

ETHICAL REDUCTIONISM

Neil Sinhababu

NATURALISTIC MORAL REALISTS hold that moral properties are part of the natural world.¹ They can accept either reductionism or nonreductionism about how moral properties relate to properties invoked in the best natural and social scientific explanations, which I call “scientific properties.”² This article argues that reductionism is the best form of naturalistic moral realism.

Reductionism and nonreductionism differ about whether moral properties and scientific properties are identical.³ Reductionists see moral properties as identical to individual scientific properties or disjunctions of scientific properties. Supposing for illustration that hedonism is the true theory of moral value, reductionism treats goodness as identical to pleasure, just as water is identical to H₂O.⁴ Nonreductionists see moral properties as natural properties supervening on and constituted by scientific properties without being identical to them.⁵

- 1 My characterization of the positions follows Darwall, Gibbard, and Railton, “Toward *Fin de Siècle* Ethics”; Miller, *Contemporary Metaethics*; and Shafer-Landau, *Moral Realism*.
- 2 “Scientific properties” refers to properties of physics, biology, psychology, and other natural and social sciences, but not moral properties unless they are identical to these properties. I know no better term. “Nonmoral properties” makes reductionism sound contradictory in claiming that moral properties are nonmoral, “natural properties” makes nonreductionism sound nonnaturalist in denying that moral properties are natural, and “descriptive properties” erects a false contrast, as realists regard moral language as descriptive. “Natural kinds” may be an equivalent term, though I do not know how broadly it is used this way. These positions are stated in terms of the abundant view of properties. The sparse view will be discussed shortly.
- 3 While reduction in some contexts does not entail identity, I defend property identity, which is part of strong-reductive theses. Schroeder regards reduction as property analysis rather than property identity (*Slaves of the Passions*). Our views are compatible, since he allows identity claims like the one defended here to fit within a property analysis.
- 4 More technically, “goodness is identical to *being* pleasure.” Following much of the metaethics literature, I usually omit the “being” and talk of property existence rather than instantiation.
- 5 While nonnaturalists like Shafer-Landau (*Moral Realism*) and Huemer (*Ethical Intuition-*

Again assuming hedonism for illustration, nonreductionism treats goodness as supervening on pleasure without identity. The Cornell Realists liken this to how psychological properties supervene on neuroscientific properties in Jerry Fodor's influential view of the special sciences.⁶

Both views share many features. They address the conceptual is/ought gap by agreeing with G. E. Moore that normative ethical truths are synthetic and not analytic.⁷ They reject his view that moral properties are nonnatural. They answer John Mackie's argument that moral properties are unacceptably queer by denying that they produce categorical reasons.⁸

Today, nonreductionism is the dominant form of synthetic naturalistic moral realism.⁹ Russ Shafer-Landau describes the consensus, writing of Richard Boyd's moral semantics:

Boyd himself does not believe that application of his theory will yield a reductive view . . . no one has supplied any reason for thinking that he has

ism) also hold that moral properties supervene on nonmoral properties without identity, they deny that moral properties are natural properties. This makes an intuitionist moral epistemology suit their views better, and may have other consequences for their metaethical theorizing.

- 6 Brink (*Moral Realism and the Foundations of Ethics*) provides the most comprehensive defense of nonreductionism, likening his position to Fodor's metaphysics of mind ("Special Sciences"). Sayre-McCord similarly defends "belief in two kinds of properties: those which can be reductively identified with explanatorily potent properties and those we have independent reason to think supervene upon, without being strictly reducible to, explanatorily potent properties" ("Moral Theory and Explanatory Impotence," 274). This view is often attributed to Sturgeon, "Moral Explanations," and Boyd, "How to Be a Moral Realist." Their metaethical approach is called "Cornell Realism" because Sturgeon, Boyd, and Brink were affiliated with Cornell University (whose press published Sayre-McCord's anthology). Boyd's and Sturgeon's criticisms of reductionism are less explicitly focused on synthetic reductionism. Boyd criticizes "the conclusion that all natural properties must be definable in the vocabulary of physics" ("How to Be a Moral Realist," 194), and Sturgeon repeatedly criticizes "reductive definitions" ("Moral Explanations," 240–43). Harman ("Moral Explanations of Natural Facts") notes that these remarks can be read merely as criticisms of analytic reductionism, as definition is primarily a semantic notion rather than an ontological notion. So I focus on Brink and Sayre-McCord here.
- 7 Moore, *Principia Ethica*. If Moore is wrong about moral semantics, the door is open for analytic reductionists like Jackson, *From Metaphysics to Ethics*, and Finlay, *Confusion of Tongues*.
- 8 Mackie, *Ethics*. For arguments favoring naturalists' rejection of categorical reasons, see Foot, "Morality as a System of Hypothetical Imperatives," and Svavarsdóttir, "Moral Cognitivism and Motivation."
- 9 Railton ("Moral Realism," "Naturalism and Prescriptivity") and Jackson (*From Metaphysics to Ethics*, "In Defense of Reductionism in Ethics") offer sympathetic treatments of reductionism. But they respond to anti-realists and nonnaturalists rather than naturalistic nonreductionists.

erred in this regard. No one has done anything towards showing that his semantics, when well applied, would yield the surprising conclusion that goodness (and rightness, and forbiddenness, etc.) is identical to some specific natural property.¹⁰

This consensus should be overturned. Naturalistic moral realists should accept identities between moral properties and scientific properties, even if they believe that properties of special sciences like psychology are not identical to properties of neuroscience or physics. If reduction is easier than Fodor allows, ethical reductionists may have more resources at their disposal than I use here.¹¹ But even if reductionism fails in psychology, it succeeds in ethics.

