deviate from the circle through each of an infinity of intermediate degrees according to constant laws; i.e., we suppose that the movements of the planets that are not a circle will more or less approximate to its properties, and then we come upon the ellipse.[61]

Kant's point is that a coherent, rather than an aimless or arbitrary, correction of experience has to be such as to be guided by principles, in this case the law of continuity. There would be no contradiction were someone, in Kepler's situation, to try to fit the data into a triangular, or hexagonal, or any other model of planetary orbits. But the proper procedure for adjusting experience follows the principle that the manifold be divided continuously to yield infinite grades of intermediate forms, a successively varying set of candidate empirical laws in which to fit the data.

This procedure, prescribed by reason to the understanding, cannot be conceived as entirely disconnected from first-order conceptual operations on sensory data. For the correction of experience cannot be a mere manipulation of concepts in the understanding without regard to empirical evidence. Rather, since it must accord with the legitimate

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[61] A662/B690.

conditions of concept application, that is, it must be restricted to spatio-temporal conditions, such correction must have a basis in sensibility. In the example of Kepler's hypothesis of ellipses, the law of continuity guides the understanding in replacing, through continuous modification, the circular construction of planetary orbits with an elliptical construction, in order to extend knowledge by bringing more observations into the system of experience. The principle of continuity places constraints on the possible ways in which the understanding can synthesize data in order to account for discrepancies. While reason does not have a constitutive role in empirical synthesis, insofar as the law of continuity does not determine any specific construction, it nevertheless plays a regulative and at the same time necessary role in that process by setting formal constraints on the construct to be sought. Reason's principles apply to objects of experience as regulative, transcendental principles, though they only do so indirectly by providing necessary conditions for the correct use of the understanding. It is for this reason that Kant attributes to the law of continuity, and the laws of genera and species unified in it, "objective, but indeterminate validity". They are non-empirical principles that are nevertheless indispensable for the coherence of our epistemic practices.

In fact, this role for the ideas of reason in the activity of the understanding is anticipated at the start of the Transcendental Dialectic. It is not just added as an afterthought, as its exposition in an appendix might suggest. In the general introduction to the discussion of the ideas or concepts of pure reason, Kant writes: "They are not arbitrarily invented, but given as problems by the nature of reason itself, and hence they relate necessarily to the entire use of the understanding."[62] Likewise, commenting on the positive epistemic function of rational principles in the *Prolegomena*, Kant writes that these "determine the order of nature *a priori*, or rather determine the understanding *a priori*." The equivocation is significant. Rational ideas determine, or are legislative for, nature by way of determining how the sensibly conditioned understanding gives rise to nature. For, Kant continues,

> just as nature does not in itself inhere in the appearances or in their source, sensibility, but is found only in the relation of sensibility to the understanding, so too, a thoroughgoing unity in the use of this understanding, for the sake of a unified possible experience (in a system), can belong to the understanding only in relation to reason, hence experience, too, be indirectly subject to the legislation of reason.[63]

Despite Kant's extensive critique of the transcendent use that has been made of the ideas of reason in traditional cosmology, psychology, and theology, he nonetheless retains a commitment to their necessary, positive function in the field of natural knowledge.

Nature, in its widest signification as both material and formal, arises from a unity of the sensible (material) and conceptual (formal) elements. The latter, however, involves greater complexity than can be found in the pure and empirical concepts of the undestanding. It also includes the necessary, yet non-empirical ideas of reason and these,

[62] A327/B384.
[63] Proleg. 4:364.

too, have a constitutive interest in how we construct nature. It is worth returning in full to a passage partially quoted above:

> 'Nature' taken adjectivally (*formaliter*) signifies the connection of determinations of a thing in accordance with an inner principle of causality. Conversely, by 'nature' taken substantively (*materialiter*) is understood the sum total of appearances insofar as these are in thoroughgoing connection through an inner principle of causality. In the first sense one speaks of the "nature" of fluid matter, of fire, etc., and employs this word adjectivally; conversely, if one talks about the "things of nature," then one has in mind a subsisting whole.[64]

Formally, nature signifies an internal, rule-governed principle of change; fire, for instance, has the nature of heating. It is also in this sense that Kant speaks of the nature of the understanding, reason, imagination or any other mental capacity. Considered materially, nature is the sum total of rule-governed appearances. In its material aspect, nature is that which is available for observation. It is essentially phenomenon or spectacle: that which can be seen. Nature in this sense, as the sum total of appearances, is often identified as Kant's meaning of 'nature' *simpliciter*.[65] But nature in the full sense, for Kant, emerges from a unity of the material and formal, the sensual and the conceptual, aspects. One of the crucial functions of rational speculation about nature's deep structure is precisely to advance such unification by bringing partial knowledge into a larger

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[64] A418/B446.

[65] R.G. Collingwood, *The Idea of History* (Oxford: Clarendon, 1993), 97, remarks on Kant's view of history, for instance: "If history is a spectacle, it is a phenomenon; if a phenomenon, it is nature, because nature, for Kant, is an epistemological term and means things seen as a spectacle."

intellectual framework. And, on account of that very function, it must also be shielded from being, as it were, a slave to sensibility. Collapsing sense content into the intellect would be idealism; the other road leads to materialism. Kant's revolution demands rethinking nature, or reality, as a normative whole at least partially accessible to the norms of human reason, because nature is partly a product of human reason. Nature as a rationally produced hylomorphic unity must therefore be approached from the standpoint of human nature which lends philosophical inquiry its new meaning of *teleologia rationis humanae*.

5. Reason, organisms, machines

In the penultimate chapter of the first *Critique*, The Architectonic of Pure Reason, Kant reaffirms the view that the contributions of the cognitive faculties aim at the production of a system of knowledge rather than a disconnected rhapsody, in order to advance the human mind's own essential ends. Kant's explication of this thought bears the image of a purposive unity, or a contingent unity of parts in accordance with an idea. The idea of a broad scope scientific theory which projects a rational unity of not only past but also future experiences, such as Newtonian physics or evolution by natural selection, for Kant, prescribes a normative ideal that "contains the end and the form of the whole that is congruent with it." In any body of knowledge that aspires to science, thus one which is not to rest as a mere assortment of useful regularities but wishes to be a system under principles, each of the parts ought to be related to the others. Here Kant famously uses the metaphor of an organism:

> the whole [i.e. body of knowledge] is therefore articulated (*articulatio*) and not heaped together (*coacervatio*); it can to be sure, grow internally but not externally, like an animal body, whose growth does not add a limb but rather makes each limb stronger and fitter for its end without any alteration of proportion.[66]

This thought is present, in fact, not just at the conclusion of the book but also in its Preface:

> pure speculative reason is, in respect of principles of cognition, a unity entirely separate and subsisting for itself, in which, as in an organized body, every part exists for the sake of all the others as all the others exist for its sake, and no principle can be taken with certainty in one relation unless it has at the same time been investigated in its thoroughgoing relation to the entire use of pure reason.[67]

The essential end of the mind in its theoretical employment, according to Kant, is to grow and flourish in a way structurally analogous to an organic body guided always by its internal needs. The mind takes in content from the world, as an animal acquires nutrition, for the sake of enlarging, preserving, and reproducing its own, internal form. As reason, the end for the sake of which the mental faculties operate is the fulfillment of its demand for completeness in knowledge and correctness in action, just as an animal seeks its

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[66] A833/B860.
[67] Bxxiii.

sensible goods and a plant its nutritive goods. Kant's analogy between mind and organism is a compelling one. It also illustrates the essential use of analogical reasoning in the critical project as "a study of our inner nature" and of rational or philosophical psychology in particular as "an anthropology of inner sense, i.e. knowledge of our thinking self in life."[68] Since the finite, rational subject cannot go behind its own appearances to intuit its inner nature, the "I, or He, or It (the thing), which thinks," its self-reflection must employ analogies and inductions from careful descriptions and analyses of its powers and capacities.[69]

Kant's exercise in descriptive philosophical psychology can be seen as an exercise in descriptive metaphysics, specifically, as a metaphysics derived from reflection on the nature of the human mind. In *Metaphysical Foundations of Natural Science* (1786), Kant remarks that, "all true metaphysics is drawn from the essence of the faculty of thinking [*Denkungsvermögen*] itself."[70] As a philosophical account of the human being, it may also be treated as philosophical anthropology, "a doctrine of the knowledge of the human being," or what "a free-acting being makes of himself, or can and should make of himself" by setting his or her own theoretical and moral ends. Kant distinguishes this project from a merely physiological anthropology which would be "an investigation of what *nature* makes of the human being."[71] Kant's foundational project, thus, turns

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[68] A703/B731; KU 5:461. Kant's rational psychology is restricted in scope. It can never become "pneumatology as an informative science." Nevertheless, it serves an important function, for through it, we are "secured against the danger of lapsing into materialism."
[69] Cf. KprV 5:6: "the strange though incontestable assertion of the speculative *Critique, that even the thinking subject is* in inner intuition *a mere appearance to itself.*"
[70] MAN 4:472.
[71] Anthro. 7:119.

toward what can be known in experience of human nature, and in particular of the human mind as the source and site of natural experience. It is a descriptive enterprise, rooted in an analysis of the capacities which makes certain kinds of ordinary and scientific experience possible. For this task, Kant directs attention to the psychological capacities underlying experience.

