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Besides “Place and COVID-19,” “Items of interest,” and “citations received,” this issue includes the following items: An “in memoriam” for architect and sacred geometer Keith Critchlow, who died in London in April; A “book note” on philosopher Dermot Moran’s study, Husserl’s Crisis of the European Sciences and Transcendental Phenomenology (2010); A “book note” on philosopher Ingrid Leman Stefanovic’s The Wonder of Water (2020), an edited collection examining how human experience relates to decisions about water; Torontonian Robert Fabian’s update on downtown neighborhood planning in his city (“A New Urban Place”); Philosopher John Russon’s exploration of the lived ambiguity of travelling to a foreign place (“The Border at the Heart of Human Life”); Independent researcher Stephen Wood’s discussion of two contrasting modes of science teaching—what he calls “knowledge-based learning” vs. “understanding-based learning” (“An Understanding-Grounded Approach to Science Education”)’; Science educator Henri Bortoft’s explication of Goethe’s proto-phenomenology of nature as one example of a science of wholeness (originally published as four separate essays in the last four EAP issues and now integrated into one) (“Seeing and Understanding Holistically: Goethean Science and the Wholeness of Nature”).

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This *EAP* completes 31 years and includes "items of interest" and "citations received." Architect and sacred geometer **Keith Critchlow** died in London in April; see an "in memoriam" on p. 4. Note the flower photographs from his last book—*The Hidden Geometry of Flowers* (2011)—right.

We include two "book notes," the first focusing on philosopher **Dermot Moran's** study, *Husserl's Crisis of the European Sciences and Transcendental Phenomenology* (2010). We highlight philosopher **Ingrid Leman Stefanovic's** *The Wonder of Water* (2020), an edited collection examining how human experience relates to decisions about water.

This *EAP* includes four essays. Torontonian **Robert Fabian** provides an update on downtown neighborhood planning in his city. Second, philosopher **John Russon** explores the ambiguity of travelling to a foreign place. Third, independent researcher **Stephen Wood** writes about two contrasting modes of science teaching—what he calls "knowledge-based learning" vs. "understanding-based learning."

Some readers will remember that, in the last four *EAP* issues, we have run a series of essays on Goethean science by the late science educator **Henri Bortoft**. Several readers requested that we integrate the four entries into one, which we have done in this issue. By far this is the longest essay *EAP* has ever run; we are honored to include it because Bortoft's work offers an unusual new manner of understanding, grounded in "authentic wholeness." We thank **Jacqueline Bortoft** for allowing us to include the full essay here.

Right: Photographs from Keith Critchlow's The Hidden Geometry of Flowers *(2011, p. 181). These flowers, representing "five-ness" geometrically, are among the most common of British wildflowers. See the "in memoriam" for Critchlow on p. 4.*

Place and COVID-19

As we continue to be threatened by the pandemic, one wonders whether and how the human relationship with place will change. As phenomenologist Maurice Merleau-Ponty emphasized, intercorporeality—i.e., human bodies together in physical space—is an integral aspect of human being. How this key social need is to be reintegrated via social distancing and voluntary isolation is a difficult question that may or may not find a workable answer.

One of the most astute commentators on COVID-19 is **Andrew Sullivan**, former blogger and columnist for *New York Magazine*. His recent takes on the pandemic have been especially perceptive and, below, we reproduce a portion of the *NYM* column he wrote for Friday, May 15, 2020. Sullivan lives in Washington, D.C.

An accelerating social atomization?

None of us has any solid notion yet of quite how transformative our current plague will be…. But one thing really does seem clear. All the trends in the culture that have led us to withdraw physically from one another, to live in an online space, to replace real life with virtual existence: These shifts have all been artificially accelerated.

The essential socializing mechanisms of school and college, from kindergarten onward, have evaporated overnight. Religious practice, for so long a communal and physical thing, is suspended in midair, the sacraments withheld, the rituals that bind us together as Christians or Jews or Muslims and connect us to the past abandoned.

Workplaces, our other major forum for socialization, have disappeared into thin air, as Zoom meetings proliferate, and we live in a *Brady Bunch* square set onscreen. Public transport that forced us to interact with one another daily continues for essential workers—but in a far more attenuated way for most white-collar and affluent Americans, further dividing classes.

Doctors diagnose through screens; therapists are on speaker phones; friends are on FaceTime and nowhere else. Evolving media technologies that were slowly gaining speed have been suddenly sucked from the future into the present….

The struggle of small, local retail stores, already pummeled by Amazon, gets more intense and doomed each day. And they are not just economic units: They're social ones. They're where we see neighbors and strangers and friends.

The collective human experience of a football or basketball game cannot be replicated in an empty stadium; the comedian cannot bring people together around a joke that ends in silence; the dates we once had—for a play or a movie or a concert—have had to end. In a crisis of loneliness, we have somehow managed to make life lonelier still.

The restaurants that have helped regenerate neighborhoods and sustain new communities are being culled at a terrifying rate. The bars where we flirted; the coffee shops where we worked and chatted; the gyms where we recognized familiar faces: These are all in suspension, underlining modernity's already dehumanizing solitude.

Even family life, which is an essential base for so much of our social activity, can't play the role it should. Packing everyone into the same space all day and night, with no outlet for others, is a recipe for marital failure and family suffocation. The abuse of spouses and children this crisis has enabled will echo into the future.

Extramarital sex has gone completely virtual—an ephemeral series of online flirtations and porn fantasies. We barely even acknowledge one another in supermarkets, our faces masked, our hands in gloves, our distance nervously kept. Social media—the addictive, distractive habit we were trying to get some handle on—is now the only real-time socialization we have. After some success at weaning myself off my phone, I've never spent so much time on it.

This is not so far, it seems to me, a revolutionary moment for change away from our recent past. At least not yet. It's more like a fast-forward of existing trends, a speeding up of social atomization, even as the cultural wreckage remains.

Perhaps this will in turn prompt a reaction and help us restore the human to our world. But humans adjust, and this time we have had to adjust very quickly. The tools we have used to keep going in this era will surely remain in our hands—we will get used to them, and, in turn, we will get attached to them. Insofar as they have made businesses more efficient, or our own lives simpler, they'll stick.

The quiet out there that seemed so shocking only a month ago now seems much more familiar. What we needed, in some ways, for our collective mental health, was a catalyst for greater physical socialization, more human contact, and more meaningful community. What we're getting, I fear, is the opposite.

Items of interest

The editors of ***Phenomenology + Practice*** are producing a special issue entitled "Practices of Phenomenological and Artistic Research." The prospectus reads that the aim is to move "beyond traditional views of the relationships between art and phenomenology by considering both as fields of research, or more specifically, as ways of researching *through* phenomena." The focus is "research practices developed through the influence, combination or even hybridization of phenomenological and artistic approaches." Contacts: info@alex-arteaga.ne; emma.cocker@ntu.ac.uk.

The ***Journal of Civic Architecture*** is a peer-reviewed effort presenting creative work "oriented toward city life." One focus is "creative life in the city, in the everyday world of work and human being…." The journal is published by London's Canalside Press. www.canalsidepress.com.

DOI:

Citations received

Patrick Lynch, 2017. *Civic Ground: Rhythmic Spatiality and the Communicative Movement between Architecture, Sculpture and Site*. London: Artifice Books.

This British architect criticizes the conventional modernist comparison of buildings with sculptures and instead argues for an understanding grounded in "rhythmic spatiality," which situates the designed thing in relation to a shifting physical setting and civic context. This book is complemented by an earlier edited collection entitled *Memesis* (Artifice Books, 2015); this earlier volume include entries by **Lynch**, **Alexandra Stara**, **David Grandorge**, **Peter Carl**, and **Laura Evans**.

James M. Magrini, 2019. Ethical Responses to Nature's Call: Reticent Imperatives. NY: Taylor & Francis.

This philosopher argues "for a renewed view of objects and nature" and "considers how it is possible to understand our ethical duties—in the form of ethical intuitionalism—to nature and the planet by listening to and releasing ourselves over to the call or address of nature."

Tim Patterson & John Buechsenstein, eds., 2018. *Wine and Place: A Terroir Reader*, Berkeley: Univ. of California Press.

In studies of "sense of place," one of the most intriguing and applicable notions is the French *terroir*—the claim that the unique quality of a particular wine is a product of its place qualities, including natural (soil, topography, drainage, weather, and climate) and human aspects (the care of vineyards and the craft of winemakers).

In this edited collection, a winemaker (Patternson) and wine educator (Buechsenstein) assemble a wide-ranging set of readings arguing for and against the reality of *terroir*. The following sidebar includes the opening passage from their introduction.

The earthly link in wine

The notion of *terrior* is at the heart of what makes wine special. No other foodstuff, no other agricultural commodity, grips the human imagination with such immeasurable force as a great wine from a great growing area.

When you taste a great wine, it seems inevitable that a connection exists between those inimitable flavors and the particulars of that place—the soil, the climate, the elevation, the aspect, the parcel's unique position on the hill or in the vale.

No other connection between food and place has inspired as extensive a body of literature as the earthly link in wine. Many agricultural products exhibit some degree of regional and subspecies variation, but since wine involves a dramatic transformation of raw grapes through fermentation, the lingering pedigree of origin is all the more remarkable.

Wine is unique, and *terrior* is the reason. The Greeks and Romans had wine gods; there is no record of any deity responsible for, say, Vidalia onions, tasty as they are (p. 1).

Christopher Tilley, ed., 2019. *London's Urban Landscape: Another Way of Telling.* London: Univ. College London Press.

In the field of anthropology, Christopher Tilley is perhaps the foremost advocate of a phenomenological perspective. The chapters in this volume are said to "stress the significance of place and the built environment to the urban landscape." The emphasis is "phenomenological thinking [that] presents fine-grained ethnographies of the practices of everyday life in London." The ten chapters focus on residential and public places. Entries include: "Change and continuity in a central London street" (**Ilaria Pulini**); "Towards a phenomenology of the concrete megastructure: Space and perception at the Brunswick Centre, London" (**Clare Melhuish**); "Isolation: A walk through a London estate" (**Dave Yates**); "Liminality and the carnivalesque in Smithfield Antiques Market"; "Holland Park: An elite London landscape" (**Christopher Tilley**); and "Observation and selection: Objects and meaning in the Bermondsey Antique Market" (**Dave Yates**).

The following sidebar highlights selections from Tilley's Preface.

Another way of telling

This book aims at least partially, and in an exploratory way, fill two gaps in the literature: (a) the paucity of thick ethnographic description of place in London; and (b) discussion of the material significance of the places forming London's urban landscape in relation to everyday life. Filling them amounts to "another way of telling" about the city, the subtitle of this book….

Each chapter discusses and analyzes a particular place in the city. The places discussed … were chosen to represent a wide a range of different places as was possible in the scope of a short book. The individual discussions range from streets to housing estates to markets and parks, from living on a houseboat to the rhythms of a taxi rank, to the material politics of graffiti and street art (pp. xiii–xiv).

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In Memoriam: Keith Critchlow (1923–2020)

Architect and sacred geometer **Keith Critchlow** died on April 8, 2020, in Kingston-Upon-Thames, London. He was 87 years old and a co-founder of the Temenos Academy, a group focusing on education in philosophy and the arts in the light of Eastern and Western sacred traditions.

Critchlow studied at the Summerhill School and the Royal College of Art. Originally trained as a classical painter, he wrote many books on the lived qualities of geometry, *including Order in Space* (1969), *Islamic Pattern as a Cosmological Art* (1976), *Time Stands Still* (1979), *Islamic Art and Architecture: System of Geometric Design* (1999), and *The Hidden Geometry of Flowers: Living Rhythms Form and Number* (2011; see sidebars below and next page).

Critchlow's professional posts included lectureship at London's Architectural Association School of Architecture and professorship at London's Islamic Art at the Royal College of Art. He founded the School of Visual Islamic and Traditional Arts (VITA) in 1984, which moved from the Royal College of Art to The Prince Charles' Institute of Architecture in 1992–1993, where Critchlow was director of research.

This institute later became the Prince's Foundation, within which the School of Traditional Arts was housed. Critchlow was a professor emeritus at VITA and served as director for research. He also taught at the Prince's Foundation for the Built Environment in London.

Critchlow was an expert in sacred architecture and sacred geometry and founded Kairos, a society which studies and promotes traditional values of art and science. Critchlow's architectural work included the Krishnamurti Study Centre in England; the Lindisfarne Chapel in Crestone, Colorado; and The Sri Sathya Sai Institute of Higher Medical Sciences in Puttaparthi, India.

In his memory, we reprint items from his last major work, *The Hidden Geometry of Flowers* (2011).

—David Seamon

Below: Examples of flowers with nine, ten, eleven, and twenty-one petals: "Names are important but here we wish to focus on other aspects of the flowers" (p. 185).

The hidden geometry of flowers

This book, like the flowers themselves, speaks primarily in the language of images. It also follows a four-layered structure. These can be called points of view. The first looks into the tangible structure of flowers, the second takes account of the social value flowers have for us. The third concerns the symbolic or cultural use of flowers. The fourth celebrates the inspirational effect flowers have on us. All four are integral as well as existing within their own separate contexts.

This is not an 'easy read' book that follows a single flow of reasoning from start to finish. On the contrary, it is composed of insights as well as outsights, focusing on how we regard flowers. It is designed to encourage all who read it to look at flowers in a new way. There are also pauses, during which the reader is encouraged to turn to the nearest flower and contemplate it and hopefully see it anew.

The illustrations are hand-drawn by the author. Geometry can be considered from at least three viewpoints. First, as a technical exercise mostly serving industrialization. Secondly, as a purely mathematical function. Thirdly, and most importantly, as a science of the soul. This has to be performed with the human hand and is fundamental to a deeper understanding of the Platonic wisdom tradition. Geometry is only fully understood by doing it.

None of the ideas here are dogmatic or fixed, but rather an offering for consideration. We have been guided ourselves by the truth of flowers, their beauty and what makes them so important to us—maybe they are also our teachers of the time-honored objective truths of number, geometry, harmony, and wholeness (p. 15).

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On the symmetry of flowers

Symmetry must rank highly as one of the chief mysteries in [life's] impulse for order…. Flowers express a plethora of beautiful symmetries ranging from the twofold to the manifold. The most predominant symmetry, particularly in wildflowers, is fivefold ….

There is more than a single way to measure the geometry of a flower and its petals. Not only does each petal have its own characteristic profile and curvature, but the ensemble of the petals is what we call the flower. This collective geometry includes the total symmetry. [For example, there are] three-petalled flowers such as the Snowdrop, the Tulip, the Iris, and the Lily….

Next, there are some very beautiful fourfold flowers [such as] the Clematis, the Balloon Flower, and the beautifully fragrant Wallflower…. Next, we come to the most frequently occurring symmetry in wildflowers: the fivefold or pentagonal symmetry. The list is impressive and includes the original Dog Rose…, the Buttercup, the Herb Robert, the Periwinkle, Borage, and soon.

Six-ness is found in the Daffodil, whose flowers fuse into its hexagonal shaft. [Critchlow goes on to highlight examples of seven-ness, eight-ness, nine-ness, ten-ness, eleven-ness, twelve-ness, and twenty-one-ness—the last illustrated in the Daisy family] (pp. 173, 174, 177–78, 181).

The importance of geometry

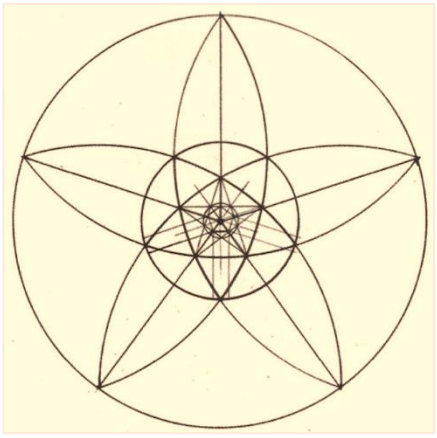
Geometry is a universal, objective language and is the study of the order in space…. This, in turn, brings us to two most fundamental tools for bringing the laws of geometry into experimental consciousness: these are the compasses (or dividers) and the straight edge (or square). They are likely the most ancient and revered of all scientific instruments. They embody actualities that can express "absolutes" symbolically and directly.

These two tools guide the human hand into the realm of objective universality. This is in contrast to what is called "freehand" drawing, which is completely subject to the will and skill of whosoever's hand holds the pen or pencil.

"Freehand" work … is totally relevant to the psyche but is of a different order from expressing and experiencing geometric graphics. The word "participation" was very popular with the later Platonic philosophers such as Proclus, Iamblichus, and Plotinus. This refers to practices—both theoretical and operative—where the human concerned *becomes the instrument* participating in a higher or superior intelligence….

The Pythagoreans, we assume, first posited that education should best be founded in the four unfoldings of number. First, pure number becomes arithmetic; second, number in space is geometry; third, number in time is considered to be music or harmony; fourth, number in space and time becomes astronomy, cosmology, or spherics.

We advocate that all might "participate" in the art/science of geometry… We are under the complete guidance of the movement of the compasses as well as the rigorousness of following the discipline of the straight edge (or ruler). With geometry, we "participate" in the timeless truths of the products of "straightness" or "roundness." Socrates affirmed that geometry was the "art of the ever true" (pp. 291–92).



Image, right, above: Critchlow's drawing of the underlying geometry of the Forget-Me-Not.

Image, right, below, a photograph of one Forget-Me-Not flower with an overlay of its underlying geometry. Critchlow writes: "The geometry of this remarkably proportioned small flower is startling in its conformity to pentagonal symmetry. The centre of this flower is a decagon or ten-pointed white star. The parallel white extension [Critchlow has drawn in three of these parallel black lines in the flower's geometric rendition] can be derived from the central star pentagon" (p.226).

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Book Note

Dermot Moran, 2012. *Husserl's Crisis of the European Sciences and Transcendental Phenomenology* [Cambridge Introductions to Key Philosophical Texts]. Cambridge: Cambridge University Press.

Of all the phenomenological philosophers writing today, Dermot Moran, is one of the most knowledgeable, accessible, and prolific. His *Introduction to Phenomenology* (Moran 2000) is an approachable overview of the history and styles of phenomenology and phenomenologists. His article-length introductions to phenomenology offer direct and understandable venues for newcomers, particularly researchers who are not philosophers (see references below). Two of his most informative writings are review articles that explore the lived body and habituality in phenomenology founder Edmond Husserl's writings (Moran 2011, 2014).

In *Husserl's Crisis*, a volume in Cambridge University Press' "introductions to key philosophical texts," Moran offers an "explanatory and critical introduction" to Husserl's last work, partly published in 1936 and today "acknowledged as an enduring masterpiece" (p. x). In his introduction, Moran described *Crisis* as:

A disrupted, partially published and ultimately unfinished project, written when its author was in his late 70s, struggling with declining health and suffering under the adverse political conditions imposed by the German National Socialist Regime that had come to power in 1933.

The Crisis *is universally recognized as his most lucidly written, accessible and engaging published work, aimed at the general educated reader as an urgent appeal to address the impending crises—scientific, moral, and existential—of the age. Husserl is writing with the authority of a lifetime of practice as a phenomenologist and with a fluidity previously not found in his tortured prose. There is the strong sense of a philosopher with a mission, a mission to defend the very relevance of philosophy itself in an era defined both by astonishing scientific and technological progress and by political barbarism.*

The Crisis *is also, undoubtedly, Husserl's most influential book, continuing to this day to challenge philosophers reflecting on the meaning of the achievements of the modern sciences and their transformative impact on human culture and on the world as a whole. The* Crisis of the European Sciences *is by any measure, a work of extraordinary range, depth and intellectual force (pp. 1–2).*

Chapters 1 and 2 of *Husserl's Crisis* are an overview of the philosopher's life and writings, including a thorough history of *Crisis's* genesis and publication trajectory. Moran then devotes six chapters to *Crisis's* key themes and arguments, including "Galileo's revolution and the origins of modern science," "the crisis in psychology," "Husserl on history," "Husserl's problematic conception of the lifeworld," and "phenomenology as transcendental philosophy."

In his last chapter, Moran discusses the significance of *Crisis* today, concluding that, "even in its incomplete and programmatic form, the *Crisis* is a remarkable and visionary work—a work that analyses the past history of philosophy only in order to understand its future mission" (p. 297).

Drawn from Moran's text, the sidebars below highlight Husserl's understanding of phenomenology as philosophy, embodiment, lifeworld, and natural attitude—all crucial concerns for environmental and architectural phenomenology.