Ethical nonreductionists borrow two arguments from Fodor's philosophy of mind, which the two main sections of this article answer. First, nonreductionists argue that the multiple realizability of moral properties defeats reductionism. I solve multiple realizability in ethics by identifying moral properties uniquely or disjunctively with special science properties. This eliminates the main purported disadvantage of reductionism. Second, nonreductionists argue that irreducible moral properties explain empirical phenomena, just as irreducible special science properties do. But since irreducible moral properties do not succeed in explaining additional regularities, error theorists can rightly say that they are pseudoscientific. Since reductionism entails the existence of moral properties when combined with the existence of the reduction bases, it is the more defensible form of naturalistic moral realism.

In recent years, the popularity of nonnaturalistic realism has exceeded that of naturalistic realism.¹² The dialectical situation makes this unsurprising. The best-known versions of naturalistic realism are the Cornell Realists' nonreductionism with its dubious moral explanations, and Jackson's reductionism with its ties to a very different philosophy of mind than the one that the Cornell Realists invoke against their opponents. I show that, even on the philosophy of the special sciences the Cornell Realists assumed, reductionism can accommodate all existing normative ethical theories while avoiding dubious empirical commitments, making it the best form of naturalistic realism.

10 Shafer-Landau, *Moral Realism*, 68–69.

11 Against Fodor are Kim, "Multiple Realization and the Metaphysics of Reduction," and Sober, "The Multiple Realizability Argument against Reductionism." To see how disjunctive properties might provide reduction bases, see Clapp, "Disjunctive Properties."

12 Especially influential are Enoch, *Taking Morality Seriously*; Huemer, *Ethical Intuitionism*; Parfit, *On What Matters*; and Scanlon, *What We Owe to Each Other*.

1. MULTIPLE REALIZABILITY DOES NOT
ENDANGER ETHICAL REDUCTIONISM

This section responds to the argument that multiple realizability defeats reductionism. David Brink presents this argument clearly and uses it to motivate nonreductionism. I compare his position to Fodor's nonreductionism in philosophy of mind, and respond with a solution for multiple realizability in ethics: identifying moral properties with natural kinds from sciences like psychology and sociology, uniquely or disjunctively. This makes reductionism as good as nonreductionism for accommodating all currently defended normative ethical theories.

Brink invokes multiple realizability to defend nonreductionism, which he calls "constitutional materialism," against reductionism, which he calls "identity materialism":

There are what should by now be familiar reasons to prefer constitutional to identity materialism. If materialism is only contingently true, then higher-order properties, though actually physical properties, could have been realized nonphysically. If so, these higher-order properties are not necessarily physical properties and so cannot be identical with physical properties. Moreover, higher-order properties and property instances could have been realized in a variety of different physical ways. If we deny that identity is a relation that can hold between relata that are indefinitely or infinitely disjunctive, the multiple realizability of these higher-order properties provides reason to deny that they are identical with physical properties.¹³

I summarize Brink's two multiple realizability arguments against reductionism.

First, moral properties like wrongness could be realized even in worlds with different fundamental properties. In a nonphysical world, it would be wrong for ghosts to torture other ghosts. And in a world whose fundamental physics differs from that of our world, slavery would still be just as wrong. Since things could be wrong in worlds that do not have our physics, wrongness cannot be identical to properties of our physics. This argument parallels arguments against reducing mental properties to neural properties: since robots and aliens who lack humanlike brains can have beliefs, belief cannot be identical to anything from neuroscience.

Second, many different actual physical structures realize wrongness. Slavery, gender discrimination, and torture have little in common at the level of physics

¹³ Brink, *Moral Realism and the Foundations of Ethics*, 178.

that distinguishes them from things that are not wrong. Wrongness and belief are equally unlikely to have unified or even finite characterizations in the language of physics. Brink rejects identifying higher-level properties with infinitely disjunctive lower-level properties. This argument parallels arguments against reducing mental properties to properties of physics: belief cannot be identical to anything from physics, since it is constituted in such disunified ways at that level.

Brink's arguments share the structure of those against reductionism in the philosophy of mind.¹⁴ On these reductionist views, mental states like belief and desire are identical to states from physics or neuroscience.¹⁵ The problem for reductionism is that one could have the same mental state by having any of many physical structures. For example, the belief that philosophy is fun need not be realized by neurons. Robots and aliens could have the same belief, realized by silicon chips or whatever is in aliens' heads. Believing that philosophy is fun cannot be identical to anything neurological, biological, or physical, because creatures can do it by having any among an infinite disjunction of different neurological, biological, and physical structures.¹⁶ I call this form of multiple realizability "infinite realizability."

Brink's theory of how moral properties relate to lower-level properties is explicitly built on Fodor's model, which accommodates infinite realizability while maintaining an attractive physicalist thesis.¹⁷ On Fodor's view, each science is a

- 14 Fodor, "Explanations in Psychology"; Putnam, "The Nature of Mental States." Here I do not focus on a powerful nonreductionist argument from the material constitution debate that concerns modal properties of ordinary objects: the statue cannot survive squashing, while its constituent clay survives squashing, so the statue is not identical to the clay. Nonreductionism about statues can plausibly claim to explain why their modal properties differ from those of their constituent clay, but the parallel argument for metaethical nonreductionism fails. Removing the goodness of any state of affairs requires removing whatever property of the state of affairs made it good. So you cannot destroy the goodness without destroying the underlying property specified by the right theory of goodness. Paul provides a helpful discussion of material constitution ("The Puzzles of Material Constitution").
- 15 Place, "Is Consciousness a Brain Process?"; Feigl, "The 'Mental' and the 'Physical'"; Smart, "Sensations and Brain Processes." Bennett, "Mental Causation," provides an overview.
- 16 Here I discuss ontology in terms of properties rather than facts, following Fodor.
- 17 Brink cites Fodor's "Special Sciences" four times, the last two specifically to support ethical nonreductionism with multiple realizability arguments (*Moral Realism and the Foundations of Ethics*, 166, 167, 180, 194). No existing work has shown that Fodor's arguments do not carry over to moral properties as Brink thinks they do. Jackson's discussion of Cornell Realism (*From Metaphysics to Ethics*) does not distinguish reductionists like Railton from naturalistic nonreductionists like Brink and Sayre-McCord. His article with Pettit and Smith ("Ethical Particularism and Patterns") and his later work ("In Defense of Reductionism in Ethics") respond to Dancy, Parfit, and other nonnaturalists who do not share Fodor's metaphysics of natural and causally effective but irreducible properties.