To be sure, mere empirical description cannot confirm or justify metaphysical theses in the philosophy of mind, such as those concerning the simplicity, personality, or immortality of the soul which he criticizes in the Paralogisms of Pure Reason. As is well-known, in the *Critique of Pure Reason* Kant trenchantly criticizes treating empirical psychology as a metaphysical discipline. Empirical psychology could at best be a "physiology of inner sense, which would perhaps explain the appearances of inner sense," but could never account for the properties of psychological phenomena.[72] Kant warns against allowing psychology to intrude upon the domain of transcendental logic, or conflating empirical claims about characteristic patterns of human behavior with normative claims about the conditions for knowledge. But his cautionary notes distinguishing psychology and logic are not claims about the impossibility of any psychological knowledge whatsoever. Rather, Kant highlights a distinction between logic as a purely formal domain and psychology as directed toward the mind as available for introspection.[73] Kant's philosophical strategy in the critical period can be seen as one of

[72] A347/B405. Cf. A847/B875, where Kant calls to banish the Wolffian discipline of empirical psychology from metaphysics.
[73] See Thomas Sturm, "Kant on Empirical Psychology: How Not to Investigate the Human Mind," in *Kant and the Sciences,* ed. Eric Watkins, 163–84 (New York: Oxford

identifying normative conditions for empirical notions of psychological capacities current in the eighteenth century.[74]

The positive results of Kant's critique of the cognitive faculties presuppose the introspectability of the mind. As minds, as we shall see, human beings are not observable merely as psychological beings but also as living agents in a world of things. Empirical psychology, in the Wolffian sense, should be replaced by anthropology, insofar as the latter, as Kant remarks in one his lectures, is not just a description of the human being but "a description of human nature."[75] Kant intends here to emphasize the status of human subjects as natural beings, thus as embodied yet still rational agents. As such, we may speak instead of anthropological description as serving an ancillary function for a Kantian metaphysics drawn from the essence of cognition. In this respect, in fact, Kant's use of anthropology closely matches Wolff's use of empirical psychology as a propaedeutic to

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University Press, 2000), for the eighteenth-century practices which are and are not the targets of Kant's various restrictions on psychology.

[74] Such an approach to Kant's epistemology and psychology is endorsed by, among others, Kurt Burchardt, *Kants Psychologie im Verhältnis zur transzendentaler Methode* (Berlin, 1911); Vladimir Satura, *Kants Erkenntnispsychologie* (Bonn: Bouvier, 1971); Gary Hatfield, *The Natural and the Normative: Theories of Spatial Perception from Kant to Helmholtz* (Cambridge, MA: MIT Press, 1990); Patricia Kitcher, *Kant's Transcendental Psychology* (Oxford: Oxford University Press, 1990); Andrew Brook, *Kant and the Mind* (New York: Cambridge University Press, 1994); and Antonino Falduto, *The Faculties of the Human Mind and the Case of Moral Feeling in Kant's Philosophy.* Berlin: De Gruyter, 2014). Gary Hatfield, "Empirical, Rational, and Transcendental Psychology: Psychology as Science and as Philosophy," in *The Cambridge Companion to Kant,* ed. Paul Guyer (Cambridge: Cambridge University Press, 1992), 216, writes: "For the purpose of reading and interpreting Kant, and for many other purposes, we are well advised to distinguish between treating reflection on ordinary experience as a minimal starting point for philosophy and adopting an empirical approach when formulating and confirming explanatory theses in philosophy. Kant argued that his Critical Philosophy could not take the latter approach; he took the legitimacy of the former for granted."

[75] *Anthropologie Friedländer* 25:471.

the special metaphysical sciences of cosmology, rational psychology, and natural theology. Properly applied to experience, anthropological (one might even say, phenomenological) description contributes to the elaboration of a true metaphysics, however limited it may be as the foundation for the special theoretical and practical sciences. While philosophical psychology or transcendental anthropology cannot speculatively pronounce on the substantiality or the numerical identity of the human soul, it nonetheless serves as an orienting point for any legitimate inquiry; that is, for any inquiry which respects what Kant describes in a telling phrase as the "humanity of the sciences" [*humanitaet der Wissenschaften*]. That is, legitimate or worthwhile science in Kant's new conception of philosophy as a teleology of human reason should have one eye on the logic of the science and the other on the point of view of human beings.[76]

As it appears in inner experience, the mind exhibits a functional structure. In general, functionalism about the mind holds that a mental state—a pain, a belief, or a wish—are best understood as, or even identical to, the function it performs or the role it plays in a psychological system. For someone to be in a state of pain just is for that person to be in a state that is typically the result of bodily damage, is accompanied by distress, a belief that something's wrong, and a desire to get out of that state. Functionalist conceptions of the mind have a long history. Aristotle describes the soul as the form of a natural, organized body in virtue of which such a body is able to perform (among others) sensitive and cognitive functions. A distinctive feature of the Aristotelian variety consists in its connection to the goal-directed character of natural, organic bodies.

[76] R 903 15:395.

Creatures like trees, cats, and humans have bodily organizations which embed functions that are by nature for the good of these creatures. Each natural, organized body is a purposefully organized system of functions that enables it to flourish—grow, find food, and build houses.[77]

In the wake of increased attention to information and computing theory in the mid-twentieth century, however, recent functionalist theories of mind have been inspired more by mechanical and computational analogies than by organic ones. Hilary Putnam's machine state functionalism, for instance, conceives the functional descriptions of mental states as the states of a Turing machine, a giant digital computer instantiating a set of instructions that determine (absolutely or probabilistically) the state the system will transition into given its previous states (recorded in its machine table) and current inputs.[78] Whereas Putnam remains neutral on the realizers of mental functions, David Lewis attempts to make functional specifications amenable to a physicalist view of the mind: functional descriptions of mental states, as of pain above, should be realizable by processes fully characterizable in the language of physics alone just as the physical parts of a bike lock realize capacities that can secure a bike from theft.[79] The image of the mind as a physical computer—of neurons encoding decision algorithms fed by information from the environment, brains telling their users what to eat or buy, and canny marketers

[77] *De anima* 412a27-412b9.
[78] Hilary Putnam, "Minds and Machines," in *Journal of Symbolic Logic,* ed. Sidney Hook, 57–80 (New York: New York University Press, 1960); "Psychological Predicates," in *Art, Mind, and Religion,* ed. W.H. Capitan and D.D. Merrill, 37–48 (London: C. Tinling, 1967).
[79] David Lewis, "An Argument for the Identity Theory," *Journal of Philosophy* 63, no. 1 (1966): 17–25.

purportedly targeting neuronal activity patterns of consumers—is pervasive in contemporary life. Unlike the old Aristotelians, modern functionalists are wary of grounding functional descriptions in internal causal powers or goal-directed agencies, whether of brain matter or of computer programs.

Kant's functionalist psychology draws closer to Aristotle. For Kant, the mind is a structure of internally goal-directed, normative powers or functions. In studying the cognitive faculties, Kant treats the human mind as a natural kind, consequently, as a conceptual structure constituted by a definite set of capacities standing in determinate relations. The description of the essence of the mind is the project of Kant's critical philosophy, insofar as it is understood as philosophical psychology. The mind has an essence, even if, given our limited standpoint, we must remain in doubt about the certainty of our knowledge of ourselves. And it has a nature, which appears in inner experience in the formal character of its essential acts.

Such interpretations are not without precedent in the secondary literature. Vladimir Satura, Patricia Kitcher, Gary Hatfield, and Andrew Brook have developed functionalist readings of Kant's theories of perception and cognition.[80] Brook, for example, interprets Kant's philosophy of mind as broadly functionalist inasmuch as, for Kant, "to model the mind is to model what it does and can do, its functions ('the mind is what the brain does')."[81] Here, I wish to extend this vein of scholarship by embedding Kant's account of mental function in his account of organic structure. Kant's view of the

[80] Satura, *Erkenntnispsychologie*; Kitcher, *Transcendental Psychology*; Hatfield, *Natural and the Normative*; Brook, *Kant and the Mind*.
[81] Brook, *Kant and the Mind*, 12.

mind, I propose, draws closer to a classically Aristotelian picture than has been recognized, and is more distant from its modern, computationalist and analytic cousins.[82] Kant's cognitive faculties exemplify an organic structure in very much the sense Kant himself elaborates this in his discussion of what he calls "natural ends," or organisms, in the *Critique of the Power of Judgment*. This implies that the various faculties of the mind—understanding, sensibility, reason, judgment, feeling of pleasure and displeasure, which are responsible for psychological episodes of conception, perception, desire, or affect—are reciprocal causes and effects of their form and existence. Kant's analysis of a natural organized being such as a tree as being a special kind of system applies just as much to his characterizations of the faculties of the mind. In order to have the analogy in view, we need to understand Kant's distinction between organisms and machines.