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On phenomenology

The *Crisis* claims to offer an introduction to transcendental phenomenology, and, of course, Edmund Husserl is best known for founding and developing the new science of *phenomenology*, developing an insight into the *intentionality*, or directedness, of conscious experiences that had been proposed by his teacher Franz Brentano (1838–1917).

Phenomenology, as developed by Husserl and furthered by his students… and followers… quickly established itself as the dominant philosophical approach on the European continent in the first half of the twentieth century. Indeed, phenomenology continues to hold its own as a movement of international significance, both within Continental philosophy and also as a specific outlook and methodological approach to human subjectivity in the cognitive and health sciences.

Phenomenology may be characterized broadly as the descriptive science of consciously lived experiences and the objects of those experiences, described precisely in the manner in which they are experienced (Moran 2012, pp. 3–4).

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On embodiment *(Leiblichkeit)*

We cannot leave the discussion of pure psychology without discussing the theme of lived *embodiment*, which is one of Husserl's great contributions. Despite being framed in the metaphysical language of the "incarnation (*Verkörperung*) of souls," his thinking about embodiment or "livedbodiliness" is strikingly original…. (p. 129).

The live body (*Leib*) is experienced, as Husserl puts it, as a series of "I can's." I am, as he puts it, an "ego of abilities or capacities" (*Ich der Vermögen*) I can turn my head and look around, moving my eyes, shifting my upper body. All these bodily movements belong to and enable perception to take place.

The living body is both literally and figuratively the centre of my experiences and the means of my perceptual encounter with the world. It is an "organ of perception"; it is experienced as a living, functioning tool, but one that, in normal situations, does not call attention to itself. It becomes obtrusiveness only if something goes wrong, e.g., I move my head, but my neck is stiff; I touch something with a blister on my finger.

All forms of ego-relatedness to the world are mediated through my body; even abstract thought (consider Rodin's sculpture *The Thinker*). I am always related to things as lifting, carrying, holding, reaching for, standing back from and so on.

The body is not a passive centre of experiences but a locus for action and self-directed movement. In this sense, the lived body is never absent from the perceptual field—a point which is later repeated by Merleau-Ponty…. (p. 130).

This experienced and experiencing body, Husserl claims, as mediator of our experienced world, has never been the proper subject of any science before phenomenology. Husserl is surely right there is no one science that addresses the lived body as experienced—such science would include all forms of bodily experience, what Husserl calls *somatology* in *Ideas* III. The anorexic's peculiar sense of her own body would have to come into play here, as well as the experiences of athletes or dancers.

Empirical psychology, due to its method, has treated [the lived body] in an objectivist and piecemeal manner. The manner in which a living body is spatio-temporally localized and is involved in a living relationship with causality differs greatly from the body understood purely as a physical entity (p. 131).

On the lifeworld

[Husserl understands the] lifeworld as a *horizontal* structure, one that includes contexts, possibilities, temporal distantiations which are intuitively experienced and can never be objectified in science. Rather than being an extant totality of things, the lifeworld is actually a "horizon" that stretches from indefinite past to indefinite future and includes all actualities and possibilities of experience and meaningfulness. The lifeworld provides a living context or "world-horizon" (*Welthorizont*) which precisely makes humans human.

Natural life is characterized by Husserl as "mundane" or "worldly." For Husserl, as for Heidegger (whose equivalent concern is "being-in-the-world"), human beings are beings who essentially live immersed (*Dahinleben*) in a *world* understood as a vaguely defined context of meaning and action. Heidegger himself states that it has become commonplace to say that humans require a "surrounding world" or "environment" (*Umwelt*), but the deeper ontological meaning of this statement is not appreciated—to be in a world is an a priori character of human existence…

Husserl's version of this claim is to speak of natural "world-life (*Weltleben*), and indeed he characterizes humans as essentially belonging to the world, as being, in his phrase "children of the world" (*Weltkinder*), a term not used in the *Crisis* itself but frequently found in other works… (p. 186).

On the obviousness of lifeworld and natural attitude

Husserl introduces the natural attitude as the commonsense outlook of naïve realism with which humans of all cultures and in all periods of history normally engage with the world. People live in a distinctly personal and interpersonal social communal world, surrounded by other human beings and within social, historical and cultural groupings.

Although this is obvious to the ordinary person in the street, this "obviousness" has in the past not been interrogated by science or by philosophy. Moreover, there are remarkable features to this supposed "obviousness" or "taken-for-grantedness" of our social and communal world.

First of all, there is the sense of the *unity* of world, its "tendency to concordance" (*Einstimmigheit*), that is, to unfold in consistent, harmonious ways. There is also the sense of *horizon*, the manner in which all experience… is against a backdrop of co-intended meanings. There is the sense of a visual and spatial world beyond what is immediately seen, the sense of the stability of objects despite the passing of time, the sense of the continuity of experience and personal identity across time, and so on.

The contemporary positive sciences assume (with the Kantians) that the real world is the world of physical forces, spatio-temporal objects and so on. But living humans experience a somewhat different and, for them, no less real world which has within it such entities as persons, animals, tools, works of art, money and so on.

Husserl recognizes that all of these "senses" or meanings are not just encountered "ready-made" in the world but are always experienced as already unified (pp. 273–74).

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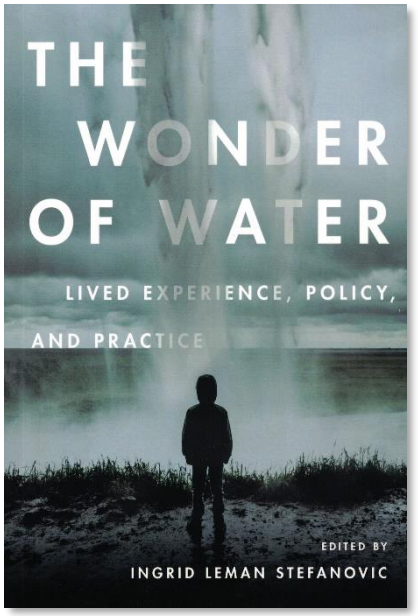
Book Note

Ingrid Leman Stefanovic, ed., 2020. *The Wonder of Water: Lived Experience, Policy, and Practice*. Toronto: Univ. of Toronto Press.



As illustrated by her *Safeguarding Our Common Future* (2000), philosopher **Ingrid Leman Stefanovic** has been a central figure facilitating research in environmental phenomenology.

In *Safeguarding*, Stefanovic discussed ways to allow our world, especially, the natural world, to become a place sustainable and sustaining for both present and future generations. Her aim was to point toward an environmental understanding that might illuminate the "referential whole within which we are situated."

Stefanovic argued that the basis for ethical actions must shift from an emphasis on "traditional liberal attitudes and self-determined concerns of autonomous individuals" to a recognition that, through the ontological primary of place, "individual human beings are fundamentally already emplaced in a complex array of sociocultural, economic, technological, regulatory, and environmental relationships."

The 12 chapters of WONDERS pinpoint Stefanovic's ethical and moral concerns in relation to water, the landscapes of water, and places associated with water, whether river, bay, sea, or otherwise. As editor, her aim is to incorporate thinking that highlights "the genuine meaning of water in its visceral quality, its vitality and its primordiality." The volume's contributors are said to:

move us beyond statistics and calculations, helping us to see *water differently and behave more discerningly in respect of water.... [M]ight a deeper, embodied vision of the wonder of water inspire more throughout policies? Could our built places be more wisely designed if we attended to water's lessons in a more meaningful way? In recalling the full depth of the lived experience of water, is it possible to rethink the meaning of water ethics, a new and growing field of study unto itself? (pp. 3–4).*

Stefanovic organizes the 12 chapters of the volume in terms of three major parts: first, the lived experience of water; second, the relationship between water and places; and, third, rethinking water policy, practice, and ethics.

Part I includes ecologist **Stephan Harding's** "Water Gaia: Towards a Scientific Phenomenology of Water"; pedagogue **Stephen J. Smith's** "Flow Motions and Kinetic Responsiveness"; philosopher **David Abram's** "Creaturely Migrations on a Breathing Planet"; and environmental educator **Martin Lee Mueller's** "When Salmon Are Deemed Superfluous: Reflecting on a Struggle of Stories."

Part II includes philosopher **Janet Donohoe's** "The Place of Water"; philosopher **Irene J. Klaver's** "Engaging the Water Monster of Amsterdam: Meandering Towards a Fair Urban Riversphere"; **Stefanovic's** "Water and the City: Towards an Ethos of Fluid Urbanism"; and philosopher **Sarah J. King's** "What We're Talking about When We're Talking about Water: Race, Imperial Politics, and Ruination in Flint, Michigan."

Part III includes philosopher **Bryan Bannon's** "The Bonding Properties of Water: Community, Urban River Restoration, and Non-Human Agency"; philosophers **Trish Glazebrook** and **Jeff Gessas'** "Standing Rock: Water Protectors in a Time of Failed Policy"; philosopher **Henry Dicks'** "Phenomenology, Water Policy, and the Conception of the *Polis*"; and philosopher **Robert Mugerauer's** "Towards a Complexity Ethics: Understanding and Action on Behalf of Lifeworld Well-Being."

The sidebars below include passages from Mueller's article on past and present situations where salmon have been deemed "superfluous and in the way of industry" (p. 58).

Salmon as symbol

The dismantling of the two Elwha dams [two hydroelectric dams built in the Pacific Northwest in the 19th century; before their construction, the Elwha River was one of the few rivers in the contiguous United States to house all of the anadromous salmon and trout species native to the Pacific Northwest] marks a concrete political act of *restoring* a landscape, but it also marks an important symbolic gesture: the dismantling of the dams has initiated a re-examination of the various peoples' complicated relationship with the larger living community, and salmon are increasingly recognized as being the keystone to this inter-ethnic work of restoring.

They are being recognized as creatures deeply entangled not only with the ecology but also with the *mind* of the Pacific Rim. Salmon are beings of flesh, blood, intention, sentience, and intelligence, but they are also symbolic creatures, totemic beings who nourish the human imagination with insights, metaphors, wonder.

The Elwha case symbolizes defiance, determination, and also love for the strange and exuberant otherness of the salmon. And it symbolizes a striving to recreate a more complex, recip-

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rocal, integrated, and beautiful relationship between humans and the more-than-human world.

There, as elsewhere across the Pacific Northwest, people are asking: What are the needs of the salmon in these streams? What are the needs of those rivers, and the many other creatures that depend on salmon flesh for their lives?

Further: How can the multi-ethnic groups of humans inside the many watersheds live in such a way that they once again become accomplices of the land, rather than disturbances?

Those are questions one now encounters again and again across Salmon Nation, and the chorus of defiant and devoted voices who challenge the anthropocentric story is still swelling to a crescendo (pp. 63–64).

Life wants to live

It bears repeating: Voices that continue thinking of salmon as inconvenient disturbances to industrial development are *not* uttering inalienable truths; their claims to legitimacy are *not* unchallengeable.

They may—while conflicts still flare up—co-opt such notions as sustainability or even responsibility but they cannot, once and for all, contain the persistent upwelling of wonder in the encounter with wildness, or blockade the spawning, sprouting, birthing, and hatching of new life, or obstruct the instant and intuitive recognition of kinship between fly fisher and salmon, or seal the countless ways in which our breathing bodies still respond alertly, and competently, to the voices of river, wind, or estuary.

Our mindful bodies are still being drawn toward, called upon, awakened, stirred, and roused by rainstorm, solstice, or autumn moon, by moose or beaver or wolf; still salmon radiate a particularly vigorous eloquence and enflame a special kind of awe in us, charging encounters between our kinds, now as ever, with [a] profoundly erotic tension....

These are dynamics worth taking seriously for that which keeps surging and leaping and running up against the physical and metaphysical dams of the human-centered lifeworld is none other than life itself, raucous, untamable life, wanting to live.

This may be warning or pledge, depending on where our allegiances lie: Life will not be contained or owned. Really, it never has been (pp. 72–73).

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A New Urban Place

Robert Fabian

Fabian is a retired Canadian management and systems consultant. He was the first Chair of Computer Science at York University in Toronto. In the last several years, he has become deeply involved in downtown Toronto neighborhood planning, especially along Yonge Street, a major Toronto thoroughfare on which he lives. His first two EAP *reports on neighborhood involvement were in the winter 2012 and fall 2013 issues. See his website at: www.fabian.ca.* *robert@fabian.ca.*

This is a report on my journey to a new urban place. Fifty years ago my wife and I moved to Toronto's Bloor West neighborhood. It wasn't all that fancy a neighborhood, at least not back then. The retail strip along Bloor between High Park and Jane Streets provided the place that anchored the neighborhood. That retail strip of several local stores delivered a village retail presence, offering all the necessities and a few of the luxuries.

As we approached retirement age, a downtown condominium augmented by a country cottage became increasingly attractive and, almost 20 years ago, we moved to a condo in downtown Toronto located on the edge of the Church Wellesley neighborhood—Toronto's first "gay" hood. The neighborhood was anchored in the village retail strip located along Church Street between Dondonald and Alexander Streets. Again, all the necessities and a few of the luxuries were offered by smaller local retail stores along that strip of Church.

Fast forward to today. Retail has been transformed by big-box stores and online sales. When we moved downtown, there were five stores offering food along the Church Street strip. Today, there is one remaining food store, but within walking distance, there are six supermarkets, including a flagship Loblaws located in the old home of the Toronto Maple Leafs hockey team. Loblaws is two blocks south of the old Church Street retail area.

Something similar seems to have happened along the Bloor West retail strip. The retail strips which provided a central, natural place for our old and new neighborhoods have faded. They haven't become placeless, but they no longer engage residents the same way that the old retail strips provided such natural defining places for their neighborhoods and their residents.

Simultaneous with these declining places, the population of our downtown neighborhood is skyrocketing. Within just a few blocks of our condo, there are more than 20 new residential towers built, going up, planned, or discussed. These towers range from a "short" 26 storeys to more than 80 storeys. A typical floor will have 10 or more residential units. A typical unit will be home to 1.5 people. In just a few years, there will be thousands of new residents in our part of Toronto.

Shortly after we moved to Toronto, geographer Edward Relph identified the placelessness that often accompanies life in the suburbs or in residential towers [1]. There is now a growing literature on the human importance of having a neighborhood place that can anchor residents to where they live and to the communities which critically define their local social reality.

A lack of place can be felt in our neighborhood today. Add thousands of new residents, and the lack of place will be felt much more acutely in the future. The heritage folks stridently defend the architectural spaces formerly holding the village retail that was the heart of many older neighborhood places. But preserving the spaces that held village retail isn't nearly enough to preserve village retail. Big-box stores will continue to attract a growing share of the spending for necessities. Online sales will continue to undercut the high margin sales that were so important to the economic reality behind village retail.

On the other side of Yonge Street from our condo (in Bay Cloverhill) there is an interesting opportunity to do something about local placelessness. There are three short side streets and a service lane within a larger block bounded by bus and subway transit lines. Toronto and other cities have identified the potential value of what is called "Shared Space" streets and lanes. The idea is almost a return to the early days of the twentieth century when all public-realm users had equal access to streets, roads and lanes. We're calling it a "Living Urban Block," with intended pedestrian-priority designation on the side streets and lanes.

Creative city building

I started my professional life in mathematics. I took great comfort in the universality of mathematical truth. Mathematical laws had universal applicability. Things got a bit muddy as I studied computability in graduate school. That focus led me to computer science, where the value of computing was critically dependent on context. There are few important computing processes universally relevant and valuable. For me, what followed was a natural transition to the "real world" of management and systems consulting, where context was key.

In retirement, I started to pay attention to urban planning. Given that we were living in downtown Toronto where there are more tall-building-construction cranes than any other North American city, this interest was a natural step. Early on, I was forced to recognize that there are precious few universal truths in the behavioral sciences. What was true for undergraduate students in psychology courses had little useful relevance for retirees living in downtown Toronto. That led me to a recognition of and respect for a phenomenological approach to urban planning. The need is not urban engineering but creative city building.

The placelessness challenge of today's downtown Toronto is merely an aspect of a broader concern for social infrastructure [2]. Toronto does a reasonable job engineering the city's services infrastructure, with dozens of departments reviewing new development proposals. Thus far the city has not paid much explicit attention to the changes required in its social infrastructure to accommodate the thousands of new residents who will be calling downtown "home."

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I look back on mathematics' universal truths and wish there were similar universal social-infrastructure truths. What will it take for the thousands of people moving into the dozens of new residential towers in my neighborhood to feel that they are part of a "real" neighborhood and can draw on the support of their local community? The absence of old-fashioned "village" retail places is bound to have an impact. Could a shared public realm substitute for these retail places and provide the space that enables residents to recognize a defining place for their neighborhood?

That question and a raft of similar questions cannot have definitive answers. It would depend on the new and old residents. It would depend on the larger social, economic, and political climate. It would depend on the public and private third spaces that are connected to potential neighborhood places. It would depend on the formal and informal events that take place in the available spaces. And those are just the initial dependencies that come to mind.

Making it happen

Urban planning in Toronto (and I suspect elsewhere as well) moves at a slow and often ponderous pace. There are plans to update Yonge Street, the city's central north-south street. In many parts of Toronto's downtown, services infrastructure is more than a century old and needs upgrading. A major study has begun. Some of the early ideas have been quite attractive, but it's likely to be a decade or more before my local section of Yonge Street is transformed into a more pedestrian-friendly place. At that point, all possible sites will be occupied, and there will be virtually no new development opportunities in the area.

A recent master's professional report by Berkeley graduate student Sarah Saviskas provides a useful summary of shared space or what she calls "pedestrian-priority streets" [3]. There is a growing recognition that motor vehicles do not need to automatically be given street priority, especially on lanes and side streets. Cities throughout the world are taking steps to regain a balanced use of pedestrians and vehicles on selected roadways. Many of these initiatives involve major transit routes, with streetcars or buses given exclusive use of some of the roadway. This approach makes transportation sense—the limited public realm can be more efficiently used by dedicating a portion as exclusively for public transit.

The use of pedestrian-priority streets considered in Saviskas' study is different. Her focus is providing spaces that would be transformed into meaningful places for the new neighborhoods being crammed into downtown Toronto. The old-village retail model for a meaningful neighborhood place is less and less tenable. Retail has changed and is changing enough that successful retail primarily needs a service rather than a geographic focus. But retail, especially third-space retail, can play a meaningful role in the establishment of neighborhood places linked to pedestrian-priority streets.

There's a commercially attractive opportunity to integrate shared streets as new residential towers are completed and brought to market. Advertising a new development as "a vital part of the new neighborhood being developed in ..." should, almost certainly, translate into faster, higher margin sales and rentals. Such an advertising push makes sense and encourages the change in mind set that might transform shared-space streets into identifiable neighborhood places.

The time to act is now. Just across Yonge Street from our condo is a modest mixed-use area bounded by transit routes on all sides. There are seven new residential towers completed, being constructed, or planned. Soon there will be no potential development sites remaining.

Developers generally like the idea of shared-space streets. The local Downtown Yonge Business Improvement Area likes the idea. The central YMCA would love to see the neighborhood defined by a shared-space street immediately north of its building and adjacent park. In addition, there are significant voices in the local urban planning establishment who are active supporters.

The effort will extend over multiple phases. An initial phase could put in place temporary indicators of shared-space intent. Perhaps eliminate most of the on-street parking, square the corners at intersections, and put in place some planned all-season events. These possibilities are similar to how Toronto approached changes in some of its high-transit-volume streets. With a demonstrated initial success, plans could be developed for a permanent conversion of the first side street to pedestrian-priority designation. Initial plans could be developed for conversion of additional side streets and lanes.

One "official" step is critical. The city needs to designate an experienced planner as the person in charge of this initiative. Fortunately, there are several planners approaching retirement who would look favorably on such an assignment. There are reasons to be cautiously optimistic that such an appointment will be made and that the neighborhood stakeholders will support the initiative. Conversion of the side streets will be an important step toward maintaining the local social infrastructure in the face of a massive increase in the number of local residents. It's what the city should be doing.

Notes

1. E. Relph, *Place and Placelessness* (London: Pion, 1976).
2. E. Klinenberg, *Palaces for People* (NY: Crown, 2018).
3. S. Saviskas, *Taking Back Our Streets*, master's professional report, Univ. of Berkeley, 2016.

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The Border at the Heart of Human Life

John Russon

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There is an ambivalence at the heart of dating.