separate layer of irreducible properties. Physics is the bottom layer, and properties like “belief” from the special-science layer of psychology need not be identical to any properties of physics or other sciences. Still, every actual belief is a physical thing. The language of physics allows a full characterization of every individual human, robot, and alien belief, even if it does not give us a well-unified general characterization to cover all of them. As Fodor concludes “Special Sciences”: “If physics is to be basic science, then each of these things had better be a physical thing. But it is not further required that the taxonomies which the special sciences employ must themselves reduce to the taxonomy of physics. It is not required, and it is probably not true.”¹⁸

Having presented these multiple realizability arguments, I explain how ethical reductionism answers them. Moral properties are reducible either to individual special science properties as water is reducible to H₂O, or to disjunctions of them as jade is reducible to jadeite or nephrite. A finitely disjunctive reduction base provides the flexibility to accommodate the most complex existing moral theories. Locating the reduction base at the special-science level allows finite realizers across physical and nonphysical worlds.

Normative ethical theories typically give accounts of the moral in terms of the psychological, social, or biological. On a reductionist metaethical treatment, the moral and scientific terms refer to the same properties. The easiest cases for reductionism are monistic theories like hedonism about moral value, on which something is good iff it is pleasure. This is a full account of a moral property—goodness—in terms of a psychological property—pleasure. While many metaethical views are open to hedonists, a natural one is the reductionist view that goodness is pleasure.

Of course, many moral theories are more complex, and do not seek to unify all of morality under one principle. These pluralist theories provide type-reductions of moral properties to disjunctive reduction bases. Moore takes aesthetic appreciation and friendship to have moral value that goes beyond the pleasure experienced. Reductionists treat his normative ethics as describing the combinations of psychological and sociological properties that make up aesthetic appreciation and friendship, and to which goodness is reducible. Goodness, on this view, is reducible to pleasure or aesthetic appreciation or friendship. To accommodate more good things, one simply needs more disjuncts.

One might object that disjunctive properties cannot provide reduction bases for higher-level properties, so reductionism will not accommodate more complex moral theories. Fodor claims that belief cannot be reduced to a big, disunified disjunction of neural, silicon, and alien states because it is a natural kind

18 Fodor, “Special Sciences,” 114.

that should provide unified explanations. Jade is not a natural-kind term in the special sciences because it is disjunctively realized by jadeite and nephrite. So jade is not a natural kind. Jadeite explains some geological phenomena while nephrite explains others, but their disjunction does not explain things. If we similarly cannot reduce moral properties to disjunctions of scientific properties, reductionism will be an option only for monistic moral theories like hedonism.

Moral properties, however, can have disjunctive reduction bases, since moral concepts do not require unified roles for moral properties in scientific explanations. So moral properties can be disjunctions of natural kinds rather than natural kinds themselves. Reductionists can let goodness be like jade—a real thing in the natural world that is not a natural kind. Denying that jade is a natural kind is not denying that jade exists. If your brother wants some phlogiston and your sister wants a jade necklace, only one of them must be disappointed. Just as those wanting jade necklaces need not be disappointed, those who want to make the world a better place need not be disappointed if goodness is a disjunction of natural kinds.¹⁹ Objective features of the natural world then satisfy the predicate “good,” making naturalistic moral realism true.

This disjunctive solution gives naturalistic moral realists what they care about, even on a sparse view of properties.²⁰ For ease of exposition, most of this article assumes an abundant view of properties on which there is a (nonscientific) property of being jade, since there are (scientific) properties of being jadeite and being nephrite. This abundant view makes disjunctions of scientific properties identical to moral properties. To show that reductionism saves realism even without assuming the abundant view, we might consider sparse views, on which there is no property of being jade—only being jadeite and being nephrite. Then if pluralism makes the reduction base of goodness disjunctive, there is no property of goodness. This may sound like victory for the error theorist, but it is not. Goodness still exists, as a disjunction of properties that exists without deserving to be called a property. Beliefs about it will be true because of disjunctions of scientific properties, rather than an individual moral property that is an individual scientific property. Reductionists can be open-minded about whether goodness is a property as long as they can identify it with scientific properties, uniquely or disjunctively.

19 As Jackson writes, “Jade, it turned out, comes in two quite different forms (nephrite and jadeite), but this did not lead us to deny the existence of jade. It led us to say there are two kinds where we might have thought that there was only one” (*From Metaphysics to Ethics*, 112).

20 See Armstrong, *Nominalism and Realism*. The abundant versus sparse terminology comes from Lewis, *On the Plurality of Worlds*. Abundant views are better at tracking when predicates refer, while sparse views support useful metaphysical distinctions.