According to Kant, for something to be an organism,

> it is required that its parts reciprocally produce each other, as far as both their form and their combination is concerned, and thus produce a whole out of their own causality, the concept of which, conversely, is in turn the cause… of it in accordance with a principle.[83]

In this passage Kant summarizes the three necessary and jointly sufficient conditions for something to be what he variously calls an organized being (*organisiertes Wesen*) or natural end (*Naturzweck*). These conditions are: 1) that its parts must reciprocally

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[82] Brook and Kitcher express their admiration that Kant held views so close to the state of philosophical wisdom two hundred years hence; Brook, op. cit.; Kitcher, *Transcendental Psychology*, 111-112. I want to suggest that this is misleading.
[83] KU 5:373.

produce each other; 2) that the parts must produce the whole out of their own causality; and 3) that this causality must be governed by a concept of the whole.

In the first place, the parts of an organized being must produce each other with respect to their form and combination. In Kant's stock example of a tree, the roots, stems, and leaves produce one another insofar as the continued activity of each depends on that of the others. Without the roots drawing up nutrients from the soil, leaves would not grow. Conversely, without the activity of the leaves in producing sugars and carbohydrates, neither the stem nor the roots could survive—repeated defoliation would eventually kill the tree. Stated more abstractly, organic parts are reciprocally connected inasmuch as each part supplies a partial condition on the activity of the other parts. The activity of the roots is conditioned by the requirement to supply certain kinds and proportions of nutrient needed by other parts of the plant. Conversely, the productive capacities of the leaves are limited by the physiological activities and limitations of the roots. Specifying the form of any part of an organism necessarily involves specifying the forms of other parts to which it stands in functional connection.

Functional specification alone, however, does not sufficiently distinguish tree-parts from the parts of a mechanical device such as a watch or a bike lock. Just as in an organic system, a wheel in a watch is set up in such a way as to communicate motion to other wheels and levers. The shapes and motor functions of any part of a watch can only be specified, as in the case of organic bodies, with reference to its fit with other part.

What distinguishes an organism from a mechanical device, according to Kant, is the second condition, that the parts of the former but not the latter produce and sustain the whole individual "out of their own causality." Unlike a watch in which the functional specification of each part is due to the causal agency of a watchmaker, the specification of tree parts is not explicable through the agency of an external designer. At least insofar as a tree is to be regarded as a *natural* system, thus explicable without recourse to non-natural sources, its structure and function cannot be attributed to a tree-maker as the form of a watch is attributable to a watchmaker. As Kant puts it, in a mechanical instrument, "one part is certainly present for the sake of the other but not because of it."[84] In a leaf, by contrast, the productive cause of its own form, and the partial cause of the forms of roots and stems, in virtue of systemic limits and conditions the leaf places, resides in its own matter rather than outside it. The crucial difference between an organism and an artifact is that,

> An organized being is thus not a mere machine, for that has only a motive power, while the organized being possesses in itself a formative power, and indeed one that it communicates to the matter.[85]

Consequently, trees and cats but not watches and bike locks have the ability to take in raw material from their environment and transform it into useable cells and tissue for their own growth and maintenance.[86]

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[84] KU 5:374.
[85] KU 5:374.

Finally, the internal, reciprocal causality of each part of an organism has the further condition of being governed by an idea of the whole system. Again, an ideal cause is required for the production of a watch just as much as a tree. But whereas the design for a watch lies in the mind of the watchmaker who uses her plan to construct a device whose parts need only determine one another with respect to the universal laws of motion, an analogous plan for an organic system must be contained or programmed, as it were, in each of the parts themselves. Consequently, in order for the tree to be a *natural* organized being, its roots, leaves, and stem must themselves have the capacity for something like a plan or idea of the whole tree of which they are parts. In other words, tree-parts must be able to represent a form and act accordingly. That nature gives us an indication of this feature of organic parts is confirmed, Kant thinks, in the fact that the leaf of a tree grafted onto the trunk of a different species continues to grow according to its own kind rather than taking on the form of its host. The form of a species, thus, appears to be present in the leaf itself instead of being communicated to it from a separate

[86] The behavior of organisms but not of machines displays the activity of something akin to a formative power, an internal, vital force that drives an individual organism toward its species-specific goals. Kant borrows the term *Bildungstrieb* from his contemporary, Johann Friedrich Blumenbach, to designate this force. Unlike Blumenbach, however, Kant recommends accepting such a principle as a useful placeholder for whatever such a force is in itself, an "inscrutable principle of an original organization" that Kant does not believe we are in a position to know (KU 5:424). See Robert J. Richards, "Kant and Blumenbach on the *Bildungstrieb*: A Historical Misunderstanding," *Studies in History and Philosophy of Biological and Biomedical Sciences* 31, no. 1 (2000): 11–32; and Ina Goy, "Kant on Formative Power," in *Lebenswelt: Aesthetics and Philosophy of Experience,* 26–49, 2012. doi:10.13130/2240-9599/2658, for Kant's relation to Blumenbach, and his appraisal of Blumenbach's theory of the *Bildungstrieb*. Goy, in particular, presents a strong interpretation on which "formative power is a fundamental, immaterial, intrinsic natural power in the organized being" (26). I am in sympathy with her view, but note that Kant would have remained uncomfortable with affirming such a statement.

tree-soul, which would stand to the parts of a tree as a pilot in a ship. For something to be a naturally organized being, for Kant, each of its parts must be internally end-directed by one and the same idea of the whole.

Organisms, thus, have a special kind of unity. A mere collection of spatially and temporally connected things, such as all the objects in a room, or all the pieces of matter in the universe, possesses only ontological unity. Such a collection is judged to belong to a single unit in virtue of the parts standing in spatial, temporal, and counterfactual relations. The sofa stands to the right of the bookcase. Were the bookcase to be moved to the other wall, the table would have to be moved as well. The objects in the room stand ontologically unified insofar as they inhere in a single subject which could minimally consist in a definite, spatio-temporal region. Should one ask, however, why the objects occupy their particular locations and relations in this subject, a mere unity of spatio-temporal connection would be unsatisfactory. Instead, one would have to appeal to the purposes or ideas guiding the placement of those objects. Organic or purposive unity, for Kant, is a special kind of ontological unity, namely, one which implies a relation of the connection of parts through a concept or idea rather than by a simple logical relation of inherence in a subject. A unity of ends, Kant writes, "throughout implies relation to a cause that has understanding," so that,

> even if all these things were united in a simple subject, still no relation to an end would be exhibited unless one conceives of them, first, as internal effects of the substance, as a cause, and, second, of the latter as a cause through its understanding. Without these formal conditions, all unity is mere natural

> necessity, and if it is nevertheless ascribed to things that we represent as external to one another, blind necessity.[87]

What the appeal to understanding grounds is the basis for an explanation of why a multitude of things exhibits one particular unified form rather than another. Reference to an intelligent cause of a unity of diverse parts makes possible appeal to a representation of ends, of why the parts are unified in a certain way. Without a power of representation, or the power to regard a unity from a perspective or point of view, and thus with a certain interest, a unity of parts could only be deemed as resulting from necessity, for example, as a collection of objects in geometrical relations in a bounded space. We explain the purposive unity of the parts of a watch by reference to the intentions of the watchmaker. And we explain the arrangement of objects in a room, typically, by reference to the interests and wishes of its owner. Unless the unity of an organism is to be explained in the same way by reference to an external designer—God, evolution, or Spinoza's *natura naturans*—or, still less helpfully as the the product of chance or blind necessity, Kant contends that such beings have to be conceived as internally directed beings. They are *naturally* purposive beings as opposed to artificially purposive beings.[88]

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[87] KU 5:393-4. Kant's distinction here between merely ontological unity and purposive unity occurs in the context of a criticism of "Spinozism," which fails to explain the fact of order in nature. As Kant understands Spinozism, the position "wants to provide a basis for the explanation of the connection of ends (which is does not deny) in the things of nature, and names merely the unity of the subject in which they all inhere." That is, Spinozism achieves only the unity of all things in God or Nature, but cannot explain why nature is unified in this particular way and not another.

[88] Appeal to chance, for Kant, is less worthy than appeal to design, for it effectively abandons its claim to explain nature. The design view, at least, provides heuristic guidance for research, even if it doesn't lead to ultimate explanations of the origins of

Purposive unity requires a particular kind of causal connection, traditionally understood as one of final causes. Kant construes the difference between the Aristotelian categories of efficient and final causes in terms of two kinds of serial order. A connection according to efficient causes always produces a descending series exhibiting a unidirectional order of causality—the effect must follow the cause and cannot be the cause of an event or thing prior in time. A descending causal series alone is sufficient to generate an ontological unity, as when items can be added one by one to fill up a certain space in a certain amount of time to yield a collection. Inferences from chains of efficient causes have a logical counterpart in the inferential function of reason. Logically, a descending series of inferences is one in which conclusions are drawn from premises, whether inductively (from a finite set of observations to a generalized conclusion), or deductively (from a major and a minor premise with a common middle term). Reasoning about the efficient causes of bodies exhibits the familiar structure of induction and deduction.