On one hand, much of the excitement and energy of dating comes from the fact that one is venturing into an unknown terrain, hoping to make a connection with someone unfamiliar, someone from a different world. Each person here is a kind of alien surface to the other, exciting in part, no doubt, because one can imaginatively write whatever one likes on that blank slate. And this alienness of the other is also a matter of risk, for the person one connects with may be unpleasant, or, worse, violent; and this danger, too, is no doubt part of the thrill of the situation—as long as that danger does not in fact turn into a reality.

On the other hand, the excitement also comes from the possibility that something further will come from the date, and a new relationship will develop. In that future, those involved will become familiar to one another, and the interaction will not be a matter of engaging with what each imaginatively projects on the other but will be a matter of both parties learning who the other is in a process of mutual adaptation.

In this case, one does not want the other simply to be an unresisting "blank slate," but to be someone specific—someone who offers one a new home into which one can precisely retreat from the demands of constant engagement with an alien world and a supportive platform from which to venture forth rather than a surface upon which to project. The other here is more a beacon than a mystery and harbors a promise rather than a threat.

The ambivalence of dating, then, is that one's desire demands that the other be both alien and familiar, both an open possibility and a closed actuality, both a thing of the momentary present and an enduring reality.

Travelling to a foreign place presents a similar ambivalence. On one hand, the excitement that white American tourists might feel in crossing from McAllen, Texas, to Reynosa in Mexico, comes largely from Reynosa's reputation as a major site for the drug-trade and the knowledge (or the imagination) that, indeed, one might be kidnapped, and part of the pleasure in the activity of visiting is the relief of getting out again successfully.

Here, it is the dangerous unfamiliarity of the place that is exciting, and one enjoys the voyeuristic pleasure of brushing up against that world while still relying on the comforting assurance that one can return to the familiar world of the U.S. On the other hand, a different American traveler might well visit Istanbul, not with such voyeuristic intent, but with the hope of encountering a cultural world that is differently oriented and richer than the pre-packaged and commodified world of the United States—a world that might broaden one's horizons and, indeed, offer one a new home.

There is something honest about the dating situation. The desire associated with the possibly threatening mystery of the other is a kind of recognition of the otherness of other people—of the fact, that is, that they are not the same as oneself. The desire to engage with that other is a desire to go beyond one's home and to have that breath of outside air breathe life into one's world—to make one feel alive.

The engagement with a challenging outside is integral to the very meaning of "living," and one can feel that one "doesn't have a life" in the absence of such outside stimulation. At the same time, we have a desire to settle, and the experience of the other as a repository for one's hope is a recognition of the other as harboring the possibility of, essentially, giving one back to oneself: of allowing one to feel reconciled with oneself and whole. If we are only ever exposed to the challenging outside without ever being able to "come in from the cold," we are worn down, and we feel as empty on the inside as we feel impoverished on the outside when we are without "a life."

The other with whom we settle allows us to feel anchored in the world, to have a reality of our own that endures despite whatever happens "outside." In the ambivalence of dating, then, we see the essential two-directedness of our engagement with others: we have a trajectory toward engagement with the outside and a trajectory toward the establishment of an inside. The contradictory paths in dating reflect a tension at the heart of our existential condition.

That tension is evident in the situation of border-crossing as well. In the simple desire to see something different and exotic, or even in the more extreme situation of wanting to be close to danger, there is, again, an honesty to both the recognition that an other culture is other, and the recognition that there is something satisfying in seeing a reality beyond the horizon of our familiar world that does not answer to its terms.

Whether one is simply enjoying an alluring view or seeking the rush of excitement that comes from flirting with danger, the contact with the exotic alien acknowledges the novelty and difference of the world beyond one's limits, even as it stays closely tethered to the reassuring support of the familiar. And yet, the very recognition that there is a tantalizing world beyond one's own can itself, by underlining the limits of one's own world, lead one to realize that one could live otherwise: those others, though exotic and threatening to oneself, are not exotic and threatening to themselves; on the contrary, for those others, their ways are precisely what is familiar.

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Indeed, the strange other, while offering the momentary pleasure of a fascinating spectacle, also promisingly invites one to change one's own life and live otherwise. Thus, in the experience of the "threat" of the other, one is not just feeling the danger that one might be subjected to violence but also feeling the allure of giving oneself up to it and coming to be at home in what was formerly strange.

Like dating, then, visiting another culture engages the ambivalence in our desire: we seek to maintain distance from an alien world that offers us an entertaining spectacle that ultimately reassures us of our sense of home; simultaneously, we feel the call to liberate ourselves from the familiar and become someone new. This, too—this tension between the desire for a reassuring familiarity and the desire for an unpredictable transformation—is a tension at the heart of our existence.

The heartbeat that keeps the organism alive has a systolic and a diastolic phase. The systole is when the heart contracts, pumping oxygen-rich blood to all the parts of the body; the diastole is when the heart relaxes after contraction and allows the return of oxygen-depleted blood for replenishment. Biologically, the human life depends on this heartbeat. Existentially, the human life depends on the systole and diastole of being exposed and being at home.

We humans need a home, which is both a physical setting dedicated to our own needs and a set of human relationships oriented to our wellbeing. "Home" is the world organized in a way that recognizes us as uniquely important, the world as intimate and close. Without a home, one has nothing else and no one other than oneself alone to establish a sense of one's reality and worth, and that is a lonely and arid existence, unsettled and unsettling. Without a home, the world is overwhelming and unrelenting in its indifference to us.

Home-life on its own can be stifling, though; as the Buddha says, "house life is crowded and dusty; going forth is wide open" (*Middle Length Discourses*, 1.240). We need a home, but we also need a world beyond—the world of the real—that precisely does not relate to us intimately and recognize us as uniquely important. This is the world of engagement, the objective world upon which we work and the public world within which we earn recognition for our accomplishments. It is precisely a world in which we can be someone beyond who we are for our intimates. The need for both intimacy and indifference and the back-and-forth between them is the systole and diastole of our existential health, our vitality.

The back-and-forth between intimacy and indifference presumes the existence of a border between them, and in dating, as in politics, it is important to establish borders. In dating, one is engaging with another and it is not yet decided whether or not one wants to go further with that other. Consequently, it is important to be able to say "no." Indeed, the desire to develop something further with that other will likely be dependent upon the experience that that other precisely respects one's limits.

In that sense, the development of a further intimate relationship is not an effacing of borders but a richer reality built from them. In politics, too, borders reflect the fact that people in groups, like individuals, do not all choose to live the same way, and there is good reason to allow different groups their integrity. Whether between people or between cultures, borders precisely reflect the fact that we are different from each other.

Normally, we live as if our home were neutral and the "other" were exceptional; this makes sense, because our home is the basis of our identity—our basal heart-rate, so to speak—and so we naturally see the other from this perspective. In reality, however, the truth is the opposite of this: we each become someone precisely by becoming "other"—by differing from the neutral indifference that recognizes no one. We become someone by establishing the border of intimacy that makes it possible to be someone ourselves and simultaneously makes it possible for there to be others for us.

But this border is a way of making the world our own, an appropriation and settlement within an open reality that could be lived otherwise. To have a home, then—to be someone—is something that depends upon the cooperation both of those with whom one makes a home through the intimate embracing our unique importance and of those who are indifferent to us but who nonetheless respect our borders. Dishonesty in our experience—a dishonesty encouraged by the very nature of being at home—is not to recognize the fact that our home reality, our being someone, is only supported by the world of others, both intimate and indifferent, who let it be such.

A living organism depends on the existence of a world outside it, a world that the organism appropriates according to the needs of its own form of life. In the context of any life, the outside world is thus necessarily both independently defined and defined in terms of the organism. Something analogous is true of our human world. The world outside us—both human and natural—is something in its own right, indifferent to us.

At the same time, there is no escaping our need to experience the outside world in terms of our own needs. What we need to recognize is that that the foreign world we experience is already defined in relationship to our borders—our appropriative settlement. We need both to respect the independent autonomy of the other life-forms we encounter and to recognize that the terms in which we encounter them (and, likewise, the terms in which they encounter us) are already a reflection of our own way of establishing borders.

In and of itself, it is not destructive to be a tourist, any more than it is immoral to date people casually. Dating is dishonest and destructive when the independent integrity and autonomy of the person one is dating is ignored, and that other is treated only as an object for one's use.

Analogously, the detached, superficial perspective on another culture has become dishonest and destructive when the foreign culture one encounters is treated as if it were only an entertaining and fascinating spectacle, or, worse, as if it were only an occasion for affirming one's fantasy of moral superiority, as happens when the role of the U.S. in cultivating the drug-trade with Mexico is ignored or when the history of Christian-European colonialism in shaping the contemporary reality of Muslim Asia is ignored.

In these destructive relationships, the other is treated as if it were only how it appears to one's home-perspective, and the formative role one's own establishing of borders plays in shaping what is really an interaction of mutually independent aliens is ignored.

Healthy dating, though, and likewise healthy cultural interaction, always holds within it an openness to the possibility of something new developing, and that means

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the independent integrity of the other is always alive under the surface, threatening, so to speak, to give birth to a mutually transformative process that reveals to each that that other is in fact one's "destiny," one's true home.

Both personally and culturally, we need both to have a site of rest and security—a home—and to be able to venture forth from that home into an outside. There is no simple answer to whether approaching the other—personal or cultural—for a momentary thrill or for an enduring reality is better. Both approaches speak to something real in our desires. But only to experience others as exotic mysteries is a problem, as is only to experience the desirability of being at home.

Any life-form is a reality that maintains itself in encounter with an other. The stronger the life-form, the stronger the other with which it can engage and still be itself.

The strongest life-form is ultimately the one that, rather than defensively suppressing the autonomy of the other to shore up its boundaries, is one for whom its borders are experienced precisely as the invitation to be changed and to come to be at home in what was foreign: the one that finds itself only in and through that other.

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An Understanding-Grounded Approach to Science Education

Stephen Wood

Wood is an independent researcher in phenomenology and the environment. He studied systematic zoology at the University of Cambridge and has held fellowships in the Theoretical Physics Research Unit at London's Birbeck College; and at the Nature Institute in Ghent, New York. Wood's four earlier EAP *essays can be found in spring and summer issues, 2014 and 2016. s.w.wood.88@cantab.net.*

In this essay, I distinguish between two contrasting approaches to science teaching, which I name *knowledge-grounded* and *understanding-grounded*. In the knowledge-grounded approach, the student is asked to acquire and to apply knowledge with little guidance on how to develop the necessary understanding to make that knowledge personally *real*. In contrast, the understanding-grounded approach seeks to make knowledge more personally vivid and meaningful by bringing the student to an overall understanding of the subject, within which relevant knowledge is situated and takes on a deeper, more comprehensive, first-person significance.

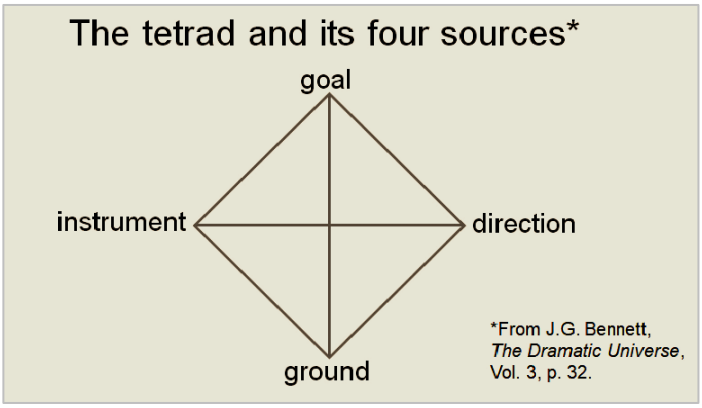
Drawing on British philosopher J.G. Bennett's insights into the nature of scientific activity, I illustrate how the understanding-grounded approach appeals to the four aspects of scientific activity that Bennett identifies as *contact*, *vision*, *knowledge*, and *technique*. For real-world evidence, I draw on my own experiences as a learner, both as a university student and as a member of volunteer naturalist groups.

I argue that, in my fruitful learning experiences, teachers followed an understanding-grounded approach attending to each of these four aspects. In contrast, my experiences of knowledge-grounded teaching led to learning outcomes that were unsatisfactory, at least partly because the learning process did not fully incorporate Bennett's four aspects of scientific activity.

To provide a thematic focus, I reflect on the implications of understanding-grounded and knowledge-grounded approaches for sustainability education. I argue that the understanding-grounded approach has the advantage of being more inclusive and less hierarchical, allowing a greater number of students to advance toward the teacher's own state of expertise.

The method of systematics

To facilitate understanding-grounded learning, Bennett proposes a method that he names *systematics*, which is said to enable investigators to probe ever more deeply into the richness of a phenomenon [1]. Systematics facilitates a progressive understanding of the phenomenon through attention to the qualitative significance of number. For example, viewing the phenomenon as oneness or *monad*, the investigator looks for wholeness, which is the central qualitative meaning of oneness. As twoness or *dyad*, the phenomenon appears as a polarity or a complementarity, and as threeness or *triad*, as a relationship and as a process. Probing the phenomenon for its fourness, or *tetrad*, the investigator considers the phenomenon as a pattern of organized activity that has some sort of intentional outcome. As fiveness or *pentad*, the phenomenon appears for the first time as an entity with a certain potential and reach in the world. As sixness or *hexad*, the phenomenon coalesces into a recognizable event in space and time.



Each of the phenomenon's qualitative possibilities—monad, dyad, triad, and so forth—is identified by Bennett as a *system*, which can be defined by the given number of mutually relevant terms. The monad consists of a single term, the *totality*. In turn, the dyad has two opposing poles, or *natures*; the triad, three *impulses*; the tetrad, four *sources*; the pentad, five *limits*; and the hexad, six *laws*. Bennett describes systems up to twelve terms and beyond.

As I hope to demonstrate through my example of science education, systematics has the advantage of bringing hitherto unsuspected aspects of the phenomenon into awareness and highlighting their mutual relevance. Using the systematics method, investigators consider the phenomenon in terms of specific systems that may draw attention to particular actions and patterns of interest.

To study the scientific enterprise, for example, Bennett chooses the tetrad as particularly appropriate, since science can be readily recognized as a system of organized activity with definite aims and hopes of accomplishment. Each of the terms of the tetrad—the four sources—reveals important aspects of science as a directed activity aiming to achieve specific outcomes.

As a symbol, the tetrad is pictured by Bennett as the cross-filled diamond of the figure, left. The tetrad's four points are its four sources, which Bennett identified, on the vertical axis, as *ground* and *goal*; and, on the horizontal axis, as *direction* and *instrument*.

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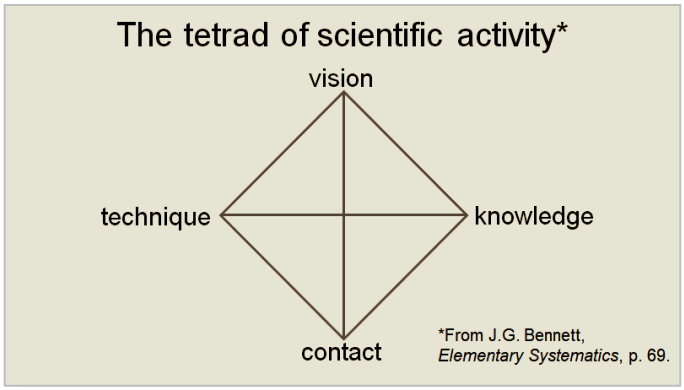

The tetrad of scientific activity is illustrated in the figure, right. Note that Bennett identifies the two endpoints of the vertical axis as *contact* and *vision*. As ground of scientific activity, contact refers to the scientist's engagement with the material world, which is his or her starting point and presupposes an "accurate contact with the thing being studied" [2]. This situation of contact with the material world is available to the senses and measurable, whether directly through first-hand observation or through second-hand instrumentalist means like telescopes or electronic microscopes.

In turn, *vision* relates to the scientist's aim for a comprehensive theory providing a thorough understanding of how the world works. This vision of a certain manner of "truth" elevates science above the ordinary and gives it enduring significance and value, a pursuit that fuels the scientist's passion and commitment: "Significant scientific activity is marked by a special kind of wonder and faith. The scientist must have insight, vision, and a sense of nature's mystery" [3].

Next, there are the endpoints of the tetrad's horizontal axis, the first of which is *knowledge*, which provides research direction for the scientist and a "guiding intelligence" [4]. Scientific erudition links researchers with past and future efforts in the field and relates their ideas and findings to the larger discipline of which they are a part.

The tetrad's other horizontal endpoint is *technique*, which refers to the practical feel scientists have for their field of research. Technique involves familiarity gained over long exposure and relates to the instinctive skills that researchers develop for conducting effective experiments and obtaining a clear account of phenomena.

Bennett suggests that technique incorporates a field of practical action via which knowledge becomes actualized [5]. More broadly, he suggests that knowledge relates more to an intellectual dimension of scientific endeavor, while technique relates more to an emotional dimension [6]. He points out how different scientists have access to the four sources of scientific activity in unique ways. He writes:

No scientist's work is so perfectly balanced that all four sources play an equal role. Some scientists have a knack for seeing empirically, while others have the ability to synthesize research in a field and to integrate their own work accordingly.

Yet again, some scientists have great technical skill and a determined persistence to carry their work through, while others are visionaries who can see deeply into the principles of nature. Einstein, for example, conducted theoretical experiments on paper and had little interest in empirical research or practical techniques. He had a remarkable ability to integrate scientific knowledge and to see conceptual patterns hidden from other scientists [7].

Encounters with nature

Though I grew up in England and did my doctoral work there, I moved to France in 2008. Right from the start, I was keen to find a community of French naturalists. If only there could be a way to engage in practical activities to understand and to protect nature better. The advisor helping me with my adjustment to my new country suggested a wildlife association affiliated with the University of Montpellier, itself very active in the ecology and conservation fields. Headquartered in a village not far from Montpellier, this association had taken over an abandoned farm and had restored it as a wildlife preserve.

Before making contact, I studied the association's website and was inspired by what I read. The salaried members described their background, all speaking of their passion for the outdoors, for particular plants and animals, as well as their appreciation of the attitudes of fellow members, their enthusiasm and conviction, their humility and imagination. One wrote that he was also a sculptor. Another described his childhood memory of the soothing movements of the Loire River and feeling like a pebble rocked back and forth on the riverbed. Another member proclaimed his conviction that there was no frontier between humans and nature. It was gratifying to read of people committed to high intellectual standards who were also willing to speak openly of their feelings for the natural world.

My first meeting with the French association, however, came as a great shock. Sent out to their reclaimed farm, I was quickly out of my depth. We were handed a list of plant species covering fourteen A4 pages and asked to tick off each species as we identified examples in the field. The list was a great intellectual achievement: an exhaustive survey of all plant species found on the abandoned farm. We were expected to contribute to the effort of keeping the list up-to-date and to learn the particularities of each species. Too soon, however, this task became a race to tick off as many species as quickly as possible.

This task could have been directed so differently. The more experienced members of the association could have provided an overview of the site's ecology and its plant communities and habitats. These senior members could have then directed us to a small number of key species and given us time to study them, to draw them, or to take turns at describing them. This approach would have helped us to develop accurate contact with the plants of the place, to acquire the skills to study them, and to gain a feel for them. The list of species would have started to organize itself into a meaningful pattern, once we started to know where to look for different types of plant and to recognize the more common species.

Instead, we were tasked with a cold, purely intellectual exercise that was a stark expression of the knowledge-grounded approach, where thinking is paramount. Despite what association

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members wrote on their website, feelings were to play no part in their daily practice. For them, reliable knowledge of nature could only be attained by leaving emotional sensibilities at the door. More than likely, these feelings had led members to that door, but once within the hallowed halls of science, only a professional detachment would allow them to arrive at defensible conclusions. They were not interested in a broader understanding of nature to be gained by uniting thinking and feeling. As my PhD supervisor at the Natural History Museum in London told me, "You're not here to understand anything!"

The supposed neutrality of science can be a reassuring refuge. If knowledge is the only aim, then we are not to make value judgments but only report on what appears to be the case, given the balance of probabilities. We aim for informative summaries of the data we have so painstakingly gathered. We conduct the analyses and produce the graphs that our chosen domain requires. We publish and go on to collect and analyze more data. In the face of the climate crisis and the decline of biodiversity, we can make a very good career documenting the crisis as it unfolds.