To be compatible with folk belief, the sparse view must allow disjunctions of properties to satisfy nondisjunctive predicates like “good” in this way. Most of the things we care about are not natural kinds with a one-to-one correspondence to sparse properties. They are instances of highly gerrymandered kinds like the sonnets that poets write, the whiskies that drinkers enjoy, and the jobs that academic philosophers seek. The sparse theorist can say that there is no property of being a job, but should not say that the predicate “job” fails to refer to anything real. Denying that “job” refers because a single predicate must refer to a single property would force the sparse theorist to give up on having a job! Sparse theorist David Armstrong avoided this bad result and got a job that let him write, “In the theory of *properties*, it is in general a mistake to look for a one-one correlation to hold between properties and predicates.”²¹ If it turns out that goodness is metaphysically like water, jade, or jobs, belief in goodness can be true and moral realism is vindicated. Whether goodness is a property does not matter to reductionists as long as scientific properties satisfy “good” in some way. So the important question is not whether goodness is a natural kind that belongs on the sparse theorist’s list of properties. It is whether belief in goodness is false like belief in phlogiston, or true like belief in water, jade, and jobs.

The example of jade shows why reductionist metaethical views are compatible with even the most complex existing normative ethical theories.²² It is an interesting question whether reductionism is compatible with a moral theory suggesting an infinitely long reduction base, or whether only nonreductionism could handle infinite realizability, as Brink suggests. No moral theory that I know of claims that the number of moral principles is infinite. Jonathan Dancy’s particularism comes closest. But his view concerns the role of principles in moral thought and judgment rather than whether moral properties are infinitely realizable.²³ So infinite realizability, which reductionism in the philosophy of mind

21 Armstrong, *Nominalism and Realism*, 6.

22 Many philosophers discuss whether a “reductionist” view makes sense of thick concepts like “cruel,” as Roberts discusses (“Thick Concepts”). But this reductionism is an analysis of these concepts into evaluative and non-evaluative components suggested by noncognitivists like Blackburn who defend an ontological distinction between fact and value (“Through Thick and Thin”). My reductionism proposes fact-value property identities, rejecting this distinction. The issue of thick concepts was initially raised by cognitivist and naturalist Philippa Foot (“Moral Arguments”). For a treatment of thick concepts that makes them compatible with naturalism, see Väyrynen, *The Lewd, the Rude and the Nasty*.

23 Dancy has confirmed this in personal communication. He defines particularism as the view that “the possibility of moral thought and judgement does not depend on the provision of a suitable supply of moral principles” (*Ethics without Principles*, 7). A finite number of principles too large for human moral thought to apply would support his arguments. There is little motivation for insisting that the number of principles is literally infinite. What sort

must face, seems to be absent from ethics. Even on the most complex theories, moral properties can be understood as identical to finite disjunctions of natural kinds, like jade. Reductionism does not force us to accept monistic normative ethical theories that are overly simplistic. Jade is the model of how reductionism handles complex theories that do not identify moral properties with unique natural kinds.

So far, I have argued that moral properties are identical to special science properties, uniquely like H_2O /water or in finite disjunctions like jade/jadeite-or-nephrite, but not that they are identical to anything from fundamental physics. They may not be, since their special-science realizers probably are infinitely realizable at the level of fundamental physics. Even if the case of jade convinces you that finite realizability permits reduction of properties that are not natural kinds, you might join Brink in denying that anything can be reduced to an infinite disjunction and reject ethical reductionism because moral properties are infinitely realizable at the level of physics. So I explain why ethical reductionism succeeds if moral properties are infinitely realizable at the level of physics, as long as they are finitely realized at levels like psychology or sociology.

Reducing moral properties merely requires their being identical to some scientific properties, not necessarily those of physics. As Thomas Polger explains, realizability is relational, holding between particular sciences rather than absolutely.²⁴ Consider the water/ H_2O -type identity. Suppose it surprisingly turned out that protons were realizable by an infinite range of different arrangements of quarks. H_2O and water would then be infinitely realizable at the fundamental physical level, since the protons in the atoms would be infinitely realizable at that level. But this would give us no reason to reject the water/ H_2O -type identity! It would still be a necessary truth that water is H_2O . Identity would ground this necessity. While type-reduction would fail between protons and quarks, it would hold between water and H_2O . This is how moral properties relate to the special-science properties invoked in moral theories. Moral properties are infinitely realizable at the level of physics only because their special-science reduction bases—pleasure, actions caused by a mental state specified by deontologists, or a disjunction specified in some more complex moral theory—are infinitely realizable at that level. Type-reduction can still hold between moral properties and special-science properties.

The relational nature of realizability answers Brink's multiple realizability objections. Reductionists can accept that the special-science reduction bases

of normative ethical data could only be explained with infinite principles? Simplicity principles may also help keep naturalists away from infinitely complex moral theories.

24 Polger, "Two Confusions concerning Multiple Realization."

of moral properties may themselves be infinitely realizable at the level of physics. Treating others as ends in themselves presumably is infinitely realizable in worlds sharing our fundamental physics, and especially across the space of metaphysical possibility. But moral properties may still be type-reducible to tidy sets of special-science properties. Reductionists who see the Formula of Humanity as the sole normative ethical principle can simply say that however treating others merely as means is physically or nonphysically realized, it is identical to wrongness. Lying will then be wrong for humans, aliens, and ghosts.²⁵ The infinite physical and nonphysical realizers of moral properties are already accommodated between the fundamental properties and psychology by nonreductionism about the special sciences. No more accommodation is needed between psychology and ethics, making nonreductionism unnecessary there.

2. NONREDUCTIONISM'S EXPLANATORY PROBLEM AND REDUCTIONISM'S SOLUTION

This section examines arguments that nonreductionism lets moral properties explain phenomena just as special-science properties do. I respond that irreducible moral properties do not add to our explanations of observed regularities, giving naturalists no reason to believe in them. Reductionism uniquely or disjunctively identifies moral properties with scientific properties that add to our explanations of regularities, justifying belief in them. While nonreductionism cannot answer error theorists' epistemological arguments, reductionism can.