By contrast, a final causal connection involves what Kant calls an ascending as well as a descending connection. Logically, what distinguishes the ascending series is the circumstance that a conclusion is given for which the premises remain to be discovered. It requires searching for the necessary and sufficient set of conditions which would make a conclusion true. What is peculiar about this procedure is that we already need to have some motive or reason to assent to the conclusion, even in the absence of determining grounds from which it can be safely inferred. It would only be rational for me to search

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natural functions. The Epicurean solution, in brief, is too wildly speculative to be taken seriously; see KU 5:393.

for premises that would allow me to infer a proposition (say, ‘it is wrong to torture babies’; or ‘nothing happens without a cause’) were I already inclined to hold it for true. This motive could reside in a brute conviction about the value of some moral principle. But such a motive also arises from a presumed value of the unity of knowledge. Even in the absence of decisive (but not complete lack of) reasons or evidence for an empirical statement, for instance, provisionally accepting it as true directs inquiry in a specific direction. We try to connect the hypothesis with suitable reasons in our existing intellectual framework and look for new evidence in certain domains of phenomena rather than others. When conclusions are given problematically, as is typically the case in empirical research, as Kant recognizes, the inferential procedure followed by reason,

> seeks to bring the greatest manifold of cognition of the understanding to the smallest number of principles (universal conditions), and thereby to effect the highest unity of that manifold.[89]

In its ascending function, reason strives to bring a logical unity of ends. But it is one and the same function which also participates in judging the physical world of experience as governed by causal conditions. In judging pieces of furniture in a room as comprising a purposive unity, we judge the items not only as standing in serial connection of spatio-temporal order but also as organized according to a plan already present or dimly emerging in the mind of their owner. Likewise, in judging the heart as carrying out a definite function in the characteristic activity of an organism, we judge not only that a

[89] A304-5/B361. Kant’s main discussion of the contrast between ascending and descending series of syllogisms is at A331-2/B338-9.

certain structure and arrangement of matter causes it to pump blood but also that this happens for the sake of a systemic end. Physiological research aims, with the use of reason's ascending function, to describe as completely as possible the set of conditions which ground the function of any organic part. In the same way, cosmological research invariably strives toward completeness and coherence in our knowledge of the universe as a whole, even if we can never affirm certain propositions about its eternality, its divisibility, or the impossibility of freedom in a system of deterministic laws.[90] In each of these cases, a spatio-temporally localizable, descending connection of efficient causes is at the same time guided by an anticipated, ideal, ascending connection presumed to result from an end. For Kant, the characteristic property of an organized being is precisely the circumstance that "the connection of efficient causes [in it] could at the same time be judged as an effect through final causes."[91] A natural organized being is one in which such a harmony of efficient and final causes arises internally, rather than being imposed from without. Plant, animal, and human bodies are the main candidates for inclusion in this class, for these kinds of being at least seem to have goods of their own, such as self-maintenance, reproduction in kind and, perhaps, sensory pleasures.

Kant is reluctant to affirm apodictically that the universe has a good, just as he is to affirm that organisms and their parts have a good; his contention that we must regard nature only *as if* it existed for a purpose, or have resulted from a highest intelligence,

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[90] I.e., those specific propositions which Kant identifies in the cosmological antinomies in the Transcendental Dialectic.
[91] KU 5:373.

results from this reluctance.[92] The good of rational agents such as humans, meanwhile, is a moral one of becoming worthy of happiness, and its conditions are radically separate from corporeal goods such as the maintenance and growth of an organic body, or the production of offspring. What he does affirm, though, is that each kind of judgment must be recognized as an expression of reason's purposes, as an activity which belongs to the good of reason itself. Whether in claims about everyday human behaviors of arranging furniture, the operations of the parts of animals, or about the physical structure of the universe writ large, judgment expresses the essential ends of reason, a teleology of human reason.[93]

With this picture of Kant's concept of a natural organized being in view, we can turn to the analogy between material organisms and the mind.

6. The purposive unity of the cognitive faculties

The critical-philosophical value of Kant's analysis of the concept of a natural purpose or an organism rests not so much in its contribution to the philosophy of biology but instead

[92] A671/B699; KU 5:404. The "as if" locution gained wide currency with Hans Vaihinger's 1911 *Die Philosophie des Als Ob*.

[93] In this respect, I read Kant's critique of teleology in a similar spirit as Ginsborg. She emphasizes that Kant's theory of purposiveness as a form of judgment is rooted in more general epistemological concerns about the possibility of knowledge of empirical lawfulness, and of rationality in assenting to contingent matters of fact; see, for instance, Hannah Ginsborg, "Kant on Understanding Organisms as Natural Purposes," in *Kant and the Sciences,* ed. Eric Watkins, 231–58 (Oxford: Oxford University Press, 2001) Similarly, McLaughlin, *Critique of Teleology*, stresses that, for Kant's critique of teleological judgment, the deeper problem is not that of the concept of an organism, but a discrepancy in the status of two kinds of explanation, mechanical and teleological, and their respective epistemological claims.

to the philosophy of human nature. Judgments of organicity as well as judgments of beauty exemplify a kind of activity natural to the human mind. But consideration of organisms as beings exhibiting a certain mereological structure of parts depending on wholes does not—and Kant never takes it to—supply arguments for validly affirming any conclusions about individual oaks or swallows, whether that they are in fact natural purposes internally directed toward their good, or even that they are alive. Should we take Kant's analysis to contain an argument, it would be a poor one. It would be guilty of a simple is/ought fallacy by moving from facts about ordinary linguistic practices (that we do employ teleological language to describe plants and animals) to a conclusion that organisms really are as we ordinarily describe or judge them to be. Or it might be merely definitional by stipulatively restricting what natural mechanisms can and cannot achieve (efficient causes cannot produce means-ends relations) and inferring that another kind of principle must be at work which is defined as teleological. Kant rightly does not present his discussion of organisms in §§64-65 of the third *Critique* as an argument but as an analysis of what the concept of an organism amounts to. As such, it is equally available for application to any domain which intimates reciprocal, purposive organization, whether in art, biology, psychology, or even physics. In this section, I shall suggest that Kant's notion of an organism neatly fits his model of the human mind. My goal here is not to explicate at length Kant's theory of the mental faculties but rather to outline it in just enough detail to make visible its organic structure. The next section will then elaborate Kant's account of what distinguishes the mentalistic, human organism from other organized natural forms, namely, its life.

A note before proceeding further. Kant's theory of the cognitive faculties certainly shifted in its details over the course of his career. There are lively interpretive questions about whether, for instance, there is a radical shift in his account of reason from the first to the third *Critiques*. My focus here is not these disputes internal to Kant scholarship. I take the third *Critique,* and in particular its two Introductions and the account of aesthetic judgment to be the most crucial and well-developed accounts of Kant's faculty psychology. To reiterate a point about my interpretive stance, I believe the third *Critique* is best approached as a treatise in philosophical psychology for which the domains of aesthetics and biology provide important resources. Specifically, I suggest in the following that the *Critique of the Power of Judgment* constitutes Kant's most direct attempt to display the purposive nature of the human subject.

Following the eighteenth-century psychological tradition of Wolff, Baumgarten, and Tetens, Kant divides the mind (*Gemüth*) into three basic faculties: the faculties of cognition (*Erkenntnisvermögen*), desire (*Begehrungsvermögen*), and the feeling of pleasure and displeasure (*Gefühl des Lust und Unlust*).[94] Following Baumgarten, Kant recognizes a proper order in which the three faculties occur in psychology, a proper order of scientific consideration if not an ontological order: "Pleasure precedes the faculty of desire, and the cognitive faculty precedes pleasure."[95] For, as we shall see, the cognitive faculty prescribes principles not only to itself as a spontaneous power but also to desire and feeling. The faculty of cognition is subdivided into higher, intellectual, and lower, sensible faculties. The higher are three—understanding, judgment, and reason—while the

[94] EE 20:206; Met. Mrong. 29:877; Letter to Reinhold, December 1787, 10:514-5.
[95] Met. Mrong. 29:877.

lower part includes sensibility, imagination, and memory.[96] The faculty of desire is likewise divided into lower and higher parts: the former is the source of physiological drives like hunger and the avoidance of harm, while the latter is directed by a free, rational will. The faculty of feelings is undifferentiated. It signals pleasure and displeasure in experience regardless of whether the intellectual or the sensible component is dominant. Each of these faculties can be considered either in their empirical-psychological, or their normative-epistemological aspects. In the following, brief sketch, I shall consider both sides together.