Reducing science to the accumulation of knowledge relieves scientists of the burden to act. The *Guardian* ran an article that struck an encouraging contrast. It described an attempt to renew seagrass meadows along the United Kingdom's coast and thereby to help reduce greenhouse gases, improve water quality, and provide valuable nurseries for commercial fish species. I was struck by the refreshing candor of one of the scientists behind the initiative, Richard Unsworth of Swansea University, for whom knowledge is a tool in the service of an overarching vision, namely the mutual flourishing of humans and nature. He wrote:

As a scientist, and as a father, I could spend the next 20 years writing awesome academic papers about seagrass decline or spend the 20 years doing something about it. We have a responsibility as scientists to act, as well as report [8].

Telling details leaping out

In my final year studying natural sciences at university, I took a course in vertebrate morphology and evolution. The course involved practical sessions where we studied fossils in the university museum's collections. I always remember the museum director teaching us how to look at a fossil of an acanthodian, a kind of early fish. He asked us simple questions such as "Where is the front?" or "Where is the top?" Before his simple questions, I could not make out anything in the fossil. I made a guess at where the fish's nose was and where the line of its back was traced out in the rock. Suddenly, telling details leapt out at me from the rock. I could now see the body outline and make out the fins, with a strong spine in front of each, the distinctive characteristic of the acanthodians.

I had a contrasting experience when I asked a young postdoctoral researcher for help. I was struggling to identify the bones of a fossil fish's shoulder girdle. He asked me no questions. In a matter of seconds, he produced a sketch of the fossil annotated with the names of all the bones. I saw that I had been confused because the cleithrum, a major component of the shoulder girdle, had in fact broken into many pieces during fossilization. On one hand, I was bewildered by how this researcher had worked that out. On the other hand, he complained about my asking him to carry out such a "labelling exercise" because this was not his role. I was none the wiser, however, as to how I could have come to the same conclusions as he.

In great contrast, the museum director guided us to ask simple questions about the fossil in front of us. We were able to help ourselves to understand the fossil better and make discoveries without detailed guidance. We were given time to get used to "reading" the fossils and to make accurate contact with them. He helped us develop our technique and skill. I remember his congratulating us at the end of the term, at the range of vertebrate diversity that we could now comprehend. He reminded us that this achievement would have been unthinkable when the course began.

For the brilliant postdoctoral researcher, the bones were just there in the fossil I showed him, but he was unable to guide me toward the same understanding because he made no place for showing and discussing—no place for dialogue. As a student, I needed to be quick, to need no time to digest, reflect or ponder to be able to grasp what he was presenting. There was no process, no gaining familiarity, no tricks for getting one's eye in, and no clues for understanding the peculiarities of this group of fishes.

This expert conveyed to me his knowledge, but I was left to my ignorance. I had a similar experience with another French wildlife association. The founder was a professional ecologist. He was helped by a retired engineer who had made his living at the paper factory in Beaucaire but had a keen interest in birds. On a field trip to look for birds of prey, I remember how the professional ecologist, while describing a particular species, commented that there were two nesting pairs in the neighboring valley. "How did that help us," I wondered? On another occasion, two birds passed us with a dipping flight. "They're pipits," he said, without explanation. Both times, he made an impressive, self-centered display of his knowledge that was not at all helpful to us learners!

In contrast, the retired engineer would take us aside and give us simple lessons. He taught us to recognize the song of the nightingale (*Luscinia megarhynchos*) [9]. I remember how he began to whistle the bird's song for us, and a nightingale responded in kind from the reeds! We would take turns looking through the binoculars at a distant group of birds, and he would point out the species that we could see. In this way, he helped my wife see her first swamphen (*Porphyrio porphyrio*) on a visit to the Camargue marshes [10]. In all, he accompanied us in our learning and helped us to grow in confidence and understanding.

You must remain critical!

I remember a discussion I had with the postdoctoral researcher in the university museum. He told me how a consensus was emerging for the existence of a previously unrecognized group of fossil fishes. I was excited. This was in keeping with my vision of what science was all about: patterns of order emerging

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where before there was only chaos and confusion.

Seeing my excitement, the postdoctoral researcher chided me, saying that the jury was still out, and we had to remain critical. I was expressing my vision, but he responded as if I were pretending to knowledge. For him, knowledge must be tested and evaluated critically in view of the evidence. My vision, on the other hand, was an intuition—of order in nature—that inspired me in my pursuit of science. The goal and ideal of science—*vision* in Bennett's tetradic sense—cannot be reduced to a state of knowledge.

One must also realize that contact with the material realm being studied may be distorted by the lens of knowledge in that cerebral abstractions can interfere with direct engagement with nature. Whereas the role of accurate knowledge in science is easily made explicit, scientists may remain entirely unaware of the roles of contact, technique, and vision.

Bennett points out how Rutherford and Faraday had an uncanny contact with nature and a sense of how to conceive and carry out experiments that would allow phenomena to reveal themselves [11]. With regard to technique, chemist and philosopher of science Michael Polanyi emphasized that practical mastery is often passed on by example, through apprenticeship. He also highlighted the role of vision in science—the scientist's intuition of a fruitful problem to study or of a possible solution even if dimly glimpsed. Polanyi explained how these "hunches" fuel the scientist's commitment to his subject [12].

The young postdoctoral researcher had spent years in contact with fossils, studying them, gaining a feel for their different peculiarities and developing a knack for recognizing bone patterns. To strengthen his technique, he worked patiently through repeated exposure to the source material. He read widely and developed a thorough knowledge of the field, not only the anatomy of the different animal groups but also of the process of fossilization. He clearly had a vision of science as the movement toward an ever more accurate picture of nature.

In his own practice, this researcher drew on all the tetrad's sources, cultivating a healthy balance among contact, knowledge, technique, and vision. One recognized this balance in the depth of his understanding and expertise. In his teaching, however, he evaluated my performance with regard only to the knowledge I displayed.

It is perhaps significant that this judgment was accompanied by an aggressive, competitive tone of voice, as if to say: "You should know by now what you're looking at. You should know this group of animals. I'm not here to do the work for you." His attitude was cold and demanding, in contrast to the warmth and patience of the museum director. This researcher gave me no time for prolonged contact nor time to develop my skills in looking, drawing and interpreting. He projected no inspiring vision to motivate me.

If the scientist follows the knowledge-grounded approach in his teaching, it becomes the student's responsibility to develop strategies to acquire understanding. There will be some students who have gained the required knowledge outside the lesson who will be able to complete the exercise without the teacher's assistance. There will be other students who have sufficiently developed their contact, technique and vision to quickly grasp what is required. These students will be able to carry out the learning task asking only a few pertinent questions. Yet again, there will be students who need to draw on all four sources to understand the lesson. Since these are not given explicit attention in a knowledge-grounded approach, these students will find it difficult to understand and to complete the learning task.

Following an understanding-grounded approach in one's teaching is more inclusive. This approach to learning levels the playing field, offering the opportunity for most students to progress. As clarified by the four terms of Bennett's tetrad, understanding-grounded learning highlights the role of craft in science and the journey to expertise, thus diminishing the distance between student and teacher.

In my experience, knowledge-grounded teaching is at times reduced to nothing more than testing, checking who already has the resources to complete the task. Rather than taking students from where they are and helping them to move forward in their apprenticeship, the teacher reminds them of what they don't know. The teacher holds on to his or her position of power and projects an air of mystique.

Learning and understanding

Understanding-grounded teaching is ultimately more successful and more valuable than knowing-grounded teaching because there is a direct, empathetic engagement with nature that resonates with the "wholeness" of human beings. As educator Stuart Hill insists: "It is important to ask: in what ways can education help us get out of the many messes we are in? Most current education will not significantly help us. In fact, it will result in a perpetuation of the mess, and most likely add to it" [13]. What styles of teaching offer a way out of this "mess" toward a just, sustainable coexistence of humans with each other and with nature?

In emphasizing the dominance of intellect and cerebral effort, the knowledge-grounded approach leads to a style of teaching that is top-down, hierarchical, competitive, and adversarial. In contrast, the understanding-grounded approach acknowledges the integral importance of contact, knowledge, technique, and vision. One can hold these four sources in mind as they each play a pivotal role in one's research and teaching. In this emphasis on understanding, science can involve the whole person, drawing on sensing, perceiving, thinking, feeling and intuiting.

Cultivating a student's understanding requires a style of teaching that is bottom-up, egalitarian, and collaborative. Knowledge assures that one's engagement with nature is well informed conceptually. But understanding is only possible when knowledge is integrated with technique. Only in this way does contact with nature ascend toward the much broader aim of comprehensive theory attuned to nature's diversity and unity.

For Hill, the choice of the best style of teaching is "profoundly simple." He writes:

[E]ducators can be most effective by enabling learners to clarify what they want to learn, and in supporting them in their

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unique learning journeys. This may involve empathetic, active listening, providing respectful, constructive feedback, appropriate challenging, facilitating access to relevant information and resources, mentoring, modelling and sharing (particularly of enabling stories from one's own and other's experiences, including from throughout history), acknowledging and celebrating efforts and achievements… Yes, if we approached education in this way humans might actually be enabled to become much more fully human, and who knows what might happen! [14].

Endnotes

1. For an introduction, see J.G. Bennett, *Elementary Systematics*. Bennett Books: Santa Fe, NM, 1993.
2. For an account of the four sources, see Bennett, *Elementary Systematics*, ch. 4 and pp. 67–69, which include an account of scientific activity. The tetrad's four sources as ground, direction, instrument, and goal are presented in J.G. Bennett, *The Dramatic Universe, Vol. 3: Man and his Nature*, p. 32.
3. *Elementary Systematics*, p. 68.
4. J.G. Bennett, *The Dramatic Universe Vol. 3*, §14.37.7, definition of "direction."
5. *Dramatic Universe Vol. 3*, §14.37.7, definition of "instrument." p. 7.
6. Bennett 1993, p. 68.
7. Bennett 1993, pp. 68–69.
8. https://www.theguardian.com/environment/2020/mar/10/uk-lost-sea-meadows-to-be-resurrected-in-climate-emergency-fight, accessed April 12, 2020.
9. https://www.oiseaux.net/oiseaux/rossignol.philomele.html, accessed April 14, 2020.
10. https://www.oiseaux.net/oiseaux/taleve.sultane.html, accessed April 12, 2020.
11. Bennett, *Elementary Systematics*, p. 67.
12. M. Polanyi (1958). *Personal Knowledge*. Univ. of Chicago Press.
13. S.B. Hill (2012). Education to Change the World, p. 1, http://doi.org/10.13140/RG.2.1.1435.7368; adapted from a radio broadcast, accessed April 17, 2020.
14. *Ibid.*, pp. 3–4.

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Seeing and Understanding Holistically

Goethean Science and the Wholeness of Nature

Henri Bortoft

Bortoft *(1938–2012) was a philosopher, physicist, and science educator who wrote* Taking Appearance Seriously *(2012) and the influential* Wholeness of Nature *(1996). This essay was originally a paper for the conference, "Goethean Science in Holistic Perspective: Scientific, Ethical, and Educational Implications," held at Columbia University's Teacher College, New York City, May 20–22, 1999. The essay is published with the permission of Jacqueline Bortoft. Note that, in the original written version of his talk, Bortoft does not provide complete references. Here, we have added citations as available, but some works remain unreferenced. The editor thanks Stephen Wood for assistance in locating references.*

This essay was originally published in four parts in the summer/fall 2018, winter/spring 2019, summer/fall 2019, and winter/spring 2020 issues of Environmental and Architectural Phenomenology. *Several readers have requested that we republish the four parts as one complete essay, and we provide that request here. See* EAP, *spring, 2013, for the "in memoriam" issue devoted to Bortoft, including his essay, "The Transformative Potential of Paradox."*

The central question I ask is what contribution Goethean science makes to understanding the wholeness of nature. I contend that there is something to be known about the wholeness of nature to which Goethean science can contribute. I was first introduced to the problem of wholeness by physicist David Bohm (1917–1992), when I became one of his post-graduate research students in the early 1960s (Bohm 1980, 2003; Bortoft 1982). Today, Bohm's name is associated with wholeness and quantum physics but, in fact, this topic was first recognized and explored by physicist Niels Bohr (1885–1962), who saw that a new factor in physics—what he called "an indivisible wholeness" and completely absent in classical physics—arose because of the indivisibility of the quantum itself.

Bohr was particularly concerned about the consequences of this indivisibility for measurement, a problem that led him to speak of the "unanalyzable wholeness" of the measuring apparatus and the phenomenon being measured. Faced with this concern, Bohr adopted a somewhat pessimistic view: Although physicists might be able to speak of the bare concept, "wholeness," this was all they could say. Thus, there was no possibility of identifying a more adequate, content-filled concept of wholeness than its "unanalyzability."

Bohr proposed that wholeness is an irrationality in nature just as the square root of the number two is an irrationality in mathematics. And just as the incommensurability of the length of the diagonal of a triangle with unit sides is accommodated by the extension of the system of integers and fractions to "cover" cases that do not fit into that number system, so Bohr believed it possible to accommodate the "irrational" wholeness in quantum physics by an analogous procedure of using the concepts of classical physics (the only physics he thought there could be) in a way that would "cover" wholeness, even though wholeness as such does not fit into that conceptual system.

Here, we reach Bohm's disagreement with Bohr: Bohm believed it was possible to have a *content-filled* idea of wholeness. The huge problem was how to do it?

Irreducible quantum wholeness

The irreducible wholeness in quantum physics is seen dramatically in the case of interference experiments with a single-photon light source. There arises the difficulty of thinking of the single photon as having a definite path as would be the case if the photon were a classical particle. If we insist that the photon is a classical particle, then we find ourselves in the contradictory position of saying that the single photon travels simultaneously in both one path and two paths. How at the same time can something that seems one also seem two? Here, with a vengeance, we have the irreducible wholeness of quantum indivisibility. As physicist Arthur Zajonc (1995, p. 299) explained,

Goethe was right [when he said about light, "How often do they strive to divide that which, despite everything, would always remain single and whole?"]. Try though we may to split light into fundamental atomic pieces, it remains whole to the end. Our very notion of what it means to be elementary is challenged. Until now we have equated smallest with most fundamental. Perhaps for light, at least, the most fundamental feature is not found in smallness but rather in wholeness.

Completely absent from the world of classical physics, the irreducible "quantum wholeness" became even more evident in the discussions between Einstein and Bohr that eventually led to the formulation of the paradox of Einstein, Podolsky, and Rosen (EPR) and its later reformulation in Bell's inequality theory (which has now received remarkable experimental confirmation; see Zajonc 1995). This research made evident that quantum wholeness cannot be described in terms of independent elements externally connected.

Quantum "non-locality" (as it is called) seems to involve "two" objects that are far apart physically and yet can be connected instantaneously as if they are not separated at all. Again, we have a situation where the language used contradicts what one is trying to say—i.e., we are trying to describe quantum non-locality in the language of physical locality.

In the quantum domain, reality cannot be broken down into independent parts and hence cannot be analyzed (if we mean by that word "broken apart and measured"). At this fundamental level of presence, the world cannot be thought of as composed of

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independent parts connected together in some way.

We do, however, continue to think in terms of parts and whole, largely because the very form of our language channels our doing so. Bohm pointed to the fact that the subject-verb structure assumed by modern languages tends to emphasize the role of separate entities acting on other entities, interacting by connections external to those entities themselves. He stressed how nouns are the dominant form, whereas earlier languages were often verb-based and therefore did not encourage speakers to think primarily in terms of separate, localized entities.

Niels Bohr himself was acutely aware of the crucial role that language plays in human understanding. In fact, it was a major source of his epistemological pessimism regarding quantum theory. As he explained, "We are suspended in language in such a way that we cannot say what is up and what is down" (Petersen 1985, p. 302).

Since Bohr assumed we cannot escape from this situation, he thought that the only way we could describe the quantum world was via concepts already available to us—i.e., the concepts of classical physics. Hence, we had to learn how to use these concepts in such a way as to accommodate "irrational" quantum wholeness without leading our understanding into contradiction. He mounted a heroic rearguard defense for a situation that he perceived as impossible.

Seeing wholeness directly

Bohm thought differently and brought attention to the relationship between forms of language and ways we perceive and think about the world. It was studying this relationship that partly led to my working with British philosopher J.G. Bennett (1897–1974) on the problem of language and the perception of wholeness. Bennett was particularly interested in time, believing that our ordinary language led us into wrong ways of thinking about temporal processes (Bennett 1956–1966). In my work with him, he proposed an experiment in which we adopted an artificial language that modified the way we describe simple actions and events (Bennett, Bortoft, and Pledge 1965).

The aim was to see how this different language might modify our perceptions. A key feature of the experiment was to avoid introducing what Bennett called "descriptive fictions"—i.e., factors introduced into descriptions that could not be found in experience. These factors often took the form of connecting linkages added to what was given directly in experience—for example, hypothetical entities functioning as hidden causal mechanisms. Whereas *what* was connected entered directly into experience, these connections themselves did not because they were postulated speculatively.

The discipline required to describe actions and events, excluding all interpretive fictions and yet giving a thorough description, seemed to focus our thinking in a new, unfamiliar way (as well as evoking states of extreme irritation and exasperation). We began to experience "breakthroughs" into a new kind of perception. There was a transformation in the *mode of togetherness* of the elements. At first, we saw these elements only as separated from each other but, over time, we realized they were connected *directly*. In other words, they were connected at the start and, therefore, there was no need to propose some extra "connection" added on after the fact.

In seeing this mode of togetherness in this transformative way, we realized that one can see wholeness directly, where "seeing" means phenomenological seeing and not the empiricist's reduction of seeing to just sense perception [1]. Although the context was different, we felt we had begun to learn how to do what Bohr had declared impossible: to see wholeness directly as it is in itself (Bortoft 1971).

Both separation and wholeness

Because nothing extra is added, this experience of transformation in the mode of togetherness can be described as a situation where "nothing has changed, but everything is different." When we *see* that the connections are intrinsic rather than extrinsic, separation does not suddenly disappear. Rather, we have *both together*: both separation *and* wholeness. The experience is twofold but not dual.

One can make a parallel with reading. Consider the three letters "c," "a," and "t" as they appear in the word "cat." Perceptually, the letters appear as separate, and we might attempt to overcome this separation by introducing external linkages as with "c-a-t." This device, however, eclipses the possibility of reading. When we recognize the meaning "cat," the letters remain separate but are also connected in a subtler way than linking them together by introducing an external connection of hyphens. This experience of seeing the meaning in complete words (rather than as separated but connected letters) parallels the experience of seeing wholeness directly.

Although I didn't know at the time, this way of seeing is in tune with Wittgenstein's "new way of thinking." What I also didn't realize was that the transformation in Wittgenstein's philosophy marking his later extraordinarily creative period was brought about by his encounter with the work of Goethe [2]. Wittgenstein's later philosophy is concerned with "the understanding that consists in seeing connections," which for him was a kind of seeing that did not need explanation because connections are encountered directly. This *direct* seeing of connections was crucial for Wittgenstein because he saw this kind of seeing as understanding so that seeing and understanding are one, and there is no need for explanation because it is replaced by seeing. Wittgenstein emphasized that to connect two things, we do not need a third because things connect directly—i.e., they already stand in connection with one another, and therefore there is no need to introduce some additional connection externally [3].

Discovering Goethe

My first encounter with Goethe came later and happened, by a stroke of good fortune, when a friend mentioned a book he thought I might find interesting—philosopher Ernst Lehrs' *Man or Matter* (Lehrs 1958), an introduction to Goethe's way of science. In reading the book's fifth chapter, "The Adventure of Reason," I suddenly found myself feeling completely at home. The limitation that Kant put on the human cognitive capacity to know wholes—"Above all, it is not given to such a thinking to think 'wholes' in such a way that through an act of thought alone the single items contained in them can be conceived as parts springing from them by necessity" (Lehrs 1958, p. 82)—reminded me of Bohr's strictures on our ability to understand quantum wholeness [4]. But here was Goethe declaring that he had done *in practice* the very thing that Kant declared impossible *in principle* for the human mind to know [5].

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In his conversation with Schiller, Goethe had said that "there must certainly be another way altogether [rather than a piecemeal way] that did not treat of nature as divided in pieces, but presented her as working and alive, striving out of the whole into the parts" (Lehrs 1958, p. 104). Goethe's work on the metamorphosis of plants illustrated this movement from the whole into the parts, rather than aiming to move from the parts to the whole, in the way it showed all the different organs up to the stem as metamorphoses of one and the same plant organ (Goethe 1790/2009).