Gilbert Harman famously argues that irreducible moral properties do not explain our observations.²⁶ This is a problem because naturalists are reluctant to believe in properties that do not explain our observations. Nonreductionists respond by noting the role of irreducible properties in special sciences like psychology and suggesting that moral properties play a similar role, explaining regularities unexplained by the properties that they supervene on.²⁷ Here oppo-

25 For ghosts' actions to be wrong, we need not include supernatural properties in the reduction base. Reductionists should instead identify wrongness with more familiar properties like treating others merely as means. Even if these familiar properties supervene on supernatural properties in ghostly worlds, they do so without identity, so instantiating them does not require instantiating supernatural properties. Otherwise, treating others merely as means could not happen in our world, which lacks the supernatural properties. The multiple realizability of the mental is inconsistent with reductive supernaturalism, just as with reductive physicalism.

26 Harman, "Ethics and Observation." Audi, "Ethical Naturalism and the Explanatory Power of Moral Concepts," and Thomson, "Reply to Critics," raise similar issues.

27 As Darwall, Gibbard, and Railton observe, "Nicholas Sturgeon, Richard Boyd, David Brink,

nents of nonreductionism can concede that irreducible properties of some special sciences explain phenomena, perhaps as higher-level causes or in program explanation.²⁸ This concession leaves open the empirical question of whether moral properties explain phenomena. It does not entail that they actually explain phenomena, just as it does not entail that irreducible astrological or alchemical properties explain phenomena. Higher-level causation and program explanation should not save astrology and alchemy along with morality! Simply allowing irreducible properties to participate in explanations does not tell us why irreducible moral properties succeed while irreducible astrological properties fail. Here we should recall why we posit irreducible special-science properties in the first place.

Irreducible special-science properties are worth positing because they provide unified explanations of observed regularities that more fundamental properties explain only in a disunified way. Fodor writes that the sciences “state such true, counterfactual supporting generalizations as there are to state.”²⁹ These generalizations are systematic and unified accounts of regularities, some of which resist unified characterization in the language of physics. Reducing psychology to physics would prevent its laws from being well-unified, as they would involve huge disjunctions of physical states producing huge disjunctions of other physical states.³⁰ Psychological laws also seem to hold under different fundamental laws, perhaps in possible worlds in which a different version of string theory is true, or where nonphysical ghosts have psychologies like ours. So psychological properties could be instantiated without actual physical properties. This is why we need irreducible special-science properties as well as those of fundamental physics. If the regularities psychology describes did not exist, or if physics or

and others have pursued analogies with natural and social science to argue that moral properties might be both irreducible and explanatorily efficacious,” “Toward *Fin de Siècle* Ethics,” 26.

28 Majors argues that properties of special sciences like psychology are genuine causes, so moral properties could be causes as well (“Moral Explanation in the Special Sciences”). Nelson (“Moral Realism and Program Explanation”) argues that moral explanations can be “program explanations” in which higher-level properties “program for” the existence of lower-level properties that really explain things, as Miller (*Contemporary Metaethics*) considers.

29 Fodor, “Special Sciences,” 114.

30 Against disjunctive laws and natural kinds, Fodor writes: “I think, for example, that it is a law that the irradiation of green plants by sunlight causes carbohydrate synthesis, and I think that it is a law that friction causes heat, but I do not think that it is a law that (either the irradiation of green plants by sunlight or friction) causes (either carbohydrate synthesis or heat). Correspondingly, I doubt that ‘is either carbohydrate synthesis or heat’ is plausibly taken to be a natural kind predicate” (“Special Sciences,” 109). He sees reductionism about mental states as providing similar disunity, with its huge disjunctions in the reduction base.

some other science explained them with equal unity, accepting irreducible psychological properties would be ontologically extravagant.

While psychology passes this test, many empirical theories have failed. Even if astrological claims occasionally accord with data (some Capricorns are ambitious), they do not explain additional regularities. The ambition of these Capricorns will be explained by biological, developmental, and social factors that leave no regularities for irreducible astrological properties to explain. So we reject irreducible astrological properties. While alchemists discovered some regularities concerning the production of acids and ceramics, chemistry explained these phenomena and more.³¹ We reject irreducible alchemical properties because they do not explain any additional regularities that chemistry leaves behind. Irreducible moral properties explain phenomena if they succeed in providing unified explanations of regularities that more fundamental properties do not. This determines whether they can figure in higher-level causation or program explanation.

Brink and Sayre-McCord argue that moral properties explain additional regularities, making ethics like psychology rather than astrology or alchemy.³² Sayre-McCord claims that “certain regularities—for example, honesty’s engendering trust or justice’s commanding allegiance, or kindness’s encouraging friendship—are real regularities that are unidentifiable and inexpressible except in terms of moral properties.”³³ On Fodor’s view, we are justified in treating special-science properties as more than mere heuristics because they explain additional regularities. Brink and Sayre-McCord claim that irreducible moral properties do so too.

Why must Brink and Sayre-McCord argue that moral properties explain nonmoral phenomena, as with justice engendering allegiance? Terence Cuneo describes how moral properties might explain moral phenomena, as when having a virtue causes someone to act rightly.³⁴ Brink and Sayre-McCord must go further and explain nonmoral phenomena because naturalists will reject putative special sciences with closed loops of irreducible properties that only causally explain each other. This rules out realms of spirits interacting only with each oth-

31 Morris, *The Last Sorcerers*.

32 Brink defends “the causal and, hence, explanatory irreducibility of higher-order facts—including moral facts—to lower-order facts that constitute, but are not identical with, those higher-order facts” (*Moral Realism and the Foundations of Ethics*, 197). For example, protest against the South African government is better explained in terms of its injustice than by the particular laws it passed, because different unjust laws would have resulted in similar protest (*Moral Realism and the Foundations of Ethics*, 195).