Each of the three faculties, Kant maintains, is governed by one of the three powers of the faculty of cognition which specify, or legislate, normative conditions for their use.[97] Thus, the understanding prescribes conditions for the correct use of the faculty of cognition in the form of Kant's table of categories and their associated principles. The understanding, or "the spontaneously purposively active nature,"[98] is the source of the condition on something's being an object of knowledge that it must, for instance, occupy a definite, finite region of space, possess determinable degrees of color saturation, and have a causal history among a community of objects. While a phenomenon's conformity to the understanding's principles alone does not render it intelligible under a concrete empirical concept or law, it does guarantee its meaningfulness. Conformity to these principles ensures that the object is of the right kind

[96] Anthro. 7:182: Memory is "the faculty of visualizing the past intentionally."
[97] EE 20:245.
[98] This gloss is from TP 8:173.

for inclusion in a coherent story of empirical reality. Appearances that fail one or more of these conditions could not legitimately be objective in the strict sense.

The second of the higher cognitive faculties, reason, relates to the faculty of desire. Reason provides normative conditions to the faculty of desire through its principle of freedom which grounds, most importantly, the obligation to act in accordance with the moral law. But reason's interests are not limited to ethical concerns, for, as we have seen, it places demands on knowledge of nature as well. It is for the sake of fulfilling its theoretical and practical interests that reason prescribes normative maxims or subjective principles to the higher, rational faculty of desire, or will. Kant defines the psychological faculty of desire in general in the *Critique of Practical Reason* as the "faculty for being through one's representations the cause of the reality of the objects of these representations."[99] In addition to the exercise of subpersonal drives—such as seeking satisfaction of hunger—this faculty is also controlled by rational legislation to do the right thing—eat salad not pizza—in which case the action must issue from freedom and cognizance of a principle of right action. Once again, it is worth emphasizing that rational desires, those which reason governs, go beyond what we narrowly think of as the 'ethical' to include practical conduct in our activities as epistemic agents such as in the practice of science.

[99] KpV 5:9n. The quote in full is as follows: "Life is the faculty of a being to act in accordance with laws of the faculty of desire. The faculty of desire is a being's faculty to be by means of its representations the cause of the reality of the objects of these representations. Pleasure is the representation of the agreement of an object or of an action with the subjective conditions of life, i.e., with the faculty of the causality of a representation with respect to the reality of its object (or with respect to the determination of the powers of the subject to action in order to produce the object)."

Finally, the third of the higher cognitive faculties, the power of judgment, governs the faculty of the feeling of pleasure and displeasure. Pleasure bears a close connection to the faculty of desire, hence, to reason. In connection with the definition of desire above, Kant writes that: "Pleasure is the representation of the agreement of an object or of an action with the subjective conditions of life."[100] That is, the attainment of any aim—whether the finding of food or the reaching of a scientific breakthrough—results in a feeling of pleasure insofar as it is the realization of an end or an aim. Pleasure, we might say, signals the satisfaction of an end, just as displeasure signals its frustration. Such ends are either subpersonal drives or inclinations, or representations of ethical or practical ends guiding actions in the everyday lives of parents or scientists. Ends, as the objects of desires, have a direct relationship to reason and, where these are judged as practically binding, are internally rather than externally prescribed ends.[101]

The possibility of judging that a subjective end has been or could be satisfied in nature, thus in this life, for Kant, presupposes the possibility of nature being suitable for the attainment of certain human ends. Consequently, judgment has an interest both in the understanding's concept of nature and in reason's concept of freedom in acting in nature. The principle of the power of judgment, that nature should be approached as if it were adequate to the satisfaction of human interests, thus mediates between the internal ends of the faculties of cognition and desire. For the power of judgment, unlike understanding

[100] KpV 5:9n.
[101] E.g. TP 8:182: "*Ends* have a direct relationship to *reason*, be it foreign reason or our own. Yet, even in order to place them in foreign reason, we must presuppose our own reason at least as an analogue to the latter, since those ends cannot be represented at all without such an analogy."

and reason, relates “only to the subject and does not produce any concepts of objects.”[102] In legislating for the feeling of pleasure and displeasure the power of judgment prescibes, in the broadest terms, satisfaction in the experience of harmony and order, of the suitability of one thing for another, and, in brief, of purposive unity in diversity. As a result, whereas sensible pleasure consists in the satisfaction of physiological desires such as hunger, the formal (or transcendental) ground of pleasure, as a capacity of the mind, consists in the agreement among the diverse ends of the faculties. The cognitive goal of having a stable objective world in view turns out to harmonize with the practical goal of meeting subjective ends. Accordingly, the principle of purposiveness—stated counterfactually, that nature cannot be such as to frustrate our ends—first comes to light in the subjective experience of natural beauty, in a “consciousness of the merely formal purposiveness in the play of the cognitive powers.”[103] It originates neither in the experience of artistic production, nor in that of organisms, for each of those cases involves the relation of reason or understanding to an external object. Rather, artistic and biological works are occasions for discovering in the human mind the model for judgments of purposive forms. The analysis of purposiveness in nature reveals that the cognitive faculties harmonize in an experience of an object as formally purposive, thus as the product of reason and intention, yet without the consciousness of a rational agent and thus as nature.[104]

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[102] EE 20:208.
[103] KU 5:222.
[104] EE 20:206-9.

This outline of Kant's picture of the mental powers embeds the conceptual conditions he identifies for organisms. In the first place, understanding, reason, and judgment are mutually implicated in one another's productivity. As shown earlier in this chapter, Kant illustrates an important instance of such mutual dependence in the Appendix to the Transcendental Dialectic. To reiterate, Kant argues that the faculty of reason, traditionally conceived as the capacity to draw inferences, makes possible the use of the understanding, traditionally conceived as the capacity to form concepts. The understanding's ability to use data gathered from experience to form general concepts such as 'tree,' to further subdivide that concept into 'oak,' 'willow,' and 'eucalyptus,' or to include it under a wider concept such as 'organism,' presupposes the power to make inferences on the basis of conceptual divisions. The understanding cannot legislate for itself a division of nature into a hierarchy of kinds, because no amount of experience with trees alone could justify a belief that the arboreal world is truly carved up into oaks, willows, and eucalyptuses. Such an idea originates in a rational desire for determinate order among concepts, in order that reason could carry out its proper function of instituting greater completeness in knowledge through inferences. Reason, as argued earlier, provides a constitutive condition on understanding in order to perform its own proper function of ordering knowledge. Conversely, the understanding alone is that which presents reason with conceptual content which is subject to reason's demands. In Kant's picture of our knowledge of nature, we already find a reciprocal dependence between sensibility, reason, and understanding.

Similarly, Kant's account of aesthetic judgment requires the spontaneous, free play of the imagination and understanding. It is constitutive of aesthetic judgment, for Kant, that imagination be constrained by the transcendental conditions for the application of concepts to appearances yet without being determined by any specific concept; or, what amounts to the same thing, that the imagination is bound by general rules, but not any specific, empirical rule. That is, aesthetic experience arises when the imagination is subject to the understanding's concept of nature but at the same time allowed free rein to transpose spatio-temporal and causal forms not presented in experience. As Rudolf Makkreel explains the situation, in the free play of the faculties, the imagination schematizes the pure concepts of the understanding without the involvement of any empirical concepts. In judging a flower as beautiful, the imagination recognizes the object as part of nature, yet, qua beautiful form, not as subject to any empirical rules of formation. Instead, reflection upon such experience of formal beauty elicits the idea of a purposive arrangement, or a design according to ends, thus the involvement of reason. It is in this free play of the cognitive faculties, where, as briefly alluded to earlier, we also uncover the distinctive, normative operation of the faculty of judgment in mediating the interests of the various powers of the mind. It is what makes possible, for Kant, the communicability of aesthetic experience. For we can dispute rationally about matters of taste even though we lack a rule for determinately judging such matters.[105]

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[105] KU §9 5:217ff. "Now there belongs to a representation by which an object is given, in order for there to be cognition of it in general, *imagination* for the composition of the manifold of intuition and *understanding* for the unity of the concept that unifies the representations. This state of a *free play* of the faculties of cognition with a representation through which an object is given must be able to be universally communicated, because

The foregoing examples from Kant's analysis of cognitive and aesthetic judgment also satisfy his second condition for organicity: that the parts have an internal principle of activity. While the cognitive faculties are connected in relations of mutual dependence, they nevertheless produce theoretical and practical activity in human life through the exercise of their internal powers. Our image of nature results not just from sensible data alone, or from the concepts of the understanding alone, nor from reason's speculations about the cosmos, nor still from the reflecting power of judgment but from the coordinated activity of all the faculties. At the same time, each of these capacities function on the basis of internal norms: to localize data in space and time, to categorize these in general concepts, and to institute completeness among concepts of empirical objects. In the successful production of a stable representation of a causal event, each faculty operates in accordance with its own, internal form. Thus, in ordinary experience of a stable world of objects, "we do not encounter the least effect on the feeling of pleasure in us nor can encounter it, because [for instance] here the understanding proceeds unintentionally, in accordance with its nature."[106] Yet, by proceeding "unintentionally," that is, according to its internal rules for applying categorial schemata to sensible data rather than by externally-given rules, the understanding contributes necessary conditions for constituting experience as a causal and spatio-temporal order. The further, reflective judgment on experience which selects certain features of empirical

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cognition, as a determination of the object with which given representations (in whatever subject it may be) should agree, is the only kind of representation that is valid for everyone." See Rudolf A. Makkreel, *Imagination and Interpretation in Kant* (Chicago: University of Chicago Press, 1990), 49-58; and Ginsborg, "Aesthetic and Biological Purposiveness," for further discussion of the free play thesis.