As I read Lehrs, it seemed evident to me that Goethe could *see the wholeness* in nature directly and, more so, had developed a set of specific practices that could lead to this holistic way of seeing. In fact, one of these methods—*exakte sinnliche phantaisie*, or "exact sensorial imagination"—was familiar to me already from working with Bennett. We had found that the practice of what we called "visualization" to be extremely valuable for using the mind in a way allowing us to disengage from the habitual activity of mental associations, a dominant characteristic of the ordinary, discursive mind [6].

Besides Goethe's plant studies, there was also his work on color (Goethe 1810/1970). Here, his insistence on staying with the phenomenon and refusing to go "behind" it by the artifice of introducing hypothetical concepts or models seemed to be the aim of my work with Bennett, albeit our results were far inferior to Goethe's efforts, which had produced what amounted to an entirely new way of doing science (Bortoft 1996; Seamon and Zajonc 1998).

I also immediately made a connection between Goethe's work and quantum physics in that Goethe's method pointed to the renouncement not only of classical models in physics but of all models as such. This is the positive side of Bohr's understanding: by insisting that *all* models be renounced, he thereby returned physics to being truly phenomenological—in other words, returning to the original phenomena from which physics as a science arose.

Finding phenomenology

Clearly, there was much to learn from Goethe, and I began to explore his work in detail (Bortoft 1985, 1986, 1996, 2012, 2013). At about the same time as I began this task, Bohm distributed draft versions of his two papers on the implicate order, in which he took the hologram as a metaphor for the kind of wholeness that he saw as a fundamental new order in physics (Bohm 1980, chaps. 6 and 7). As with Goethe, here was another instance of going from the whole to the part. I realized that it should be possible to use this way of understanding to show how the radically new direction taken by Goethe was a reversal of our habitual way of thinking. At the same time, one could use Goethe's approach to illuminate Bohm's notion of an intrinsically implicate order. I was never able, however, to interest Bohm in the connection with Goethe, perhaps because he was not willing to see past scientists' and philosophers' typical stereotypical understanding of Goethe's science.

Also at this time, I discovered phenomenology, which came as a revelation—an experience of stepping into a different dimension of mind, but one that is there in front of us all the while, only hidden from our customary assumptions. The fundamental insight of Husserl's phenomenology is that we see the necessary structure of experience—the intrinsic necessity—and not just the discrete particulars of experience that empiricism assumes. Perception is twofold: simultaneously, an awareness of contingent particulars (just the facts as such) *and* perception of necessary structures, connections, and relations among the facts (the idea as such). Empiricism does not recognize this complementarity, collapsing the two into one, which it identifies with sense experience only. The result is endless confusion—e.g., the notion that experience itself is incomplete and requires something added by "the mind."

The key point is that we *see directly* the way in which the particulars are *necessarily* connected. We do not infer the necessary connection by means of intellectual speculation *after* seeing. We see the necessary structure directly because to know *is* to see—this is Husserl's fundamental insight and is not a metaphor. While we may say that seeing the necessary structure in the facts is analogous to the sensory seeing of the facts, it would be better to turn the phrasing around and say that sensory seeing is a particular species of seeing (instead of being the only *real* case of seeing, as is conventionally assumed).

It is the recognition of this integral togetherness of seeing and knowing that prompted Goethe's reply to Schiller, who had said, "That is no experience. That is an idea." But Goethe responded, "I am glad to have ideas without knowing it, and to see them with my very eyes."

Looking back via Husserl, we recognize that Goethe's statement was an attempt to express the insight that only came later with phenomenology—namely, that we can and do *see* ideas directly, but that lacking an adequate basis for being able to say this, Goethe made the mistake of attributing this seeing to sense perception. There is both a positive and negative here: negative, in that Goethe was mistaken about knowing being a matter of sense perception; positive, in that he recognized a way of knowing that is seeing.

In one sense, Goethe was a phenomenologist, and phenomenology is a crucial way of understanding his work, since it has always been too easy to mistake his efforts as naïve empiricism, which is not the case at all. It is his phenomenological way of seeing that is exemplified to some degree by his science of color and his work on the morphology of plants. One finds more recent examples in the work of zoologist Wolfgang Schad (2019) on the morphology of mammals; and the work of biologist Craig Holdrege (1998) on seeing animals whole. There is also the work of ecologist Mark Riegner (1993, 1998), who examines the wholeness of landscapes as revealed through their flora and fauna.

Husserl and Wittgenstein

As my work proceeded, the discovery of an unsuspected affinity between Husserl's phenomenology and Wittgenstein's later philosophy was particularly astonishing, since many commentators claimed that the two thinkers were philosophical antipodes. What we realize today, however, is that both Husserl and Wittgenstein, in different ways, were working toward the same recognition: that there is a direct kind of *seeing* that *understands* without explaining—without the *need* to explain—because this way of understanding *is* seeing. For Husserl, to know is to see; this aim takes the form of seeing the necessary, intrinsic structures of the phenomenon. For Wittgenstein, there is a way of seeing that is also a way of understanding, which takes the form of seeing connections—the inten-

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sive interlinkages wherein things are together directly because they "already stand in connection with one another."

In this sense, the differences between Husserl and Wittgenstein are far less significant than their common ground: an experience of direct seeing likened metaphorically to another dimension of the phenomenon itself. In other words, what at the start is seen as only "two-dimensional" is suddenly seen as "three-dimensional" [7].

Affinities

But only with the publication of Ray Monk's Wittgenstein biography in 1990 (Monk 1990), did I first learn of the crucial influence that Goethe had on Wittgenstein's emphasis on "the understanding that consists of connections." Monk claims that this emphasis on *seeing* connections has no precedent in the Western philosophical tradition "unless one finds a place for Goethe… in that tradition" (Monk 1990, p. 316). In this sense, one might describe the Goethean way of seeing the wholeness of nature in the manner of either Husserl or Wittgenstein. For example, in his perceptive study of the horned mammals, Schad makes visible what he calls "the awesome inner logic of the organism" (Schad 1977, p. 118), which could just as easily be interpreted as seeing the necessary structure or principle (Husserl) or seeing the "grammar" of intensive connections (Wittgenstein).

Reflecting on the beginnings of my own interest in the question of wholeness, I realize that the work done by a small group of us with Bennett in the 1960s was unwittingly an initiation into a wider movement in modern consciousness. Our stumbling attempts to learn how to see wholeness directly in things, prepared a doorway for us to enter into a much more comprehensive cultural stream than any of us could have realized at the time. The pathway I have taken since then reveals certain unexpected affinities:

- Goethe's way of seeing is illuminated by Husserl's phenomenology, which among other things, shows us the difference between Goethe's science and the phenomenalism for which superficially it can be mistaken;
- Wittgenstein's later philosophy was inspired directly by his encounter with Goethe's way of seeing; consequently, Goethe's way of seeing is illuminated by Wittgenstein, just as Wittgenstein's "new way of thinking" is illuminated by Goethean science;
- Husserl and Wittgenstein were, each in his own way, really concerned with the same kind of seeing; thus, unexpectedly, one realizes an affinity between two thinkers long thought to be different in their ways of understanding.

Toward a science of wholeness

As I hope the above discussion indicates, I am interested primarily in seeing and understanding wholeness, which necessarily requires a phenomenological science. My concern with Goethean science is the extent to which it contributes to this science of wholeness. In locating Goethe's contribution to this effort, I begin by considering his work in the context of the historical development of modern science—a task that Goethe himself found of considerable interest.

In spite of our shifting understanding of the nature of science, the "myth" of empiricism continues today to dominate science education and popular understanding. This perspective assumes that scientific knowledge is based directly on the experience of the senses. Empirical observations and experiments are the grounds upon which scientific knowledge is built. In this view, modern science began when human beings "came to their senses" and no longer relied on religious or philosophical speculation.

The history of science, however, does not support this view. In fact, when we look at the major scientific developments from Copernicus to Newton, we find that what actually unfolded was the opposite: people "took leave of their senses" *in favor of the mathematical*. From the beginning, modern science elevated the mathematical above all other aspects of nature. Renaissance scientists like Galileo contended that the experience of the senses was an illusion and that reality was to be discovered accurately only by going behind experiential appearances to discover mathematical relationships, ratios, and harmonies not visible to the senses directly.

But why should the mathematical be elevated above all other factors with the consequent demotion to secondary status of all non-mathematical aspects of a phenomenon? There was nothing like this demotion in medieval science, where mathematical certainty had its place but was not given the privileged status of *the* way to truth. Furthermore, there was no objective basis for this demotion in that no one suddenly "discovered" that reality is only mathematical.

In fact, this emphasis on the mathematical had no "scientific" basis. It was not discovered by science but *incorporated into* science. Grounded in the cultural-historical ethos of the time, this mathematical emphasis points to a free-standing decision to do science in this way. "Free-standing" is the crux here, since there is nothing inherent in nature that requires consideration only in terms of its mathematical aspects. There is no *intrinsic* scientific basis for this mathematical choice. Rather, this choice works as a *precept*: this is how science will be done and specifies what counts as "scientific." The result is a new organizing idea that transforms science itself.

The historicity of science

The rejection of the senses and the affirmation of mathematics as the source of truth arose from the way in which Platonic philosophy was interpreted in the Renaissance (together with the role of the Sun as representative of God in the visible world and therefore the center of that world).

This shift in understanding relates to what historians of science now refer to as the intrinsic historicity of science: that cultural-historical context enters into the very form that scientific knowledge takes. This recognition of an intrinsic historical dimension means that science is not, as is often assumed, a self-founding and self-generating activity with absolute foundations. Nor does this contextual recognition mean that scientific knowledge is somehow arbitrary or relative in a subjective sense. What it does mean is that nature is portrayed in its mathematical aspect because that aspect is an integral part of what nature is. But this way of understanding does not preclude that there are other ways in which nature can manifest and thus be.

Once, however, scientists embark on a research program emphasizing mathematical knowledge, the possibility of understanding nature in other ways is mostly set aside. At least at first, there was no suggestion that sensory qualities were not real aspects of the world, even if they were not

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considered to be as fundamental as nature's mathematical dimension.

Over time, however, sensory qualities were denied any "objective" reality in themselves and, instead, were taken to be entirely subjective. Galileo seems to have first introduced this ontological bifurcation into physics, and this point of view was subsequently adopted by others, most notably Descartes. The result was that anything in nature not mathematical (i.e., identifiable via quantity) was assumed to be "subjective" and thereby excluded. The eventual result was the impoverishment of nature [8].

Incorporating secondary qualities

Goethe recognized that this elevation of the mathematical above other qualities of nature was unwarranted in that the emphasis had no *intrinsic* validity. He did not seek to devalue the mathematical approach but to restore the distinction between the sciences and mathematics in situations where this distinction had become confused, thus distorting a fuller understanding of nature [9].

His major aim was to renew the significance of the so-called "secondary" qualities of the natural world. In his light studies, for example, he took color as a phenomenon in its own right and, by giving attention to the *phenomenality* of color, he sought to discover the laws of color phenomenologically. He hoped to locate the necessary connections that constitute the "inner logic" of the qualities of color (such "laws" being the equivalent in a phenomenological science of the quality of color to the mathematical laws in the quantitative science of light).

The irony is that, in returning *directly* to the phenomenon via firsthand, sensuous experience, Goethe was doing what many people assume science does anyway but which in fact is not done in its mathematical version.

A dynamic way of seeing

Goethe's method for a science of color can be specified in one word: *attention*. He *gives attention* to the phenomenon in question and thereby strives to guard against the introduction of any theoretical factors outside the phenomenon. Such external factors could only have the effect of obscuring the necessary connections within the phenomenon itself and substituting for the perception of necessity in the phenomenon what is no more than an external explanation—"external," that is, as compared to the intrinsic nature of the phenomenon itself [10].

Goethe directed attention to the phenomenon in two stages. First, he attempted an *active seeing*, a way of encountering the phenomenon considerably different from a taken-for-granted registering of sense impressions. In active seeing, one works to reverse the direction of seeing so as to go from the observer into the observed (rather than from the observed to the observer, which is the habitual way in which one looks and sees).

This effort of active seeing is followed by what Goethe called *exact sensorial imagination*, in which one attempts, without looking, to re-envision the original encounter. The effort is an imaginative but accurate consciousness of the phenomenon [11]. Unlike any fanciful imagination that embroiders the phenomenon and envisions it as something more or less than it is, the aim of exact sensorial imagination is to be as true as possible to the perceived phenomenon. But this is not a static activity as if the aim were just to achieve an "inner" picturing of the phenomenon. Because we attempt to make the imaginative seeing happen in a way that we do not need to do with "outer" perception, there begins to be movement and flexibility in our inner picturing.

It is by this means that consciousness shifts, and one becomes a participant in the coming-into-being of the phenomenon rather than an onlooker observing a finished product. This shift of consciousness—from static observations to unfolding process—is the key to Goethe's dynamic way of seeing. It is this different way of encountering nature that is Goethe's most valuable potential contribution for deepening our understanding today [12].

Goethe's prism experiments

We can get some idea of Goethe's method by considering the experience of looking through a prism at a white rectangle with a black background. One sees colors at the rectangle's horizontal edges: red, orange, yellow at one edge; violet and light blue at the other.

When we begin looking, we tend to focus on distinguishing colors. We give attention to the quality of each color and then try to do for ourselves, via exact sensorial imagination, what nature provides via direct experience. We visualize the colors at each edge, seeing them together in the order in which they appear. By making ourselves reproduce the phenomenon we have seen in our mind's eye imaginatively, we become aware of an aspect of the colors subtler than their separation into "red," "orange," "yellow," and so forth.

One comes to realize that the colors are not just juxtaposed externally but *belong* together. There is a "belongingness" among the colors at the two edges not visible in sense experience alone. One can express this quality by calling it "unity without unification" (though perhaps "wholeness" is preferable to "unity" here).

One can recognize this "belongingness" in Heidegger's distinction between "*belonging* together" and "belonging *together*." In the former, the "belonging" determines the "together," whereas in the latter the "together" determines the "belonging." In the latter case, we may "together" things that don't "belong" or simply miss the way in which things *already* "belong" independently of any attempt on our part to "together" them [13].

In workshops, it happens quite often that one or two participants spontaneously experience a "movement" in the colors at the edges. For example, one participant might say that "the colors seem to grow out of one another," or someone else suggests that "the boundaries of the colors have dissolved, and I feel like I'm 'swimming' from one color into another."

Goethe himself commented that no color can be considered as stationary [14]. For participants not coming to this shifting pattern directly, one can provide a "guided" visualization from white to pale yellow, orange, red, and black, and then the reverse. Practicing this shifting pattern of visualizing helps to facilitate a flexibility of seeing [15].

Working with exact sensorial imagination in this dynamic way has the effect of strengthening the initially weak sense of the colors *belonging* together. One result is that we begin to experience a quality of necessity in the colors. Instead of red, orange, and yellow experienced as merely contingent—as if the order of these colors were

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just accidental—we *experience* the order in the qualities as *necessary*.

One way to become more aware of this non-contingent *belonging* is to visualize an incorrect color sequence—e.g., red, blue, yellow. Most participants recognize that this arrangement simply does not fit: "The blue popped out when I tried to make it go between red and yellow. And the blue makes a separation between the red and yellow. They no longer seem together" [16]. It is crucial to our understanding of Goethe's way of science that we can come to have the experience of *necessity* of the phenomenon itself. We are familiar with this requirement in mathematics, to which it is usually supposed that the intuition of necessity is restricted.

It is here that Goethe's way of science becomes phenomenological instead of being either phenomenal-empirical or hypothetical-speculative. In both the latter situations, one goes outside the phenomenon to introduce elements of another kind from outside the domain of color qualities themselves—e.g., wavelengths and their instrumental measurement.

In rephrasing the phenomenon in these ways, there is no longer any necessity within the phenomenon. It has been converted into something other than itself. When we see the necessity, then it is part of understanding the phenomenon that there is no need to look beyond it for anything further. This point is very difficult to explain to anyone who has not yet had the experience of necessity [17].

A corollary is that, when we have not reached the experience of necessity, then we feel impelled to search for some explanation external to the phenomenon. One recognizes this importance of necessity in Goethe's often-quoted remarks:

- *Let the facts themselves speak for their theory.*
- *Don't look for anything behind the phenomena; they are themselves the theory.*
- *The greatest achievement would be to understand that everything factual is already its own theory [18].*

The Urphänomen

There is an awkward point in workshops on Goethe's approach to color in which participants must make a transition from the experiential investigation to what Goethe called the *Urphänomen*—the primal or archetypal phenomenon of color. Goethe does not mention this transition in "Contributions to Optics" (1792), in which he limits himself to an investigation of the formation of colors at different boundaries when seen through the prism [19].

The "awkward point" is that the introduction of the primal phenomenon seems like a discontinuity—a sudden jump in seeing. For sure, the workshop leader can smooth this transition over as a conjuror does when he comes to a "gap" in his performance that he covers in a way that spectators don't notice. But the fact remains that Goethe does not describe how he came to his claim regarding the *Urphänomen* that "One instance is worth a thousand, bearing all within itself"—a claim that, in relation to color, he found in the shifting colors of the sun and sky [20].

Goethe speaks of this jump from lived experiences of color to the broader *Urphänomen* as an *aperçu*—a sudden moment of insight and understanding. But this explanation does not tell us *how* Goethe came to relate these particular facts—i.e., the changing colors of the sun and sky—to the original prism experiments [21].

This recognition that there must be an "instance worth a thousand, bearing all within itself," indicates that Goethe's way of proceeding is phenomenological rather than empirical. An empirical procedure would collect many different instances of a phenomenon and compare them to find something they had in common. The presence of this commonality would then be taken to be essential for the occurrence of the phenomenon. An empirical approach involves *induction*—i.e., generalization arising from many cases.

In a phenomenological approach, in contrast, only one instance is needed to see what is essential. The difference is that, phenomenologically, we see the necessary principle in the facts. We do not infer, deduce, or construct this principle but *see it directly*. This is not to say that such seeing always happens clearly at once. Rather, the recognition will more likely be achieved only with difficulty because, in many instances, there will be contingent and accidental factors that obscure what is necessary and essential.

What is needed is an instance in which these "asides" are reduced to such a degree that what is necessary and essential—i.e., the pure phenomenon—shines forth in seeing. This is the phenomenological grounding for the "One instance worth a thousand, bearing all within itself."

Universal and particular together

What we realize in Goethe's phrasing here is the emphasis on the universal in the particular. We don't see the particular as just an instance of the universal in the way that a particular triangle is an instance of the universal "triangle." Rather, we see the universal in the particular so that, instead of being *merely* an instance of the universal, the particular becomes a "window" through which we *see* the universal. Or we might say that the particular is a "mirror" in which the universal *appears*.

This seeing is twofold—i.e., simultaneously universal and particular. Crucially, however, *there is no separation*. The universal is twofold but non-dual; it is not "behind" the particular and separate from it.

The philosopher Ernst Cassirer emphasized that, for Goethe, "the particular and the universal are not only intimately connected but… they interpenetrate one another." Goethe said that "The universal and the particular coincide: the particular is the universal itself appearing under different conditions." The mode of consciousness that sees the universal in the particular is "inside out" to that which sees the particular as merely an instance of the universal.

In relation to Goethe's color studies, one realizes that, via the varying colors of sun and sky, we see how colors arise from light and dark alone—the darker colors arising from light overcoming darkness; the lighter colors, from darkness overcoming light. The qualities of the different colors become intelligible in themselves.

In addition, the order of the colors becomes intelligible, and the quality of necessity is now grounded in the coming into being of the phenomenon itself—as also does the experience of the *belonging* together of the colors, particularly the two different edge-color phenomena, which are now seen to *belong* together as a dynamic polarity.

Where with the senses we see separateness, we can simultaneously see wholeness—as we now see the wholeness of the *yellow* sun and the *blue* sky, which are otherwise just juxtaposed facts. Where before there was only contingency, there is now

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necessity grounded in the coming into being of the phenomenon.

This dynamic relationship is seen especially when the "poles" of the two color edges are brought together and green appears [22]. Now for the first time we have the colors that Newton described as the "spectrum of light" and that he took as the *beginning* of his investigation. But now, instead of being just a contingent arrangement of colors, this spectrum is a necessary whole and intelligible as such. Each color is intelligible in itself and hence in relation to the others, in terms of its coming into being.