33 Sayre-McCord, “Moral Theory and Explanatory Impotence,” 276.

34 Cuneo, “Moral Facts as Configuring Causes.” At the end, he suggests further application to nonmoral explanations.

er, but does not rule out psychological properties. When race car drivers desire to win races and believe that they can win by accelerating, this explains not only the psychological event of their intending to accelerate, but the nonpsychological event of cars accelerating. Similar cross-domain explanations are ubiquitous. Economic events like industrialization explain geophysical events like climate change, which explain biological events like extinctions. Moral properties must do the same, or they will be as eliminable from our ontology as realms of spirits.

This takes us back to familiar debates about the explanatory potency of irreducible moral properties, but with a clearer view of the central question: do they explain additional regularities? Let us consider Sayre-McCord's claim that justice engenders allegiance. This generalization also has a merely psychological explanation. People desire that they and others be treated justly, and believe that allegiance to the just makes just treatment more likely. For justice's engendering allegiance to support the irreducibility of moral properties, morality has to provide a unified explanation of regularities that psychology does not explain. If we consider the reasons for regarding psychology as irreducible to neuroscience, and for positing chemical properties that are not alchemical properties, we can see two ways for moral explanations to have such an advantage. Justice could systematically engender allegiance in creatures lacking beliefs and desires. Or it could systematically engender allegiance in creatures whose beliefs and desires do not support psychological explanations of allegiance. I consider both options, explain how they parallel good defenses of irreducible special-science properties, and argue that they fail.

First, justice might systematically engender allegiance even in creatures that lack human psychological states like beliefs and desires, paralleling how psychology explains even robot behavior.³⁵ Neuroscience cannot explain robot behavior, since robots have other structures instead of brains. Psychology does so, supporting its irreducibility to neuroscience. Moral explanations of creatures without humanlike psychology would justify ethics as an irreducible special science by explaining phenomena in which psychology does not apply. This would be the best case for nonreductionists, as it would make their position perfectly analogous to Fodor's.

Sadly, justice does not systematically engender allegiance in creatures without our psychological architecture. Being just to amoebas and bees does not engender their allegiance. Creatures without humanlike psychologies do not systematically respond to moral properties, except perhaps in ways that scientific properties already explain. Psychology explains regularities that neuroscience does not address and that physics handles with disunity. But ethics has no

35 Some robots, like the Mars Rover, have a belief-desire-intention architecture.

similar advantages over psychology and sociology. Nonreductionists do not explicitly defend moral explanations of amoeba and bee behavior. They probably have not recognized that their arguments require these bad explanations to succeed. But if psychology is not reducible to neuroscience because its laws apply to creatures without humanlike brains, parallel arguments against reducing moral properties to psychological properties require moral laws to apply to creatures without humanlike psychologies.

Second, justice might systematically engender allegiance in creatures psychologically like us, but whose beliefs and desires do not suggest a psychological explanation of justice's engendering allegiance. Then psychology would fail to explain some regularities. If moral theories filled this gap, systematically explaining regularities that other special sciences did not, that would justify belief in irreducible moral properties. Belief in chemical properties similarly is justified by their ability to systematically explain regularities that alchemy does not.

Empirical evidence suggests that ethics does not fill any such gaps left by other sciences. If it did so, social scientists would invoke irreducible moral properties to explain regularities that scientific properties did not explain. But as Brian Leiter writes, "moral facts appear to play no role in any developed explanatory theory.... While, for example, there are Marxist historians using broadly 'economic' facts to explain historical events, there is no school of 'moral historians' using moral facts to do any interesting or complex explanatory work."³⁶ Current practice in the social sciences suggests that irreducible moral properties play no useful role in explaining regularities. Social scientists instead use psychological or sociological explanations that invoke economic or cultural facts.³⁷ Histories

36 Leiter, "Moral Facts and Best Explanations." Majors misunderstands the problem Leiter raises, taking it to be "that no moral generalization will be exceptionless" ("Moral Explanation in the Special Sciences," 150). That indeed would not be a problem. Fodor writes, "Intentional psychology is a special (i.e., nonbasic) science, so its laws are *ceteris paribus* laws. And *ceteris paribus* laws tolerate exceptions, so long as the exceptions are unsystematic" (*The Elm and the Expert*, 39). Leiter's point is that moral generalizations fail systematically enough to make them useless, so that social scientists must invoke nonmoral natural facts instead. Cuneo notes that explanations of empirical phenomena are incomplete and sometimes "it is just not obvious what these natural facts are," ("Moral Facts as Configuring Causes," 154). But psychologists, sociologists, and economists are discovering these natural facts, and moral facts do not seem to be among them.

37 Might ethics develop in such a way that moral facts would explain psychological or sociological events, contrary to current psychological or sociological methodology? As Parfit notes, "Non-Religious Ethics is at a very early stage," and we should be open-minded about how it will develop (*Reasons and Persons*, 454). But there is plenty of room for open-mindedness without expecting ethics to overturn the methodology of better-understood empirical disciplines.

in which irreducible moral properties exert pressure on political events, systematically pushing toward better outcomes, are pejoratively labeled “Whig history” and rejected along with the nineteenth-century school of historiography that provides the name.³⁸

While psychology does not have systematic exceptions that moral generalizations explain, the moral generalizations suggested by nonreductionists have systematic exceptions that psychology explains. To return to Sayre-McCord’s example, those who profit from injustice often align themselves with the unjust rather than the just. It is unclear how moral explanations would explain this regularity. Psychology explains it—their desire to profit from injustice exceeds their desire for justice. In this and other cases, moral generalizations have systematic exceptions that psychology explains, but not vice versa.³⁹

Frederick Engels claimed that justice was “social phlogiston.”⁴⁰ In trying to make irreducible moral properties explain social regularities just as chemists before Lavoisier tried to make phlogiston explain combustion, nonreductionism fails just as phlogiston theories failed. Error theory then defeats naturalistic moral realism.