[106] KU 5:187.

objects in order to describe them using particular empirical laws properly follows its own principle.[107] A more-or-less determinate picture of nature emerges from the coordinated activity of each of the distinct, normative, cognitive functions.

Finally, for Kant, the faculties are directed toward their internal ends—knowledge of nature, satisfaction of desire, avoidance of pain and pursuit of pleasure—in the larger, systemic pursuit of the good life, thus by an idea of the whole, healthy human being as integrated end.[108] Recall that, in the final chapter of the first *Critique*, The Architectonic of Pure Reason, Kant tells us that the contributions of the cognitive faculties aim to produce a system of knowledge according to an idea in service of the mind's own ends. In the same way, the experience of pleasure is not disconnected from either cognition of nature or the satisfaction of desires. For in ordinary life, scientific work, or the activity of producing and appraising artworks, the fundamental good resulting from a harmony of the cognitive faculties is the stability of experience and the preservation of forms that underwrite the possibility of communication among rational subjects. Pleasure in general, for Kant, is the "consciousness of the causality of a representation with respect to the state of the subject, *for maintaining* it in that state."[109] That is, the deep source of the feeling of pleasure in the human nature arises from humanity's capacity to institute a formal order in experience, or to maintain a stable representation of a world as governed by norms and values to which we have freely given assent. Once again, Kant's theory of the free play of the faculties is not merely an insight about aesthetic experience but rather

[107] EE 20:220.
[108] To echo Suárez's gloss on the human being as *finis integer* (DM 23 2.5.).
[109] KU 5:220.

represents a fundamental condition of human nature in virtue of which it expresses itself in characteristic ways.

7. Mind, life, and biology

I have suggested that Kant's psychological theory in general, and most notably in the third *Critique*, should be read as an account of the human being as a purposive, organic unity. By reflecting on forms in nature that express purposiveness, or the involvement of ends, we are led to discover purposive unity within the powers of the mind. But do Kant's texts license us to go further, and assert, for instance, that the mind is a simple, unified goal-directed substance, as with Leibniz or Wolff? Or, if pressed, should Kant concede the old Aristotelian formula that the mind/soul is the form of a natural organized body as an essence which imparts to a body a certain form in virtue of which it is able to act in characteristic, self-directed ways? More generally, does the analogy between non-human and human organisms warrant attributing to plants and animals a mind or soul? Kant's answer to the last question is clearly negative. On the issue of the hylomorphic unity of the human subject, Kant is more equivocal.

As on many matters of special metaphysics, Kant would vehemently reject any assertion that non-human organisms are hylomorphic substances: it is *impossible* for there even to be a Newton of a blade of grass, to know with complete certitude the formal and material principles constituting a natural organism as a unity. It is more generally impossible to judge categorically any instance of organization in nature as due to a purpose, hence an intention, including of the cosmos as a whole:

> Thus we cannot make any objective judgment at all, whether affirmative or negative, about the proposition that there is an intentionally acting being as a world-cause (hence as an author) at the basis of what we rightly call natural ends; only this much is certain, namely, that if we are to judge at least in accordance with what it is granted to us to understand through our own nature (in accordance with the conditions and limits of our reason), we absolutely cannot base the possibility of those natural ends on anything except an intelligent being."[110]

From the human point of view, judgments of plants and animals as purposive beings remains necessarily problematic. Indeed, it must remain something beyond the bounds of knowledge since we can never go behind the appearance of organization in an oak or a swallow and come to know what kind of life, if any, it has. At the same time, Kant also insists that we can confidently judge contingent order in nature on an analogy with the conditions of human nature and its intentional productions. It turns out that the gap between the certainty in our self-knowledge and knowledge of other beings resembling our behavior in some respects rests in a peculiar feature of human beings which Kant calls 'life'. On the one hand, we should distinguish non-human organisms from artifacts, for, "[o]ne says far too little about nature and its capacity in organized products if one calls this an analogue of art." On the other, we are not entitled to declare plants and animals as actually directed by internally represented ends. For in that case, "one must

[110] KU 5:400.

either endow matter as mere matter with a property (hylozoism) that contradicts its essence, or else associate it with an alien principle standing in communion with it (a soul).” That is, we would have to affirm either that oaks and swallows, as material beings, have the power of perception and desire and, hence, the capacity to act for the sake of represented ends; for Kant, the purposive is the realm of representations and intentions. Or, we have to accept that oaks and swallows are metaphysically joined to a separate intelligence which moves their matter as its instrument. The first option contradicts the essence of matter as inert, movable quantity in space, while the second is a plain transgression of the bounds of experience. As a result, Kant evasively suggests only that “one comes closer to this inscrutable property [i.e. of means-ends organization] if one calls it an *analogue of life*.”[111]

Identifying the organic with the living is deeply rooted in everyday language. We recognize a division of research called the ‘life sciences’ as those disciplines which study a broad class of beings we call organisms. Kant, by contrast, marks an important distinction between the concept of an organism and that of life. Not everything that behaves as if it were guided by internal ends is therefore known as something that is alive. The domain of the living, for Kant, can only be identified with a proper subset of the domain of the organic, namely, the class of those beings which have minds. For Kant,

> the mind [*Gemüth*] for itself is entirely life (the principle of life itself), and hindrances or promotions must be sought outside it, though in the human being

[111] KU 5:374-5.

himself, hence in combination with his body.[112]

Mind is a principle that enlivens an organized body and, thereby, constitutes it as a human being.

To be clear, Kant does not deny that the nature of non-human organisms bears striking similarities to human nature. Appearances strongly suggest that plant and animal bodies operate from a principle akin to what we experience in our own agency. In converting raw materials from the environment into usable instruments, or organs, which allow plants and animals to grow and reproduce in species-appropriate ways, as well as in exhibiting plasticity in the use of their organs, they resemble human organisms. But to judge something as life and not just as organic, is to judge it as having "the faculty… to act in accordance with laws of the faculty of desire." The faculty of desire, further, "is a being's faculty to be by means of its representations the cause of the reality of the objects of these representations."[113] But external appearances of material beings do not license inferences about immaterial aspects of their natures such as desires and representations. As objects of outer experience—the only manner of presentation under which oaks and swallows are available to us as knowers—organisms are essentially material beings. But this fact of our relationship to external objects forces us to consider them as being without life. For the essence of matter is inertia, or being movable in space upon the action of external forces. The inertia of matter, as Kant writes in the *Metaphysical Foundations of Natural Science*,

[112] KU 5:278.
[113] KprV 5:9n.

> is, and means, nothing else than its *lifelessness*, as matter in itself. *Life* is the faculty of a *substance* to determine itself to act from an *internal principle,* of a *finite substance* to change, and of a *material substance* [to determine itself] to motion or rest, as change of its state. Now we know no other internal principle in a substance for changing its state except *desiring*, and no other mental activity at all except *thinking*, together with that which depends on it, the *feeling* of pleasure or displeasure, and *desire* or willing.[114]

We experience ourselves as beings acting for the sake of desires, having thoughts about the world as being certain ways, and with a concern to increase pleasures and to avoid pain. Mental capacities such as these ground the possibility of having a point of view, a perspective on the world which generates interest and value. We experience ourselves as having interests from our own standpoint, and it is this feature of experience which Kant identifies as distinctive of life. As perspectival, interested experience, life is not just the capacity for self-maintenance, growth, and reproduction but, further, the source of value for a being. Kant describes the link between life and value in strong terms: "if the world consisted entirely of lifeless beings… then the existence of such a world would have no value at all, because there would exist in it no being that has the slightest concept of a value."[115]

For all we know, other kinds of organized being might similarly have formal (non-material) powers which might ground their legitimate interests in having the world

[114] MAN 4:544.
[115] KU 5:449.

be certain ways. But since, to us, non-human organisms are only available as material beings, we are not in an epistemic position to affirm that they are animated by the formal principles we know from our own lived experience. We cannot validly affirm that oaks and swallows have categorical interests from which they take themselves to derive value from the world. To reiterate, we can only call the inscrutable principle underlying the apparent, purposive behavior of non-human organisms an analogue of life, not life itself. Leibniz, on the basis of such an analogy, had confidently declared that "all of nature is full of life," progressing in complexity in organized beings from bare sensation to perception to thought. Kant, by contrast, is at pains to distinguish the diminished force with which we are constrained to attribute life to other beings as compared to ourselves.[116]