Newton wrote about the *origin* of the colors seen with the prism, but the so-called "spectrum of light" that he took as his starting point is a secondarily derived phenomenon instead of the simple phenomenon he took it to be. He began with what is in fact already a "finished product" that he then tried to explain by projecting the colors back into light, imagining them already there but not visible until separated by the action of the prism. Newton's claim was that the prism simply brings out what is already there [23].

Newton's understanding here reminds one of the person who, in Rumi's saying, tries to "reach the milk by way of the cheese." What Newton claims about the origin of color is like saying that cheese comes from milk because it is in the milk already. He no more describes the *origin* of color than this saying describes the origin of cheese.

Goethe, on the other hand, *does describe* the origin of color. He shows how the colors are "excited" in the light when conditions are right. When conditions cease, the colors cease. Instead of starting with a phenomenon that is a "finished product"—the so-called spectrum of colors—he follows through the coming into being of this phenomenon. In doing so, he *consciously participates* in the phenomenon instead of remaining an independent onlooker.

Different movements of thinking

In making this transition from the phenomenon in its finished state to its coming into being, Goethe ends up where we usually begin. What he does, in effect, is to go back "upstream" and "flow down" again to finish where the standard Newtonian explanation begins, a direction of understanding that simply flows further "downstream" while giving the illusion that it is returning to the source by back-projecting the finished product into the origin.

There are two quite different movements of thinking here. If we cannot transform from the product into the producing, then our efforts at explanation can only take us further away from what we imagine they take us toward. The result is Goethe's dynamic mode of consciousness: to follow the coming into being of the phenomenon instead of beginning with the phenomenon in its finished state. This different way of seeing and thinking may be his most important contribution to our understanding today.

From the whole into the parts

Goethe's way of seeing dynamic wholeness is encapsulated in his remark to Schiller that there must be a way of seeing nature that "presented her as working and alive, *striving out of the whole into the parts"*(my emphasis). We notice here a reversal in perception: not from the parts to the whole, but from the whole into the parts. The parts are seen within the whole, instead of seeing the whole arise out of the parts. This way of seeing nature, "striving out of the whole into the parts," is illustrated by Goethe's own work on the metamorphosis of flowering plants and also in current Goethean research—e.g., Craig Holdrege, Mark Riegner, and Wolfgang Schad's interest in the wholeness of the animal organism and the organization of mammals as an organic whole [24].

There are two common misunderstandings of Goethe's way of seeing the metamorphosis of flowering plants. First, there is the misunderstanding that what he meant by metamorphosis is a historical or procreational change—i.e., that one organ changes directly into a different organ as if, for example, a petal *changes into* a stamen. This misunderstanding has been particularly encouraged by erroneously thinking about Goethe in Darwinian terms.

The other misunderstanding is to suppose that Goethe thinks of the different organs up the stem—leaf, sepal, petal, stamen—as being formed on the same pattern according to a common plan. This so-called "ground plan" is imagined to be what the different organs have in common—their lowest common denominator. It is supposed that this is what Goethe means by the *Urorgan*, a term often translated either as "primal organ" or "archetypal organ" (each of which is misleading in its own way, the first leading in the direction of Darwinism; the second, in the direction of Platonism). Similarly, when Goethe talks about the *Urpflance*, it is supposed that he means what all the many different plants have in common—the group plan of all plants. Here, again, the terms "primal plant" and "archetypal plant" are misleading.

These misinterpretations can be dispelled by looking at what Goethe *says* (though he does not always help himself here) and, on this basis, learning to *see* the plant "striving out of the whole into the parts." It will help to first consider what others have said about Goethe before considering what Goethe says himself. At the start, however, we should note that it is unrealistic to consider Goethe in isolation from the context of his time, a period when the search for "archetypal forms" was a concern of many thinkers. In Germany, this interest was known as "transcendental morphology"; in France, "philosophical anatomy." This approach extended to all organisms—for example, the attempt to find an archetypal form for all vertebrates (pursued especially by Richard Owen in England).

Comments made about Goethe, therefore, are typical of what is said of the morphological approach in general. In fact, Goethe (who coined the term "morphology") is almost invariably taken as representative of this school of biological thought, even though his way of thinking is dynamical throughout and is different from the more static thinking of others with whom he is often associated in the search for archetypal forms in the organic world.

An abstract, reductive unity

Bearing this historical context in mind, the following are typical examples of the kind of thing said about Goethe, together with similar statements about the project of transcendental anatomy in general and the contribution of Richard Owen in particular. These examples are taken from books that happen to be on my shelves [25]:

"Goethe searched for the ideal archetype of the vegetable world, the general plan common to all plants."

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"Goethe perceived the unity of plan or structure common to whole groups of organic beings."

"Goethe believed that nature, despite its diversity, was a manifestation of a single plan or 'Idea'. Consequently, it was his object to reveal the underlying unity of nature."

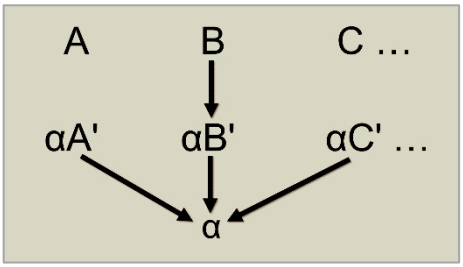
"Seemingly influenced by Plato's theory of Universals, Goethe was transfixed by uniformities and commonalities in nature."

"The distinguishing characteristic of transcendental anatomy was the presupposition of an Ideal Plan or Type that lay behind the great multiplicity of visible structures in the animal and plant kingdoms."

"For Owen, … nature's plan could be demonstrated … by seeking the underlying unity beneath the diversity of living forms. He sought the 'archetype' or ground plan on which all forms of life, or at least the vertebrates, are modelled. The archetype was an idealized vision of the simplest form of living creature, from which the anatomists' mind had been stripped the specialized organs required by real living beings."

We can recognize what happens here by following the *movement of thinking* that produces these statements. We realize that this movement *begins with the finished products*, whether organs or organisms. This manner of thinking begins from a set of entities taken as given, and from there it can only go farther "downstream," abstracting from the entities what is "common." Thus, by comparing any one organ or organism with another, this manner of thinking looks for similarities and rejects differences, until one can identify one factor as present in every organ or organism of the set. This factor is then taken as what the specific individuals all have in common. The result, therefore, is unity in the multiplicity.

Thus, *beginning* with a set of *given* organs or organisms A, B, C … (that organically are "finished products"), we reconstitute them in the form of αA', αB', αC' …, where α is what is common and where A', B', C' … comprise all about them that is different. This reconstitution can be represented in the drawing above, next column [26].



We come in this way to "unity and multiplicity" by the elimination of difference. The result is a unity that is abstract and reductive because it abridges multiplicity to unity and diversity to identity by finding the respect in which the different "entities" (organs or organisms) don't differ at all but are the same. This is the static unity of self-sameness, generated by a manner of movement—"unity in multiplicity"—that is the unity of the dead end. I repeat:

"Unity in Multiplicity is the static unity of self-sameness."

With this movement of thinking, the "entities" can be anything whatsoever. In the early "Socratic" dialogues of Plato, for example, they are virtues. The following quotations are some other examples (at least in the form given to them by modern English translations). From these phrasings, one notes that the movement of thinking is to look for "unity in multiplicity"—a unity in which all differences are cancelled out, leaving only what is everywhere the same [27]:

"What is that common quality, which is the same in all these cases, and which is called courage?" (Laches)

"Isn't it true that in every action piety is self-identical? … What I urged you to do was not to tell me about one or two of these many pious actions but to describe the actual feature that makes all pious actions pious. For you were in agreement, surely, that it is virtue of a single characteristic… that all pious things are pious." (Euthyphro)

"We have discovered a number of virtues when we were looking for one only. This single virtue, which permeates each of them, we cannot find…. What is the character in respect of which they don't differ at all, but are all the same?" (Meno)

The idea of unity illustrated by these quotations is the unity of what is "common." But the common property that constitutes this unity is not separate from it but there in the multiplicity. The "unity in multiplicity" is *part* of the multiplicity of the given, being in fact a selection from the contents of the given and is, therefore, not in any way different or separate from the many individual entities (organs or organisms). This is what is meant by saying that "unity in multiplicity" is an abstract unity.

Yet if we look at expressions such as "the underlying unity beneath the diversity" or "an Ideal Plan or Type that lies beneath the multiplicity," we realize that the very form of this phrasing introduces a *separation* between the unity and the multiplicity, as if the unity had been hypostasized into an abstract object itself. It is as if the idea of unity as what is common to many had "solidified" into a mental impression of the common property as an abstract entity and, as such, is separate from the multiplicity given to experience.

This manner of understanding produces a "doubling" of the world—an unnecessary duplication that is the source of metaphysics. The implication is always that the unity "behind" or "underlying" the multiplicity is in some way superior to, or more fundamental than, the multiplicity itself. In this way, a two-world theory develops that incorporates an ontological dualism: The unity is more real than the multiplicity even though it is the latter that is the more immediately visible.

The most influential example is the philosophical tradition of Platonism, which cannot by any means necessarily be identified with Plato himself in any straightforward way. In Platonism, we encounter the primary reality of Forms or Ideas over the reality of visible objects that are secondary. The relation of the unitary platonic archetype to the multiplicity of sensory objects—e.g., Beauty to the things that are beautiful—is referred to as "being the one over many." Here, the unity is made transcendent and, as Aristotle pointed out, the result is an unnecessary duplication of the world of sense objects, since, in its crude aspect, the reality of Forms or Ideas is clearly derived from the very sense world whose true origin the Forms or Ideas are then back-projected as being.

What we recognize here is the hypostatization of the "unity in multiplicity" to "a

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unity underlying multiplicity," a situation of trying to "reach the milk by way of the cheese," as a consequence of beginning from things in their finished state (the given) and then going farther "downstream" in abstraction, instead of reversing the movement of thinking so as to catch things in their coming-into-being and thereby ending instead of starting with "the given" [28].

Mathematical thinking

The unity in the manifold phenomenon appears in the form of a "law of nature" in science, where it also usually takes a mathematical form. Though such laws *do not* in fact have the form of "unity in multiplicity," they are nevertheless most often presented and understood as if they did. In itself, mathematical thinking is intrinsically dynamical, and its mode of unity is very different from the static unity of what things have in common. From the way, however, that mathematical thinking is seen *afterward*—from an awareness of the "finished product," which sees only the *results* of mathematical thinking and not the dynamics of the thinking itself—it seems as if the mathematical laws of physics refer to what phenomena have in common, so that the unity in the phenomena that they characterize has the form of "unity in multiplicity."

Certainly, this is undeniably true of the way in which science is taught today. Take, for example, Galileo's discovery that, for uniformly accelerated motion, the total distance traversed from the start of the motion is directly proportional to the square of time that has elapsed. It is simply supposed that, by experiment, this law was found to be the common factor in many instances.

The history of science shows, however, that this law was not discovered in this way at all. In fact, the philosophy of science shows that it *couldn't* have been discovered in this way. Certainly, it *can* be presented afterward (beginning with the "finished product") *as if* it had been, and therefore *as if* the unity in the phenomenon that this mathematical law represents has the form of "unity in multiplicity."

From this external point of view, it does seem to be the characteristic of mathematical laws of physics that they exclude the ways in which phenomena differ in favor of what they have in common. In relation to Galileo's discovery just mentioned, this law is the same for *all* bodies moving with uniform acceleration (neglecting air resistance), no matter how they differ in weight, size, physical nature, or chemical constitution; where they are on the earth (or anywhere else); whether or not they are moving; and so on.

It is with Newton that this idea of the universality of science really caught hold of the imagination, and the idea of a unified science that applies to all natural phenomena begins to have widespread influence, not only in science but in the entire Western culture [29]. Newton's first law of motion stipulates that "Every body…."—in other words, it is true regardless of *all* differences whatsoever. In fact, the very term "body" in physics seems to denote a lowest-common-denominator "thing" that has been stripped of all differences.

But it was really Newton's law of gravity that captured the imagination and became the very paradigm for the movement of thinking that finds "unity in multiplicity" or "identity in diversity," whereby the common factor within different phenomena comes to be seen as what is "essential," whereas the differences come to be seen as merely "superficial." How utterly unexpected it was to discover that the proverbial apple falling from the tree, the moon orbiting the earth, and the planets and comets circling the Sun (all of which are evidently so different), nevertheless have something in common with regard to which they don't differ at all but are the same. And then to "discover" that this pattern applies to all bodies in the Universe!

We are so accustomed to this line of knowledge that we not only fail to be surprised but fail to notice the movement of thinking that it assumes. The point can be made by seeing this manner of understanding through the eyes of someone from another culture in which it has not become "second nature" to think in this way. One example is what Nobel-Laureate physicist T.D. Lee said when asked about his educational experiences in China before emigrating to America:

Without hesitation, Lee replied that it was the concept of universality of physical laws that had struck him most deeply—the idea that physical laws applied to specific phenomena here on earth, in one's living room as well as on Mars, was new and compelling…. [30].

Unity behind multiplicity

In the historical development of science, the laws of nature have not only been understood as being the "unity in multiplicity" but, more fundamentally, as being the unity *underlying* or *behind* the multiplicity. This perspective comes directly from the influence of Neoplatonism on the development of modern science, with its emphasis on the mathematical, together with the influence of the Christian tradition [31].

What this means is that the mathematical laws of nature are conceived as separate from, and acting *externally upon*, matter in the manner of the two-world metaphysics of Platonism. In this picture, it is the mathematical laws that are ontologically more fundamental. In other words, they act on matter—i.e., they are not intrinsic to matter but *impose* order on what otherwise is chaos.

Thus, in the fashion of metaphysical dualism, these mathematical laws transcend the world they act upon and were identified as being thoughts in the Mind of God, who was therefore conceived as a divine mathematician with his priest, the physicist, illuminating the mathematical Plan of Creation. Although this identification with God has now dropped out of science—notwithstanding the tendency of some mathematical physicists from Einstein to Hawking to resurrect it—the dualism that it entails has not dropped away.

In some ways, this dualism is even stronger in contemporary physics than ever before—for example, the fundamental equations of a unified field theory are thought by some physicists to be independent from, and ontologically prior to, the material universe itself. This claim often seems strange to laypeople who suppose that physicists discovered mathematical laws from an investigation of the *intrinsic* properties of matter itself—i.e., these laws are not beyond matter but essentially part of it. This puzzlement is reasonable, even though, if the laws of nature had not been conceived as being separate from the matter they act upon, and if the intrinsic nature of matter had had to be understood first, then more than likely modern Western science would not have developed at all.

Again, a comparison with the Chinese situation makes this point clear. In traditional Chinese culture, the belief was that order developed spontaneously in the world, out of the intrinsic character of the

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things themselves. Thus, the Chinese idea of law was that it was latent within things and not imposed from without. Hence, since everything had its *own* law, there was no idea of *universal* law in the Western sense. Consequently, the kind of scientific thinking that developed in China was very different from modern Western science [32].

This kind of thinking was subsequently extended from the physical to the organic sciences. The idea was to find the morphological laws of organisms, which would be for biology what the mathematical laws were for physics. The result would be biology as a properly based science as physics already was.

As suggested by the quotations I presented earlier, the kind of unity looked for in morphology was the "unity in multiplicity" formed when the movement of thinking begins with the finished products. As in the case of physics, however, this assumption did not stop at simply discovering what different organs or organisms had in common. This "common plan" was very often made transcendental—i.e., as a unity *underlying* or *behind* the multiplicity. This archetype was conceived as being *separate* from the organs or organisms that it organized, like the mathematical laws of physics. This archetypal understanding could play the role in biology equivalent to that played by the laws of physics.

Thinking moving upstream

We have already seen that Goethe is often associated with this manner of understanding. We will now see, however, that the movement of his thinking is entirely different—in fact, it moves in the opposite direction. To provide this understanding, we will follow the same procedure as before by looking at some of Goethe's statements. Once again, it is a matter of following the movement of thinking grounding these claims [33]:

"Hypothesis: All is leaf. This simplicity makes possible the greatest diversity."

"It has occurred to me that in the organ of the plant that we ordinarily designate as leaf the true Proteus is hidden, who can conceal and reveal himself in all forms. Forward and backward the plant is only leaf."

Nature "produces one part of another and creates the most varied forms by the modification of one single organ."

"The process by which one and the same organ presents itself to us in manifold forms has been called the metamorphosis of plants."

"It is a growing awareness of the Form with which, again and again, nature plays and, in playing, brings forth manifold life."

"The thought becomes more and more living that it may be possible out of one form to develop all plant forms."

In these descriptions, we see nature "working and alive, striving out of the whole into the parts" and not just what the parts have in common externally. Instead of beginning from the "given" (the finished organs or organisms) and going farther "downstream" to abstract what is common, Goethe's thinking moves "upstream" and "flows" down with the coming-into-being of the phenomenon. Consequently, he ends with "the given" that, in contrast, is the arbitrary point of departure for modes of thinking assuming "multiplicity in unity."

This facilitation of coming-into-being is the dynamic thinking of the participant mode of consciousness instead of the static thinking of onlooker consciousness. What we see is the dynamical unity of the coming-into-being instead of the static unity of the finished products. We could say that this result is the dynamic unity of the living source instead of the static unity of the dead end.

This way of seeing turns the one and the many inside out. Instead of many different ones that are the same, we now see one that is becoming itself in many different ways. What is important to understand is that each of these different manifestations *is* the one itself and not another one—it is other but not another.

What we have here is *self-difference* instead of self-sameness, whereby each is the very same one but differently instead of each the different ones being the same. If we follow this movement of thinking, we begin to *see* in the mode of consciousness corresponding to this concrete idea of organic unity instead of the unity of abstraction. This shift is the important step to make because, otherwise, we cannot *see* the dynamical unity of self-difference. We do not realize how fundamentally different this situation is from the static unity of self-sameness [34].

Multiplicity in Unity

Following the growth of a plant in imagination is one accessible way to discover this dynamical movement of thinking [35]. The procedure is the same as in the work on color: active seeing followed by exact sensorial imagination [36]. When we practice this method of looking and seeing, we find that we begin to experience the plant "striving out of the whole into the parts." The idea of the dynamical unity of self-difference forms as a movement in our mind as if it were the plant itself doing this movement.

We now have difference *within* unity rather than a unity that excludes difference. Furthermore, this mode of "seeing" is concrete rather than abstract. Instead of a "unity in multiplicity," we have "multiplicity in unity, which is the unity of the living source:

"Multiplicity in Unity" is the dynamical unity of self-difference.

We must be careful here not to think of "multiplicity in unity" as if it implied that unity is divided—in which case, it would not be unity. This error happens if we think of "multiplicity in unity" in an *extensive* sense (as we would think of "unity in multiplicity"). Rather, if the unity is not to be divided, "multiplicity in unity" must be *intensive*, a situation that can be understood via simple examples such as dividing a hologram or propagating a plant by means of cuttings [37].

For example, we can contrast holograms and photographs. If we cut a photograph in two, we have two halves with half its image on each piece. When we cut a hologram in two, however, we have, astonishingly, two holograms with the whole image on both parts (though those images are somewhat less clear than the original image). We have divided the hologram materially but, optically, it remains one. Clearly, there are two holograms materially but, since each is the original whole, there is, in some sense, one hologram only.

We easily miss what is happening in this hologram example because of our ingrained habit of thinking in terms of the

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logic of solid bodies. The arithmetic of wholeness is very different from the arithmetic of bodies. This difference points to how we must think intensively rather than extensively: it's not one and another one (two) but one and its own other (not two but one). In the intensive dimension of wholeness, something can be one and many at the same time—both same and other. This situation means that ontology is "free from the limitation of single-valued existence" [38].

Perhaps the best we can *say* is that each is the very same one and not another one, but this is not the best we can do because we can *see* it in the phenomenological sense. Comparing the hologram with a photograph helps to make this point in that, to achieve the same result photographically, we would have to make a copy of the original photograph and then there *would* be two because the copy is another one and not the other of the one.

Indivisibility of the whole

This process of hologram division illustrates the mode of unity that I call "multiplicity in unity." The value of such an example is that it can form a template for thinking in a new way—in this case, helping us to think intensively instead of extensively. In such cases, however, we must be careful not to confuse the container with the content. One way to avoid this difficulty is to use several different examples.