Reductionism saves ethics from this misfortune. It treats moral properties as identical to scientific properties that explain phenomena, answering the challenge that we have no reason to believe in moral properties because the best explanations of our observations do not entail their existence. Harman, who famously brought this challenge against the Cornell Realists, allows that reductionism answers it.⁴¹ After discussing an example in which Jane believes that Albert has done something wrong after seeing him beat his cat, Harman writes, “certain naturalistic reductions of wrongness might enable us to explain how the wrongness of Albert’s action could help to explain Jane’s disapproval of it.”⁴² If wrongness is identical to causing pain, and causing pain explains Jane’s disapproval, wrongness explains Jane’s disapproval.⁴³ While disjunctions of natural

38 In *The Whig Interpretation of History*, Butterfield provides a classic criticism of Whig history.

39 Consider Brink’s example of apartheid ending in South Africa. On a psychological explanation, other restrictions regarded as unjust would have generated indignation, causing protest and instability. Moral and psychological explanations differ about what would happen if everyone regarded South Africa’s injustices as just, perhaps because of racism among whites and internalized oppression among blacks. Moral explanations implausibly predict that there still would have been instability and protest.

40 Engels, “The Housing Question.”

41 Harman, “Moral Explanations of Natural Facts.”

42 Harman, “Moral Explanations of Natural Facts,” 63.

43 Railton proposes a “reduction basis” for moral value (“Moral Realism,” 142) and later sympathetically considers the view I accept—a goodness/pleasure property identity on the

kinds may not provide a unified explanation of any one regularity, each disjunct provides a unified explanation of some regularity. Then wrongness can be identical to a disjunction of natural kinds, as jade is. Even if wrongness does not explain any regularity, its disjuncts each explain regularities, entailing its existence.

Nonreductionists cannot construct an analogous position on which irreducible moral properties supervene on arbitrary disjunctions of realizers. The way irreducible properties can inherit the causal powers of their supervenience bases might seem to suggest such a position, as nonreductionist theories of mental causation typically involve higher-level properties exercising causal powers through lower-level realizers.⁴⁴ But these higher-level properties explain additional regularities, unlike irreducible moral properties.

How can we discover which scientific properties are identical to moral properties? Many answers are possible. Brink's favored method of reflective equilibrium works just as well for reductionists as for nonreductionists. The moral theory that results from reflective equilibrium can be treated as a synthetic identity.

Unsurprisingly, moral properties fare better when they do not have to explain regularities beyond those of scientific properties and can simply be identified with elements of existing scientific explanations, as reductionism allows. Our interest in ethics is not about providing new, unified explanations of natural phenomena. We care about rightness, virtue, and goodness whether or not they explain additional regularities. We want to act rightly, be virtuous, and make the world a better place. It would be neat if moral properties explained regularities that scientific properties did not, but that is not why we care about them. Moral concepts leave open which phenomena moral properties explain, or whether they explain any at all.

Then why do naturalistic moral realists care about explanations? It is because

water/H₂O model ("Naturalism and Prescriptivity," 157). He argues that moral properties can explain things that beliefs about the properties cannot explain. His reductionism helps his moral explanations succeed, since moral properties that reduce to scientific properties explain whatever the scientific properties explain. This goes beyond what moral or scientific beliefs about the properties explain.

44 See Bennett, "Mental Causation." This avoids problems Elizabeth Tropman discusses about knowing moral facts "via inferences from the best explanation of some observed phenomenon," "Can Cornell Moral Realism Adequately Account for Moral Knowledge?" 33. Perhaps nonreductionist ambitions of explaining additional regularities prevented Joseph Long from invoking reflective equilibrium in response ("In Defence of Cornell Realism"). Reductionists do not require goodness to provide unified explanations of additional regularities that scientific properties cannot provide. While Lei Zhong ("An Explanatory Challenge to Moral Reductionism") is right that error theory and reductionism are equally simple, deep, and unified, reductionism gains an advantage in reflective equilibrium through its coherence with our existing moral beliefs.

of their broader epistemological commitments, not because of anything specific to morality. They are happy to believe in whatever the best explanations invoke or entail, and reluctant to believe in anything else. While they may accept that it is conceptually possible for there to be moral properties that do not explain anything, they deny that there is reason to believe in them. By identifying goodness with scientific properties or their disjunctions, reductionism makes our explanations entail its existence so that naturalists can believe in it.

Readers may be wondering how my explanatory arguments fit with the previous ones concerning multiple realizability. To solve multiple realizability for pluralism, I gave goodness a disjunctive reduction base that could not provide unified explanations. Then I argued against irreducible goodness on grounds that it does not add to our unified explanations of regularities. But how does a disjunctive reduction base avoid this problem? Why accept reductions of goodness to disjunctive bases that do not provide unified explanations, while rejecting irreducible goodness for not providing unified explanations? The answer is that if pluralism prevents goodness from doing unified explanatory work, only reductionism allows our scientific and normative ethical theories to jointly entail that there is goodness in the world.

Our best explanations invoke some things, entail the existence of disjunctions of the things invoked, and cast doubt on the existence of things that do not fit the data. Suppose normative ethics treats pleasure and democracy as the two good things, and metaethics commits us to the objectivity of their value. Nonreductionism then suggests understanding goodness as being constituted by pleasure or democracy but not identical to them. The existence of pleasure or democracy does not entail that anything fits that description, and the suggested empirical effects of this irreducible property do not fit our social-scientific observations. So we should reject such an irreducible property. Our explanations invoke only scientific properties, and entail that there are disjunctions of these properties. On a reductionist construal, the above ethical theory suggests that goodness is identical to pleasure or democracy. Even if this disjunction is too disunified to explain anything and is not a property on the sparse view, the existence of either disjunct entails its existence. So the reductionist construal of this ethical theory and our scientific ontology jointly entail moral realism.