At the same time, however, it is crucial that we do not affirm the opposite conclusion, that non-human organisms do not have internal purposes. For then we land in a different problem, namely, of having to invent a radically unfamiliar kind of causality. In his 1788 essay, "On the Use of Teleological Principles in Philosophy," Kant makes the case for an intermediate solution between the radical options of, on the one hand, treating non-human organisms as brute machines, and on the other, of treating them as actually

[116] Leibniz, *Principles of Nature and Grace* §1, GP VI 598; AG 207. Kant repeats the identification of life with cognition in his lectures: Met. Mrong. 29:894: "A being is living if its power of representation can be the ground of the actuality of its objects. Life is thus the causality of a representation with respect to the actuality of its objects."; Met. Mrong. 29:894: "A thing lives if it has a faculty to move itself by choice. Life is thus the faculty for acting according to choice or one's desires"; Met. Dohna 28:680 "Life is the faculty for having representations of the faculty of desire." With his qualifications, Kant's position bears greater resemblance to Suárez's, who also is at pains to recognize the distinctive character of first-personal experience of agency while not wanting to deny that other animals might also possess something analogous (DM 23 10.15).

ensouled. To this end, he deploys a familiar argument form of a disjunction with a suppressed premise.

Kant's argument begins by making explicit a naturalistic assumption: "that everything in natural science must be explained naturally."[117] That is, whatever is to be an object of natural science must be conceptualized and investigated in terms of properties attributable on the basis of experience to a finite being. When explanations cannot be confirmed by experience, then one has reached "the boundaries of natural science." It thus excludes appeal to supernatural agency, and even the agency of noumenal moral agents such as human beings. Explanation in natural science is always causal explanation, where a cause in general, for Kant, is a power grounded in a substance that is responsible for producing an effect. Scientific explanation typically progresses in reductive fashion by arriving at more fundamental powers to which a wider range of effects can be attributed. For these explanatory practice to be naturalistic means that the basic powers permitted in explanation not be invented arbitrarily but always inferred from experience of causal relations.[118] From this account of the bounds of natural science, Kant makes the following argument for the sciences of non-human organisms:

> [an organism is] a material being which is possible only through the relation of everything contained in it to each other as end and means (and indeed every anatomist as well as every physiologist actually starts from this concept). Therefore a basic power that is effectuated through an organization has to be

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[117] TP 8:178.

[118] TP 8:180

> thought as a cause effective according to *ends* [*eine nach Zwecken wirkende Ursache*], and this in such a manner that these ends have to be presupposed for the possibility of the effect. But we know such powers, *in terms of their ground of determination* only *in ourselves*, namely in our understanding and will, as a cause of the possibility of certain products that are arranged entirely according to ends, namely that of *works of art*. In us, understanding and will are basic powers, of which the latter, insofar as it is determined by the former, is a faculty to produce something *according to an idea* which is called end.[119]

As organisms, plants and animals have to be understood as the effects of a represented end. In explaining their structure and function, we have to identify causes known to us from experience of causal relations. The suppressed premise in the argument is that there are only two kinds of causal relation known to us from experience: mechanical or efficient causality familiar from experience of collision and impact events, and the causality through freedom familiar from our own rational agency. These two exhaust the possible structures of explanations accessible from experience. Of these, only the latter supplies an experientially-grounded causal power that could be used to explain the purposive behaviors of organisms.

The philosophical project of bringing plants and animals into the scope of natural science faces a dilemma, a dialectical situation between universal mechanism and natural teleology. Either we abandon the world of plants and animals altogether as inaccessible to human knowers. If we can neither conceive of their distinctive, purposive behaviors on

[119] TP 8:181.

the structure of mechanical explanation, nor wish to attribute to them little souls guiding their activities by perception and appetite, we are left with no causal principle in which to ground their effects. Or, we may posit an intelligent being as the intentional cause of organic forms. For Kant, the option of abandoning the sciences we now know as biological is unacceptable. For the disciplines of anatomy and physiology—in which Kant, it is worth highlighting, finds confirmation of his analysis of the concept of an organism—are flourishing enterprises in the eighteenth-century and, in any case, too important to our rational and practical interests. But Kant is equally reluctant to embrace the metaphysical commitments demanded by a vitalist, or hylozoist, concept of organisms. The dilemma arises from the suppressed premise in Kant's argument which limits the choice of possible causal explanation to one between efficient causes and final causes. Efficient causes are not adequate for explaining purposive order, while final causes are only available to us through our experience of ourselves as productive agents. There is no third alternative along the lines of the vitalists' claims about formative, quasi-psychical powers inhering in matter. In wishing to explain the reality of natural ends, vitalists or hylozoists such as Buffon or La Mettrie end up believing "themselves to understand a special kind of causality," namely, of a living matter. But the idea of essentially animated matter is, for Kant, a *contradictio in adjecto*, for matter is essentially inert as the Newtonian consensus in eighteenth-century physics conceives it and for which Kant has offered metaphysical foundations.[120] As Kant continues from the above quoted passage:

[120] Kant's metaphysics of matter as the movable in space are the subject of his 1786

> we may not conceive a new basic power independent of all experience, [which]… would be the case with the basic power that were effective in a being in a purposive manner without having its determining ground in an *idea*.

Kant's analysis of the causal structure of inner and outer experience has resolved the experientially grounded causal powers into two kinds, mechanical and teleological. The former consists of the Newtonian forces of attraction and repulsion, the latter in psychological powers such as imagination, memory, understanding, or desire. Inasmuch as we are committed to the naturalistic principle, we are not entitled to invent non-intentional teleology as a third kind.

In this circumstance, Kant endorses a version of the second horn of the dilemma, namely, to view plant and animal bodies as if they were designed by an intention, as the more preferable of the two options. But this cannot be affirmed unqualifiedly. For, on the one hand, it is obvious that no human has crafted a cow or an oak from pieces of wood or lumps of earth. On the other, appeal to the intentions of a supernatural designer would have the consequence of placing plants and animals outside the boundaries of natural science. Paradoxically, it turns out to be a condition of regarding organisms as natural, thus as legitimate objects for experiential knowledge, that we accept their ineluctably problematic status for human knowers. In order to possess even a partial, limited science of natural organized beings, we are forced to recognize their ultimately elusive nature.

Metaphysical Foundations of Natural Science. The critique of hylozoism, present already in his 1763 *Only Possible Proof*, are repeated in 1790: KU 5:394.

Organic bodies cannot be affirmed as hylomorphic substances, even though that is how we must study them, if we wish to subject them to rational investigation at all.

8. "The thinking self in life"

As intimated earlier, Kant's critical theory of human nature constitutes a kind of limited, descriptive metaphysics which displays the human subject as an integrated, purposively organized natural being. Biological inquiry provides an occasion to reflect on the conditions of possibility for objective purposiveness in external nature. From the work of anatomists and physiologists we are able to conceptualize the kind of physical structure that naturally goal-directed beings appear to have, and thus what must at least partially be true of ourselves as finite, natural beings. But biology is not life, because it cannot account for what we take to be ultimately valuable. Life, in Kant's peculiar usage, can only be studied within the bounds of human experience as an "anthropology of inner sense, i.e. knowledge of our thinking self in life."[121] Since post-scholastic philosophy should become a science of the essential ends of human reason, Kant's critical program emerges as a study of the life of the human subject.

In this project, purposiveness occupies a central position, as the form of judgment that we require in order to engage in living, theoretical and practical activities. While the teleological standpoint does not enjoy the ontological primacy of the categories of experience, it is essential to the rationality of scientific and everyday practice. As a

[121] KU 5:461.

principle structuring human practices of judging, it guides the life of human nature as a part of nature at large considered as a system of rational ends. The teleological standpoint is not a mere heuristic, or an unfortunate tendency toward cognitive error of which we should be vigilant, but that through which experience first acquires meaning. The ends of human reason provide us with our real interest in understanding nature's purpose and value as the condition in which human beings are to achieve their ultimate end of becoming worthy of happiness.