For example, vegetative reproduction by taking plant cuttings is another illustration that can help us to see the intensive "multiplicity in unity." Here, again, we tend to miss what is happening because our customary thinking is attuned to the external world of solid bodies. If we divide a fuchsia plant into pieces and grow them all, we have many new fuchsia, each separate from the others spatially. Organically, however, they belong together because each is the same plant. There is "intensively one" plant organically, but we see "extensively many" plants that can be counted physically.

Here, again, we have the indivisibility of the whole, which can be divided but remains whole. No matter how many plants we can count, in the intensive dimension of wholeness there is One plant that is many but not many ones. What we discover here is that there is an intensive dimension of One instead of the extensive dimension of many ones.

For convenience, we shall adopt the convention of distinguishing the intensive One from the extensive one by capital and small letters. Thus "multiplicity in unity" is an intensive dimension within the One. Neither one nor many but at the same time both: This is the intensive dimension of One with the others of itself—"multiplicity in unity" instead of the extensive dimension of one and another one.

Evidently, this intensive aspect cannot be mapped onto the bodily world; thus, we cannot form any sense-based mental picture of it. But we can *see* it in the phenomenological sense, though it takes practice to be able to do so, partly because we must set aside the habit of forming mental pictures based on the bodily world we encounter through the senses [39].

Thinking intensively

Admittedly, the holographic and plant illustrations are somewhat static, but they are only intended to help us think intensively rather than extensively. If we examine Goethe's statements quoted earlier, we see that they express a more dynamical quality. Here we see "multiplicity in unity" directly as the *dynamical* unity of self-difference.

At first reading, however, we might miss the *way* that it is always the one organ or organism manifesting different forms of itself. In other words, it is always the same organ or organism ontologically because existence is not single-valued in the intensive dimension of One. Some of these statements might be read in the extensive manner, in which case the differences would not be seen intensively as the One's differences but extensively as the difference of one organ or organism from another—i.e., existence is now single-valued so that there are many organs or organisms with a common factor among them.

What Goethe means, however, by "metamorphosis" is this dynamical unity of self-difference—the intensive movement that produces the intensive dimension of One that is "multiplicity in unity." This is how Goethe's description of the inner activity of imagination should be understood:

When I closed my eyes and lowered my head, I could imagine a flower in the centre of my visual sense. Its original form never stayed for a moment; it unfolded and from within it new flowers continuously developed with coloured petals and green leaves [40].

What is important here is that the experience Goethe describes is intrinsically dynamical. It is not one plant followed by another and another with a result that is an extensive sequence of different plants. Rather, Goethe describes One plant be-ing itself differently [41]. What we must do here is "to give up thinking in terms of beings that do and think instead of doings that be" [42]. This formative doing—the be-ing of the plant—is the self-producing "forming itself according to itself" for which Goethe adopted the term "entelechy."

Furthermore, since Goethe did not accept a purely representational theory of knowledge (i.e., a Cartesian/Kantian epistemology), we should try to avoid reading what he says in the light of a subject-object dualism. Thus the "movement that takes place in imagination"—i.e., the effusions of plants—is not merely subjective but is in fact the intrinsically dynamical One plant be-ing itself imaginally instead of materially.

It is a consequence of the disciplined practice of imagination that the phenomenon (in this case, the coming-into-being of the One plant) can form itself imaginatively so that what is being experienced is literally the *self-manifesting of the phenomenon itself* and not just a mental representation of it. This seems strange to us moderns—especially when we conveniently forget about the intractable difficulties with a representational theory of knowledge.

But hermeneutic philosopher Hans-Georg Gadamer reminds us that "this involvement of knowledge in being is the presupposition of all classical and medieval thought," which is understood as "knowledge as an element of being itself and not primarily as an attitude of the subject" [43]. It is within the context of this hermeneutic tradition that Goethe's following remarks are to be understood:

Through the contemplating of an ever-creating nature, we should make ourselves worthy of conscious participation in her production.

There is a delicate empiricism that makes itself utterly identical with the object,

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thereby becoming true theory. But this enhancement of our mental powers belongs to a highly evolved age.

An undivided wholeness

If we return to Goethe's work on morphology, we realize what he means when he suggests that the organs up a plant's stem can be perceived in the mode of One organ's metamorphosing into different modes of itself, whereupon the visible sequence of organs can then be *seen* as a whole movement of which these organs are simply "snapshots." There is a reversal of perception in this way of seeing: The movement is not made out of the sequence of organs, but the organs are "made out of" the movement—for example, physicist David Bohm's holomovement, which he described as "undivided wholeness in flowing movement" [44].

What is perhaps most important to emphasize here is the way this manner of seeing illustrates the true phenomenological character of Goethe's way of science. We *see* the discrete particulars *and* their intrinsic connection with twofold vision [45]. In this case, the necessary connection is dynamical: It is the whole movement, of which the individual organs now appear as arrested stages. There *is* a single form, but it is not what the particular organs have in common and it is not what is "behind" the appearances. Rather, it is *the unity that is the whole movement* whereby the single form is not static but dynamical. A common form could not generate the movement, whereas here it is the movement that generates particular forms. As Brady writes,

Thus the movement is not itself a product of the forms from which it is detected, but rather the unity of those forms, from which unity, any form belonging to the series can be generated [46].

Furthermore, we can now see why *any* form belonging to the series (whether of leaves only or all organs up the stem) can be taken as representing all others in the series. Each part is a manifestation of the whole ("striving out of the whole into the parts") so that each member of the series *is* the One organ metamorphosing into different modes of itself. Thus, *any* organ of the series can function as a concrete symbol for all others, and the entire series incorporates a dynamical unity of self-difference that generates an intensive dimension of One.

This is what Goethe meant when he said that "All is leaf." Because of the habit of thinking in the mode of "unity in multiplicity," this statement is usually interpreted as implying somehow a common plan, with the term "leaf" referring to a kind of generalized image formed by abstraction. If really engaged with Goethe's meaning, however, we realize that this interpretation is like trying to fit a square peg into a round hole.

The reason for this dissonance is now clear: Goethe thinks of the organs, not as a set of finished products to be compared but, rather, as a "coming-into-being" series produced by the One organ metamorphosing into different modes of itself. The result is that any one mode of this organ can function as a *concrete symbol* representing the entire series thus generated. Alternately, we may say that this diversely metamorphosed organ has no name and moves through the series in both directions (e.g., a stamen is a contracted leaf; or a leaf, an expanded stamen). Whichever way, what is important is the dynamical wholeness of the series of organs and not what members of the series have in common.

Participating in thinking

The difference between the concrete dynamical wholeness of the series and the abstract common factor of a set was recognized very early on by philosopher Ernst Cassirer. He saw that, although universal concepts were traditionally (i.e., in the empirical tradition) supposed to be formed by the abstraction of a common factor, this widely held view was intrinsically contradictory because it presupposed the very concepts the origins of which it sought to explain.

Cassirer recognized that, more fundamentally, concepts in mathematics and mathematical science took the form of a series rather than a common factor. Once the general principle is known, then far from eliminating differences, it is possible to generate all the different possibilities. In other words, the particular cases in their concrete totality can be evolved from the concept so that the concept can be said to include diversity within itself. In short, the concept is a concrete universal instead of the abstract universal of the empirical tradition [47].

Although Cassirer does not mention Goethe directly, it is nevertheless clear that what he says about the form of universal concepts is very much in accord with the way that Goethe understood the dynamical wholeness of the organism. As Gerry Webster and Brian Goodwin explain, "Cassirer's important concept of 'serial form' seems to have been anticipated, if only intuitively, informally, and obscuring, by Goethe in his 'Theory of Metamorphosis'" [48]. Webster and Goodwin draw on philosopher Ron Brady's work to show how Goethe's transformation series of organs is of a similar kind to Cassirer's concept of serial form [49].

Though they discuss this link between Goethe and Cassirer, Webster and Goodwin also indicate how the two thinkers differ in that Cassirer ultimately assumed a representational theory of understanding that separates being and knowledge into different domains, with the latter restricted to the domain of cognitive representation. Consequently, Webster and Goodwin see Goethe's phenomenology of organic form as emphasizing only "the epistemic order, the forms of thought in terms of which being is represented or described—the structure of a set of concepts or propositions—and not to the forms of being per se, the ontological order" [50].

To some extent, the tendency to depend on a representational theory of knowledge is itself a consequence of failing to incorporate a dynamical mode of consciousness in scientific thinking. The reductive result is that thinking remains in the onlooker mode of consciousness and consequently too closely tied to things in their finished state. As a result, the question of knowledge becomes that of how we can know things that have already become with the result that the subject-object dualism of representational theory seems quite "natural."

In contrast, a dynamical mode of consciousness invokes a participation in "thinking the coming-into-being of things" and encountering generatively what otherwise we would only know as a completed product. In Goethe's manner of seeing, the coming-into-being of the phenomenon forms itself in thinking so that the dynamical mode of understanding is no longer divorced from the phenomenon. Knowledge

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is no longer apart from being because knowledge is the phenomenon be-ing itself through thinking. Understanding becomes a part of being itself.

The whole entering into each part

When we are able to encounter nature "working and alive, striving out of the whole into the parts," we come to see the whole reflected in the part because the part is an expression of the whole—literally a *part*-ial expression. When we look in this way, we *really* see the unity of nature as the dynamical unity of self-difference and, hence, in the mode of the intensive dimension of One. It is especially characteristic of what is *living* that, in philosopher Ron Brady's succinct phrase, "It is becoming other in order to remain itself" (Brady 1987, p. 286).

Anyone can practice this way of seeing. For example, one can see a particular family of plants in its organic mode. It is an enlivening experience to observe the different members of a family such as the *Rosaceae* (rose, blackberry, strawberry, apple, and so forth) and realize they are One plant in the form of "multiplicity in unity." How different this experience is from that of looking for what these different plants have in common!

A Phenomenology of mammals

Though Goethe's way of seeing works satisfactorily with plants, one finds it intensified when looking at animals. Here, we turn to the extraordinary work of biologist Wolfgang Schad (2019) and ecologists Craig Holdrege (1998, 2003, 2009) and Mark Riegner (1993, 1998, 2008, 2013). Their research provides some of the best examples of the phenomenology of nature that we yet have. This work is rooted in a Goethean approach yet developed and presented with only minimal reference to Goethe. This distancing is important if phenomenological research on the wholeness of nature is to develop into a real science. What is not needed is making Goethe into some sort of romantic scientific hero, battling against mainstream Western science.

All the themes I have discussed here are exemplified in these animal studies when seen in the light of "multiplicity in unity" rather than "unity in multiplicity." Schad's book works as a "template" for thinking in a new way. His perceptive, readily understandable examples facilitate a new movement of thinking. As one studies the book, he or she is astonished to see the wholeness of nature emerge in such a natural way that it seems as if it is there "in front of our very eyes" (but of course it is not).

Schad's way of seeing is so clear that I'm convinced it makes a far better introduction to a Goethean phenomenology of nature than Goethe's work on color that more often gets phenomenological attention [51]. When we see nature "striving out of the whole into the parts," via Schad's example of mammals, we see in a way that is "inside out" to what is usual. We see how the whole enters into each part, which is therefore a *part*-ial expression of the whole.

This way of seeing naturally leads to a *dynamical* classification of the mammals instead of the static "pigeonhole" classifications with which we are more familiar. The difference between a thinking arising from a "coming into being" and a thinking arising from a "finished product" is experienced vividly in Schad's account, which leads us to discover *intrinsic* relationships among mammals that otherwise would not be recognized. As Schad explains,

Here, we witness the awesome inner logic of the organism and experience a diversity ordered in a living way and not merely schematized (Schad 2019, p. 4).

In Schad's understanding of mammals, we see the *phenomenological* science of nature clearly—i.e., that it *is* phenomenological in Husserl's sense because it returns to "the things themselves." Schad's work on animal wholeness also exemplifies Wittgenstein's new kind of understanding (replacing explanation) that consists in seeing relationships—i.e., recognizing the way whereby things (in this case, mammals) "already stand in connection with one another" (the "grammar" of the mammals) [52].

Intrinsic relationships

The phenomenologist of nature *sees* the intrinsic relationships and necessary structures that, otherwise, would appear only externally as contingent facts. Holdrege's research on the "whole organism" begins with Goethe's remark that "Every creature has its own reason to be." This phrase describes precisely what a phenomenological science of wholeness is about: giving attention to *seeing* the "idea" of the organism (in the same sense that we say, in practical life, "I've got the idea of it now"). In a similar way, Husserl used the term *essence* (*Wesen*) by which he meant not something hidden behind the appearances or some supposed inner core but the characteristic way of being of something that presents itself directly in experience.

This is what Holdrege (2009) does so beautifully in his work on the sloth. He shows how the characteristic way of this creature's being reveals itself through a range of manifestations so that "Every detail can begin to speak 'sloth'."

Phenomenology does not try to explain but to understand. It tries to catch sight of the intrinsic intelligibility of the phenomenon ("its own reason to be") instead of leaving the phenomenon and thereby explaining it by means of something outside itself. When we begin to see the whole animal, then each of its details is seen to be consistent with the characteristic way of that animal's being.

For example, we see this characteristic way of being in the giraffe, a mammal that cannot be considered in isolation from other mammals if we are to come to experience the being-what-it-is. In other words, the giraffe must be seen in the context of all the other mammals within the order of ungulates. The most striking feature of the giraffe—its long neck—becomes intrinsically intelligible when one realizes that:

The tendency [of ungulates] towards elongation is carried to an extreme in a very particular way in the giraffe, which does not merely have a long neck. Rather, this length is mirrored in the formation of the rest of its body, especially in its very long legs (Schad 2019, p. 667).

When the wholeness of the giraffe is seen, every detail begins to speak "giraffe." The long neck is now no longer seen as a contingent feature, an accidental development resulting from random variation and natural selection but as a necessary expression of the characteristic way of being that is the giraffe. This "elongation" is consistent with all the other necessary manifestations of the giraffe's "being-what-it-is" so that one recognizes a coherent whole in which no detail is contingent. No longer

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is any creature just a bundle of accidental developments as claimed by current genocentric biology.

It is a consequence of the way that modern biology developed that the organism as such has disappeared to be replaced by genes as the fundamental units of life [53]. As a counter to this reductive, genetic view of organism, an alternative "organo-centric" biology—i.e., a biology of the whole organism—cannot possibly be overestimated. Even without considering the genetic factor, the conventional tendency among biologists is to see organisms in a mechanical fashion—i.e., as an aggregate of parts rather than an organism-as-whole.

One example is Holdrege's study of the cow (Holdrege 2004, ch. 4), which demonstrates how the isolation of a single factor—milk production—leads to unhealthy practices that would be ended immediately if we saw the organism as a whole and not just an aggregate of traits and functions. When the organism is seen as no more than an aggregate of bits, then it seems quite natural, now that biotechnology is available, to simply change one part of the creature, independently of other parts. With genetic engineering, this piecemeal manipulation of organisms is commonplace. As Holdrege (1998, p. 230) concludes:

In this respect, the ignorance of the life of organisms in our day is staggering, and Goethe's approach is needed more than ever.

One of the most significant values of Goethean science is countering this reductive, piecemeal approach to the natural world, particularly as one might facilitate research and education in Goethean phenomenology.

Appearance and being together

By facilitating a "coming-into-being" rather than assuming a finished product, Goethe avoided a metaphysical dualism without falling into the flatland of positivism. He avoided separating being and appearance, where being is "behind" the appearance, without reducing everything to "merely" appearance. Instead, appearance *is* the manifestation of being [54].

Goethe's dynamical mode of consciousness is in tune with a development in thinking that has gradually developed over the last 200 years. There has been a *shift away* from thinking in terms of static endpoints. There has been a *shift toward* thinking in terms of coming-into-being.

This dynamical mode of understanding is illustrated in quantum physics, which has moved away from thinking in terms of entities in their finished state. One example is the development of so-called "elementary particle" physics, which provides an exceptional illustration of the need to think in a dynamical, transformative way. Physicist Werner Heisenberg never tired of pointing out that there really are no elementary particles comprising the ultimate building blocks of the universe or the ultimate constituents of matter. He maintained that our familiar language of "division" and "consists of" is highly inappropriate and obstructs our understanding of the remarkable processes actually taking place. Experiments with high-energy machines do not show the fragmentation of matter but, rather, its *dynamical unity*. All the different "particles" that appear are in fact mutable forms of one another and self-differing forms in which energy-matter can appear.

What is observed in these revealing experiments should be seen in the manner of the dynamical unity of self-difference, producing "multiplicity in unity"—i.e., a mode of the intensive dimension of One. Instead of fragmentation, there is unity, albeit in a form that we weren't expecting and therefore overlooked at first. On the other hand, when we say that such experiments are revealing the fundamental building blocks of matter, we project our thinking backward and see the situation back-to-front. In other words, we lose sight of the formative processes and only see instead the finished products—yet another instance of trying to reach the milk by way of the cheese [55].

A dynamic phenomenology

Instances of this dynamical way of thinking are not confined to science alone. In various ways, this approach is a hallmark of some of the major movements in twentieth-century philosophy, especially in the case of phenomenology.

The shift of attention from what Husserl called "the natural attitude" to seeing the taken-for-grantedness of that natural attitude has the effect that we catch (but not catch hold of) "the world" coming into being. We then see how "the world" is constituted in experience, whereas, in the natural attitude, we begin at the end with the world as independent object (what is "given") and then try to explain experience in terms of the world (instead of understanding the way that the world is constituted in experience).

Beginning at the end, we ask how our experience "in here" is related to the world "out there." Thus, we begin with the separation of subject from object, whereas in phenomenological seeing, we catch the coming into being of this separation. We realize that any representational theory of knowledge based on this subject-object separation ends in a cul de sac because it starts from the end and therefore gets things "back-to-front." Any representational theory of knowledge is another case of milk and cheese.

A particularly good example of the dynamical mode of thinking typical of phenomenology is provided by Gadamer's understanding of hermeneutics, which begins with the coming into being of meaning in the event of understanding (rather than beginning with meaning as a finished product in the author's mind). By following the coming into being of meaning in the event of understanding, we discover that this experience takes the form of the dynamical unity of self-difference. When we see the way that Gadamer's hermeneutics illustrates the dynamical unity of self-difference, we find the closeness to Goethe's organics quite astonishing!

Modes of counterfeit wholeness

I end by emphasizing that the science of wholeness can take two counterfeit forms, the first of which is *systems thinking*, which ranges from Ludwig von Bertalanffy's "general systems theory" (Bertalanffy 1968) to Ervin Laszlo's "evolutionary systems theory" (Laszlo 1987). Whatever its specific formulation, systems thinking claims to be a science of wholeness. These formulations are a "mechanistic" counterfeit in the sense that, no matter how sophisticated, they ultimately fail to escape from the mechanistic paradigm they claim to counter—the so-called "Cartesian" or "Newtonian paradigm."

One key problem with systems thinking is that it sees things in isolation from one another and therefore ignores the ways in

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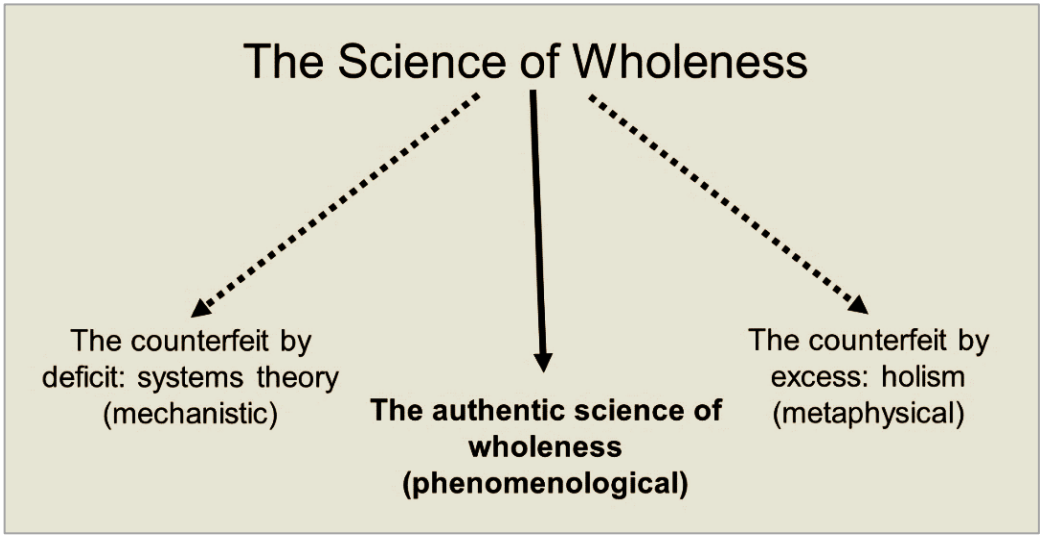
which things already *belong* together. Unaware of this intrinsic relationality, these theorists arbitrarily identify parts that are not really of the whole because they don't belong [56].