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Catholic Scholasticism

DM	Francisco Suárez. *Disputationes metaphysicae*. in *Opera Omnia*, ed. Charles Berton. Paris: Vives, 1866; reprint Hildesheim: Georg Olms, 1998. (cited by disputation, section, and article)
Comm. Met.	Pedro Fonseca. *Commentariorum… in libros Metaphysicorum Aristotelis*. Lyon, 1585. (cited by book, chapter, question, and article)
In Phys.	Jean Buridan. *Acutissimi philosophi… phisicorum libros Aristotelis.* Paris, 1509. (cited by book, chapter, question, and article)
Phys.	Collegium Conimbricensis [Coimbra]. *Commentaria… super octo libros physicorum Aristotelis*. Lyon, 1602. (cited by book, chapter, question, and article)
PN	Thomas Aquinas. *Principles of Nature,* Translated by R.A. Kocourek, in his *An Introduction to The Philosophy of Nature.* St. Paul: North Central Publishing, 1948. (cited by paragraph)
SM	Thomas Aquinas. *Commentary on Metaphysics*. Translated by John Rowan. Chicago: Regnery, 1964. (cited by paragraph)
S. Phys.	Eustachius á Sancto Paulo. *Tertia pars summae philosophiae: De rebus naturalibus.* In *Summa philosophiae quadripartita*. Paris: Carolum Chastellain, 1614. (By part, tractatus, disputation, and question).
ST	Thomas Aquinas. *Summa theologica*. Translated by Fathers of the English Dominican Province. New York: Benzinger Bros., 1948. (cited by part, question, and article.)

Descartes

AT — *Oeuvres de Descartes.* 2nd ed. 11 vols. Edited by Charles Adam and Paul Tannery. Paris: Vrin, 1964–74. (Cited by volume and page number.)

CSM(K) — *The Philosophical Writings of Descartes,* 3 vols. Edited and translated by John Cottingham, Robert Stoothoff, Dugald Murdoch, and Anthony Kenny. Cambridge: Cambridge University Press, 1984-1991. (Cited by volume and page number)

PP — *Principles of Philosophy*. Translated by Valentine Rodger Miller and Reese P. Miller. Dordrecht: Kluwer, 1982.

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C — *Opuscules et Fragments Inedits de Leibniz: Extraits des Manuscrits de la Bibliotheque Royale de Hanovre.* Edited by Louis Couturat. Paris: Felix Alcan, 1903.

GP — *Die philosophischen Schriften*, 7 vols. Edited by C.I. Gerhardt.

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GM *Leibnizens mathematische Schriften.* Edited by C.I. Gerhardt. Berlin: A. Asher & Comp., 1849. (Cited by series, volume, and page)

L *Philosophical Papers and Letters.* Edited and translated by Leroy E. Loemker. Dordrecht: Kluwer Academic Publishers, 1969.

LDV *The Leibniz-De Volder Correspondence: With Selections from the Correspondence Between Leibniz and Johann Bernoulli.* Edited and translated by Paul Lodge. New Haven: Yale University Press, 2013.

NE *Nouveaux Essais sur L'Entendment par L'Auteur du Systeme de L'Harmonie Preestablie.* In A VI.6 43-527. English edition: *New Essays on Human Understanding*. Edited and translated by Peter Remnant and Jonathan Bennett. Cambridge: Cambridge University Press, 1996.

T *Essais de Theodicee: Sur la Bonte de Dieu, la Liberte de L'Homme et L'Origine du Mal.* In GP VI 21-462. English edition: *Theodicy: Essays on the Goodness of God, the Freedom of Mann, and the Origin of Evil*. Edited by Austin Farrer. Translated by E. M. Huggard. La Salle, Ill.: Open Court, 1985.

WF *Leibniz's 'New System' and Associated Contemporary Texts.* Edited and translated by R.S. Woolhouse and Richard Francks. Oxford: Clarendon Press, 1997.

Wolff (all texts cited by paragraph number unless indicated otherwise)

AN *Ausführliche Nachricht von seinen eigenen Schriften die er in deutscher Sprache herausgegeben.* Frankfurt, 1726.

Anmk. *Anmerckungen über die vernünftigen Gedancken von Gott, der Welt und der Seele des Menschen.* Frankfurt, 1724.

Brf. *Briefe von Christian Wolff aus den Jahren 1719-1753. Ein Beitrag zur Geschichte der Kaiserlichen Academie der Wissenschaften zu St. Petersburg.* In *Christian Wolff: Gesammelte Werke, I. Abt. Bd. 16*. St. Petersburg, 1860, reprint: Hildesheim: Georg Olms, 2010.

Cosm.	*Cosmologia generalis methodo scientifica pertractata, qua ad solidam imprimis Dei atque naturae cognitionem via sternitur*. Frankfurt and Leipzig, 1731.
Disc. prae.	*Preliminary Discourse on Philosophy in General*. [*Discursus praeliminaris de philosophia in genere*] Translated by Richard J. Blackwell. Indianapolis: The Bobbs-Merrill Company, Inc., 1963.
DLog.	*Vernünfftige Gedancken von den Kräfften des menschlichen Verstandes und ihrem richtigen Gebrauche in der Erkäntnis der Wahrheit*. Halle, 1712.
DMet.	*Vernünfftige Gedancken von Gott, der Welt und der Seele des Menschen, auch allen Dingen überhaupt*. Halle, 1751.
DPhys.	*Vernünfftige Gedancken von den Würkungen der Natur*. Halle, 1725.
DPhysio.	*Vernünfftige Gedancken von dem Gebrauche der Theile in Menschen, Thieren und Pflantzen.* Frankfurt, 1737.
DTel.	*Vernünfftige Gedancken von den Absichten der natürlichen Dinge*. Halle, 1741.
Elem. Math.	*Elementa matheseos universae*. 2 vols. Halle, 1713-15.
KS	*Gesammelte kleine philosophische Schriften*. Halle, 1736. (cited by page number)
Log.	*Philosophia rationalis sive Logica, methodo scientifica pertractata, et ad usum scientiarum. atque vitae aptata.* Frankfurt, 1728.
LW	*Briefwechsel zwischen Leibniz und Christian Wolff.* Edited by C.I. Gerhardt. Halle, 1860. (cited by page number)
Melet.	*Meletemata Mathematico-Philosophica.* Halle, 1755.
Ont.	*Philosophia prima sive ontologia methodo scientifica pertractata qua omnis cognitionis humanae principia continentur*. Frankfurt, 1730.
Phil. pract.	*Philosophia practica universalis, methodo scientifica pertractata*. Halle, 1744.

Psy. emp. *Psychologia empirica methodo scientifica pertractata, qua ea quae de anima humana indubia experientiae fide constant, continentur.* Frankfurt and Leipzig, 1732.

Psy. rat. *Psychologia rationalis methodo scientifica pertractata, qua ea, quae de anima humana indubia experientiae fide innotescunt.* Frankfurt and Leipzig, 1734.

Rat. prae. *Ratio prælectionum Wolfianarum.* Halle, 1718. (cited by part, chapter and paragraph number)

Theo. nat. *Theologia naturalis, methodo scientifica pertractata: pars prior.* Verona, 1738.

WeLb *Wolffs eigene Lebensbeschreibung*. Ed. H. Wuttke. Leipzig, 1841. (cited by page)

Kant

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ANg *Universal Natural History and Theory of the Heavens*. 1755.

Anthro. *Anthropology from a Pragmatic Point of View*. 1798.

BL *Blomberg Logik.*

DWL *Dohna-Wundlacken Logik.*

EE *First Introduction* to *Critique of Power of Judgment*. 1790.

EmBg *Only Possible Proof of the Existence of God.* 1763.

ID *Inaugural Dissertation.* 1770.

JL *Jäsche Logik*.

KprV *Critique of Practical Reason.* 1786.

KrV *Critique of Pure Reason.* (cited by A (1781) and B (1787) editions)

KU *Critique of the Power of Judgment.* 1790.

MAN *Metaphysical Foundations of Natural Science.* 1786.

Met. Dohna *Metaphysics Dohna*.

Met. Mrong. *Metaphysics Mrongovius*.

Met. Pölitz *Metaphysics Pölitz.*

MM *Groundwork of the Metaphysics of Morals.* 1785.

Proleg. *Prolegomena to any Future Metaphysics.* 1783.

R *Reflexionen*.

TP "On the Use of Teleological Principles in Philosophy." 1788.

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Ar. ex Eucl. Erhard Weigel. *Analysis Aristotelica ex Euclide restituta.* Jena, 1657.

Diluc. Georg Bernhard Bilfinger. *Dilucidationes philosophicae de Deo, anima humana, mundo, et generalibus rerum affectionibus,* 3rd ed. Tübingen: Johann Georg Cotta, 1746. (cited by section)

Inst. Ludwig Philipp Thümmig. *Institutiones philosophiae Wolfianae*, 2nd ed. Frankfurt and Leipzig: Renger, 1729. (cited by section)

Phil. comp. Christoph Scheibler. *Philosophia compendiosa.* Oxford: Henry Hall, 1657. (*cited by book, chapter, and paragraph*)

Phys. conc.	Johann Christoph Sturm. *Physica conciliatricis*. Nürnberg: Wolfgang Moritz Endter, 1687.
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OO	Johann Clauberg. *Johannis Claubergii Opera omnia philosophica*, 2 vols., edited by Johann Schalbruch. Amsterdam: Blaue, 1691. (cited by volume and page number)
Op. log.	Christoph Scheibler. *Opus logicum*. Marburg, 1634.
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