Holism is the second counterfeit form of a science of wholeness. In contrast to systems theory, holism overreaches the whole in that, whatever form it takes, this manner of understanding always turns wholeness into something metaphysical. Often irrational, mystical, and pseudo-spiritual, this manner of holistic thinking typically rejects science and has too often been used as a front for prejudice and domination, the most egregious example being Germany's National Socialism. Too often Goethe has been unfairly associated with holism, as in the "Goethe against Newton" syndrome. This association has done much to harm Goethe's remarkable contribution to the evolution of scientific thinking.



I summarize the three contrasting approaches to wholeness via the diagram above. Note that in both counterfeit versions, the movement of understanding is *away from* the phenomenon as that phenomenon is in itself. In contrast, Goethe's approach moves *into the parts* as they illuminate the whole. An authentic science of wholeness as exemplified by Goethe's phenomenological approach should today interest all individuals who aim to avoid the pitfalls of intellectualism, on one hand, and mystical pseudo-science, on the other.

Notes

1. At the time, because we were not aware of the phenomenological perspective, we were not able to make this distinction between seeing directly and seeing reduced to sense perceptions.

2. And at the time, I knew nothing of Goethe either.

3. During the time I worked with Bennett, we were influenced by Wittgenstein in the approach we took toward language, but his influence was mostly limited to our emphasizing the ways in which language can "sleepwalk" us into using concepts inappropriate for a given situation, leading one into confusion that he or she then mistakes for some difficulty in the situation itself—for example, a "problem" to be "solved." This alternative way of seeing was very much "in the air" in Britain in the 1960s, but we were unaware of Wittgenstein's emphasis on a new kind of seeing—i.e., an understanding that sees connections and thus removes any need for explanation.

4. These strictures might have been because Bohr had absorbed the Kantian attitude.

5. Kant's motivation here may well have been that he hoped to save Newtonian mathematical physics not only from the skepticism of Humean empiricism but also from the claims of Swedenborgian "spirit seeing," which for Kant posed an equal threat to what he saw as the greatest achievement of human knowledge—mathematical physics.

6. The capacity to form mental images intentionally was crucial for Bennett, and he sometimes called the practice by the German word *vorstellung*.

7. At a 1986 seminar at London's Goethe Institute, philosopher Hans-Georg Gadamer declared that "Wittgenstein has the same kind of phenomenological imagination as Husserl." Philosopher John Heaton told me that people in Vienna who knew Wittgenstein in the 1930s said that he was really doing phenomenology (and this at a time when, according to the standard Wittgenstein narrative, he was a logical positivist!).

8. There are no grounds for this way of understanding nature other than the elevation of the mathematical, for which, in turn, there are no grounds other than cultural-historical context. This situation did not stop thinkers from trying to offer foundations, but the key point is that there is no *intrinsic* scientific foundation. Descartes made the most notable effort to provide this foundation by arguing that the new science of mathematical physics was grounded both ontologically and methodologically in God. For further discussion, see Bortoft 1996, chaps. 1–3.

9. Note the two following passages from Goethe:

An important task: to banish mathematical-philosophical theories from those areas of physical science where they impede rather than advance knowledge, those areas where a one-sided development in modern scientific education has made such perverse use of them.

I can receive mathematics as the most sublime and useful science, so long as they are applied in their proper place; but I cannot commend the misuse of them in matters which do not belong to their sphere, and in which, noble science as they are, they seem to be mere nonsense. As if, forsooth! Things only exist when they can be mathematically demonstrated. It would be foolish for a man not to believe his mistress' love because she could not prove it to him mathematically. She can mathematically prove her dowry, but not her love!

10. For a discussion of how this approach differed from Newton's work on light and color, see Bortoft 1996, pp. 205–07; pp. 223–26. Also see Bortoft 1971, 1982, 1985, 1986, 2012, 2013.

11. Exact sensorial imagination is often misleadingly described as producing a mental image *in* consciousness, whereas phenomenologically it is not a content of consciousness but a mode of consciousness and a special kind of intentionality.

12. Hjalmar Hegge (1987) identified the practice of exact sensorial imagination as the means by which necessary connections can be seen within the domain of qualities. Mastering Goethe's method of seeing and understanding amounts to a way of developing the mode of consciousness needed for Goethe's way of science. In other words, the activity of Goethean science is an educational activity. It is the education of a mode of consciousness.

13. For a thorough explication of "belonging *together*" versus "*belonging* together," see Bortoft, 1996, pp. 3–26; 290–320.

14. See *Theory of Colours*, ¶ 772 (Goethe 1970).

15. Older workshop participants sometimes have more difficulty with exact sensorial imagination, perhaps because the capacity atrophies through lack of use. But it can be restored given time.

16. Biologist Brian Goodwin first suggested this effort to visualize a wrong color sequence.

17. The awkwardness is that we usually don't recognize that we *were* experiencing the order as contingent and accidental until *after* we have begun to experience the quality of necessity—a situation that makes describing this difference difficult.

18. One thinks of related comments by Wittgenstein: "A phenomenon isn't a symptom of something else. It is the reality" (Wittgenstein 1953, section 126). Or "Since everything lies open to view, there is nothing to explain" (Wittgenstein 1964, p. 283).

19. Goethe understood the *Urphänomen* of color to be the tension between light and darkness—what he described poetically as "colors as the deeds and sufferings of light." Lightness overcome by darkness leads to the lighter colors of yellow, orange, and red, while darkness overcome by lightness leads to the darker colors of blue and indigo. Goethe argued that, in nature, the *Urphänomen* could be seen in the sun's shifting color—from yellow at midday to orange and red while setting; or in mountain ridges receding in the distance, with nearer ridges indigo and farther ridges blue. Goethe understood the blue of the sky as

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the lightness of the atmosphere in front of the darkness of outer space.

20. See note 19.

21. My guess is he found the idea of the *Urphänomen* in a book. This determination is not unusual—Copernicus, for example, explained that he found the idea for the heliocentric universe in ancient books. In this sense, it is not what one finds but what he or she does with it that counts. We know that Goethe researched thoroughly the history of color, and he may well have found his "One instance worth a thousand, bearing all within itself" in the writings of the Renaissance painters—Leonardo da Vinci perhaps? If this is true, it would explain why there seems to be such a "jump" when presenting Goethe's work on color in workshops. Nevertheless, by whatever means Goethe came to it, the recognition that there is a connection between the prismatic colors and the colors of the sun and sky is an insight in itself. For further discussion of the *Urphänomen*, see Bortoft 1996, pp. 231–46.

22. Significantly, when one uses the prism to view a black rectangle on a white background, one sees how the two colored edges move together in reverse order and "blend" to generate a new color—a ruby-magenta, or "peach blossom," that is the complementary color to green. One can now form a circle that marks Goethe's color wheel based on complementary colors. The result is a circle that is a dynamic whole in which, as Goethe wrote, "no color can be considered stationary."

23. For a discussion of the ambiguities and hidden influences in Newton's 1672 paper to the Royal Society, see Bortoft 1996, pp. 192–212.

24. For example, Holdrege 1998; Riegner 1993, 1998, 2008; Schad 2019.

25. No citations are provided for these quotations.

26. Bortoft explains that, in this diagram, he adapts a notation used by Ernst Cassirer in *Substance and Form* (Cassirer 1980).

27. No citations are provided for these quotations.

28. There can be no transcendence without immanence, or immanence without transcendence because each is the condition of possibility for the other. There is duality here but no dualism—no dichotomy as there is in the two-world theory, where each world is mutually external to the other. The difficulty arises from the counterfeit transcendence, which has the quality of externality and is therefore conceived as being *separate* from and *outside* the sense world, and hence as another "world" (see Miller 2005, esp. pp. 120–21).

Significantly, Plato was not a Platonist—he did not subscribe to the two-world theory that is central to the Western metaphysical tradition. In view of this, we should perhaps refer to the Neoplatonic tradition, especially as it influenced the development of modern science from the Renaissance onward, as "pseudo-Platonism" (See Bortoft 2012, pp. 158–59, pp. 183–86).

29. This idea of a unified science is the source of the Enlightenment idea of *universality* in human nature and the belief in universal reason that can discover universal principles in morality, politics, and religion, as well as in science.

30. Prigogine and Stengers 1984, p. 64. The implication here is not that Chinese culture is somehow deficient. Rather, comparative studies illustrate that Chinese culture emphasizes aspects of phenomena different from those emphasized in modern Western culture, most notably giving priority to the uniquely particular rather than the underling unity. This difference means that the Chinese culture developed a mode of perception that we Westerners tend to lack, just as our Western culture has developed some modes of understanding not traditionally found in Chinese culture.

31. And, subsequently, the emergence of the Nation State, with its transition from common law to statute law.

32. See Needleman, 1976.

33. No citations are provided for these quotations. In his last entry of this list, Bortoft quotes Rudolf Steiner (1963), who wrote that Goethe "seeks to bring the diversity back into the unity from which it originally went forth."

34. In parentheses, Bortoft writes that "You know that you've seen it when you feel that your seeing has been turned inside out."

35. In parentheses, Bortoft writes that "I have found a Busy Lizzie plant very helpful."

36. See Bortoft's earlier discussion of active seeing and sensorial imagination.

37. In parentheses, Bortoft writes that "As simple as these examples are, it helps to think *doing* them in imagination instead of only thinking of the result."

38. Bortoft attributes this quotation to philosopher J.G. Bennett but does not provide a citation. On Bortoft's relationship with Bennett, see the earlier part of this essay.

39. The intensive dimension of One is no stranger than many of the "difficulties" we face in quantum physics—think, for example, of the interference experiment with a single photon. The fact that we cannot map the intensive dimension of the One into a sensory representation does *not* mean that it is an abstraction. On the contrary, "multiplicity in unity" is a concrete unity, even though it cannot be recognized sensorily or caught in the logic of solid bodies. It is "unity in multiplicity" that is abstract.

For further discussion of the hologram, see Bortoft 1996, pp. 4–13.

40. No citation is provided for this quotation.

41. In parentheses, Bortoft writes that "A somewhat more static (because non-living) 'model' is illustrated by the construction of a multiple hologram, which lacks the intrinsically dynamical character of living being but does nevertheless demonstrate the notion of 'multiplicity in unity' in a way that imitates artificially the dynamical wholeness of living being"—see Bortoft 1996, Part 2, note 58.

42. Bennett 1977, p. 64. Bennett's precise phrasing is: "We can hardly bring ourselves to see that there are doings that *be* things. If I say something, it is not I that says it but that the speaking says me."

43. No citation is given for this quotation. For further discussion of Gadamer, see Bortoft 2012, pp. 121–26.

44. See Bortoft 1996, pp. 283–89; Brady 1998.

45. Bortoft 1996, pp. 303–20.

46. No citation is given for this quotation; either Brady 1987 or 1998?

47. This remarkably valuable insight is discussed in some detail in Cassirer's early *Substance and Function* (Cassirer 1980). Although he does not explicitly consider the idea of a different mode of unity (so that he does not consider the generative serial concept [as distinct from the abstract generic concept] in terms of the of the metamorphosis of One into different modes of itself (i.e., producing an intensive dimension of One), Still, it is clear (even when not made explicit) that the movement of Cassirer's thinking is away from entities in their finished state toward their coming-into-being. His thinking becomes dynamical. If one reads what he writes carefully, it becomes clear from the language he uses that sometimes he moves toward one mode in his thinking and, at other times, moves toward the other, sometimes getting caught more in the product (e.g., "the unification of multiplicity") and, at other times, becoming free from this static sense and moving toward the processual (e.g., "we have to create this multiplicity").

48. Webster and Goodwin 1996, p. 110.

49. Brady 1998.

50. Webster and Goodwin 1996, p. 101.

51. See Bortoft 1996, pp. 212–36.

52. See the first part of this essay for Bortoft's remarks on Wittgenstein.

53. See Goodwin 1994.

54. As Gadamer (1989, p. 484) explained, "being is self-presentation."

55. Bortoft draws on this phrase several times in Parts I–III of this series.

56. In *Wholeness of Nature*, Bortoft (1996, p. 290) writes: "[Systems thinking] tries to put *together* what already *belongs* together. Thus, the intrinsic relatedness is not seen, and instead, external connections are introduced with a view to overcoming separation. But the form of such connections is such that they, too, belong to the level of separation."

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Bortoft Lectures on-line

Writer **Simon Robinson** has uploaded on YouTube several lectures that Henri Bortoft presented on wholeness at Schumacher College in the 2000s. These lectures are an excellent introduction to Bortoft's thinking, including his understanding of Goethean science. The links are below.

There is also available a tape recording of Bortoft's presentation at the 2011 **J. G. Bennett's** *Dramatic Universe* conference; this link is listed below after the Schumacher links. Note that, in the early 1960s, Bortoft was a researcher under the direction of Bennett.

Bortoft's Schumacher lectures

Lecture 1:
https://www.youtube.com/watch?time_continue=8&v=iGEl2E2CcTo

Lecture 2, Part I:
https://www.youtube.com/watch?time_continue=1&v=1Tzx5EOWHe0

Lecture 2, Part II:
https://www.youtube.com/watch?time_continue=351&v=UmdLQMlV3KE

Lecture 3:
https://www.youtube.com/watch?time_continue=1&v=nsH6-n7BUtw

Lecture 4, Part I:
https://transitionconsciousness.wordpress.com/2018/12/30/the-henri-bortoft-lectures-day-four-part-one-2/

Lecture 4, Part II:
https://www.youtube.com/watch?v=aCywGtSeWi4

Lecture 4, Part III:
https://www.youtube.com/watch?time_continue=2&v=thMjGQzhEN0

Lecture 5, Part I:
https://www.youtube.com/watch?v=ILVxvP_S9zI

Lecture 5, Part II:
https://www.youtube.com/watch?v=LLy14NKt0TQ

Bortoft's J. G. Bennett lecture
https://soundcloud.com/seandotcom-1/du-008-henri-bortoft

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Questions relating to environmental and architectural phenomenology (from *EAP*, 2014 [vol. 25, no. 3, p. 4])

Questions relating to phenomenology and related interpretive approaches and methods:

- What is phenomenology and what does it offer to whom?
- What is the state of phenomenological research today? What are your hopes and concerns regarding phenomenology?
- Does phenomenology continue to have relevance in examining human experience in relation to world?
- Are there various conceptual and methodological modes of phenomenology and, if so, how can they be categorized and described?
- Has phenomenological research been superseded by other conceptual approaches—e.g., post-structuralism, social-constructionism, critical theory, relationalist and non-representational perspectives, the various conceptual "turns," and so forth?
- Can phenomenology contribute to making a better world? If so, what are the most crucial phenomena and topics to be explored phenomenologically?
- Can phenomenological research offer practical results in terms of design, planning, policy, and advocacy?
- How might phenomenological insights be broadcast in non-typical academic ways—e.g., through artistic expression, theatrical presentation, digital evocation, virtual realities, and so forth?
- What are the most important aims for future phenomenological research?
- Do the various post-structural and social-constructionist criticisms of phenomenology—that it is essentialist, masculinist, authoritative, voluntarist, ignorant of power structures, and so forth—point toward its demise?

Questions relating to the natural world and environmental and ecological concerns:

- Can there be a phenomenology of nature and the natural world?
- What can phenomenology offer the intensifying environmental and ecological crises we face today?
- Can phenomenology contribute to more sustainable actions and worlds?
- Can one speak of a sustainable lifeworld?
- What is a phenomenology of a *lived* environmental ethic and who are the key contributors?
- Do the "sacred" and the "holy" have a role in caring for the natural world? For places? For lifeworlds broadly?
- Can phenomenology contribute to environmental education? If so, in what ways?
- Can there be a phenomenology of the two laws of thermodynamics, especially the second law claiming that all activities, left to their own devices, tend toward greater disorder and fewer possibilities? Are there ways whereby phenomenological understanding of lifeworld might help to reduce the accelerating disordering of natural and human worlds?

Questions relating to place, place experience, and place meaning:

- Why has the notion of place become an important phenomenological topic?
- Can a phenomenological understanding of place contribute to better place making?
- Can phenomenology contribute to a generative understanding of place and place making?
- What roles do bodily regularity and habitual inertia play in the constitution of place and place experience?
- What are the lived relationships between place, sustainability, and a responsive environmental ethic?
- How are phenomenological accounts to respond to post-structural interpretations of space and place as rhizomic and a "meshwork of paths" (Ingold)?
- Can phenomenological accounts incorporate a "progressive sense of place" argued for by critical theorists like Doreen Massey?
- Can phenomenological explications of space and place account for human differences—gender, sexuality, lessabledness, social class, cultural background, and so forth?
- Can phenomenology contribute to the politics and ideology of place?
- Can a phenomenological understanding of lived embodiment and habitual inertia be drawn upon to facilitate robust places and to generate mutual support and understanding among places, especially places that are considerably different (e.g., different ethnic neighborhoods or regions)?
- Can phenomenology contribute to mobility, the nature of "flows," rhizomic spaces, the places of mobility, non-spaces and their relationship to mobility and movement?

Questions relating to architecture and environmental design and policy:

- Can there be a phenomenology of architecture and architectural experience and meaning?
- Can phenomenology contribute to better architectural design?
- How do qualities of the designable world—spatiality, materiality, lived aesthetics, environmental embodiment etc.—contribute to lifeworlds?
- What are the most pertinent environmental and architectural features contributing to a lifeworld's being one way rather than another?
- What role will cyberspace and digital technologies have in 21st-century lifeworlds? How will they play a role in shaping designed environments, particularly architecture?
- What impact will digital advances and virtual realities have on physical embodiment, architectural design, and real-world places? Will virtual reality eventually be able to simulate "real reality" entirely? If so, how does such a development transform the nature of lifeworld, natural attitude, place, and architecture?
- Can virtual worlds become so "real" that they are lived as "real" worlds?

Other potential questions:

- What is the lived relationship between people and the worlds in which they find themselves?
- Can lifeworlds be made to happen self-consciously? If so, how? Through what individual efforts? Through what group efforts?
- Can a phenomenological education in lifeworld, place, and environmental embodiment assist citizens and professionals in better understand the workings and needs of real-world places and thereby contribute to their envisioning and making?
- Is it possible to speak of human-rights-in-place or place justice? If so, would such a possibility move attention and supportive efforts toward improving the places in which people and other living beings find themselves, rather than focusing only on the rights and needs of individuals and groups without consideration of their place context?

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Environmental & Architectural Phenomenology

Published digitally twice a year, ***EAP*** is a forum and clearing house for research and design that incorporate a qualitative approach to environmental and architectural experience, actions, and meanings.

One key concern of ***EAP*** is design, education, policy, and advocacy supporting and strengthening natural and built places that sustain human and environmental wellbeing. Realizing that a clear conceptual stance is integral to informed research and design, the editor emphasizes phenomenological approaches but also gives attention to related styles of qualitative research. ***EAP*** welcomes essays, letters, reviews, conference information, and so forth. Forward submissions to the editor.

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Exemplary Themes

- The nature of environmental and architectural experience;
- Sense of place, including place identity and place attachment;
- Architectural and landscape meaning;
- The environmental, architectural, spatial, and material dimensions of lifeworlds;
- Changing conceptions of space, place, and nature;
- Home, dwelling, journey, and mobility;
- Environmental encounter and its relation to environmental responsibility and action;
- Environmental and architectural atmospheres and ambiences;
- Environmental design as place making;
- Sacred space, landscape, and architecture;
- The role of everyday things—furnishings, tools, clothing, interior design, landscape features, and so forth—in supporting people's sense of environmental wellbeing;
- The progressive impact of virtual reality on human life and how it might transform the lived nature of "real" places, buildings, and lifeworlds;
- The practice of a *lived* environmental ethic.

For additional themes and topics, see the preceding page, which outlines a series of relevant questions originally published in the 25th-anniversary issue of *EAP* in 2014 (vol. 25, no. 3, p. 4).

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