Jade is identical to jadeite or nephrite. Jade does no unified explanatory work. But wherever there is jadeite or nephrite, there is jade. If reductionism is true and the true normative ethical theory says pleasure and democracy are the two good things, goodness is identical to pleasure or democracy. If either exists, there is goodness in the world.

3. HAPPY ENDING

I conclude by explaining why Cornell Realists should be happy to accept reductionism.

One does not accept nonreductionism for its own sake. One accepts it to address multiple realizability. Contrast the reasons to accept the rest of Cornell Realism. We might accept that our moral concepts demand objectivity because we feel that nothing less would count as genuine moral value. We might accept moral realism because error theory is so unappealing. We might accept naturalism because nonnatural moral facts are epistemically dubious and ontologically extravagant. We might accept externalism about moral judgment because it is possible for Satan to be rational, fully understand evil, and wholeheartedly do evil for evil's sake. By contrast, nothing directly pushes us toward nonreductionism. We want wrongness to be instantiated across infinite disjunctions at the level of physics and when ghosts torture other ghosts. But if reductionism delivers these results, nonreductionism has no further appeal. Moreover, reductionism answers Harman's objections, making our scientific explanations entail the existence of things that make moral belief true.

The simplicity of reductionism should attract naturalistically minded philosophers like the Cornell Realists. Einstein writes, "It can scarcely be denied that the supreme goal of all theory is to make the irreducible basic elements as simple and as few as possible without having to surrender the adequate representation of a single datum of experience."⁴⁵ Sometimes we have to abandon simple theories because they fail to explain the phenomena. But when a view like reductionism explains everything, it delivers the supreme goal of all theory.⁴⁶

*National University of Singapore
neiladri@gmail.com*

45 Einstein, "On the Method of Theoretical Physics."

46 For helpful questions and comments, I thank audiences at the Slovak Academy of Sciences, the Zagreb Institute of Philosophy, the Creighton Club, the University of Western Australia, the University of California at San Diego, the University of Erfurt, the Naturalism and Normativity in the Social Sciences Conference, Nanyang Technological University, the University of Texas at Austin, Southern Methodist University, the University of Houston, the University of Florida, the UNC Metaethics Working Group, the University of Cincinnati, the University of Puget Sound, the University of Tennessee, and the Australasian Association of Philosophy. Dan Korman and Nicholas Laskowski also offered helpful feedback.

REFERENCES

- Armstrong, David M. *Nominalism and Realism: Vol. 1: Universals and Scientific Realism*. Cambridge: Cambridge University Press, 1978.
- Audi, Robert. "Ethical Naturalism and the Explanatory Power of Moral Concepts." In *Moral Knowledge and Ethical Character*, 112–28. Oxford: Oxford University Press, 1997.
- Bennett, Karen. "Mental Causation." *Philosophy Compass* 2, no. 2 (March 2007): 316–37.
- . "Why the Exclusion Problem Seems Intractable, and How, Just Maybe, to Tract It." *Noûs* 37, no. 3 (September 2003): 471–97.
- Blackburn, Simon. "Through Thick and Thin." *Proceedings of the Aristotelian Society, Supplementary Volume* 66 (1992): 285–99.
- Boyd, Richard M. "How to Be a Moral Realist." In Sayre-McCord, *Essays on Moral Realism*, 181–228.
- Brink, David O. *Moral Realism and the Foundations of Ethics*. Cambridge: Cambridge University Press, 1989.
- Butterfield, Herbert. *The Whig Interpretation of History*. London: W.W. Norton and Company, 1931.
- Clapp, Lenny. "Disjunctive Properties: Multiple Realizations." *Journal of Philosophy* 98, no. 3 (March 2001) 111–36.
- Cuneo, Terence. "Moral Facts as Configuring Causes." *Pacific Philosophical Quarterly* 87, no. 2 (June 2006): 141–62.
- Dancy, Jonathan. *Ethics without Principles*. Oxford: Oxford University Press, 2004.
- Darwall, Stephen, Allan Gibbard, and Peter Railton. "Toward *Fin de Siècle* Ethics: Some Trends." *Philosophical Review* 101, no. 1 (1992): 115–89.
- Einstein, Albert. "On the Method of Theoretical Physics." *Philosophy of Science* 1, no. 2 (April 1934): 163–69.
- Engels, Friedrich. "The Housing Question." *Volksstaat* (1872). <https://marxists.org/archive/marx/works/1872/housing-question/cho3.htm>.
- Enoch, David. *Taking Morality Seriously*. Oxford: Oxford University Press, 2011.
- Feigl, Herbert. "The 'Mental' and the 'Physical.'" *Minnesota Studies in the Philosophy of Science* 2 (1958): 370–497.
- Finlay, Stephen. *Confusion of Tongues*. New York: Oxford University Press, 2014.
- Fodor, J. A. *The Elm and the Expert: Mentalese and Its Semantics*. Bradford: MIT Press, 1994.
- . "Explanations in Psychology." In *Philosophy in America*, edited by Max Black, 161–79. Ithaca, NY: Cornell University Press, 1965.

- . “Special Sciences (or: The Disunity of Science as a Working Hypothesis).” *Synthese* 28, no. 2 (October 1974): 97–115.
- Foot, Philippa. “Moral Arguments.” *Mind* 67, no. 268 (October 1958): 502–13.
- . “Morality as a System of Hypothetical Imperatives.” *Philosophical Review* 81, no. 3 (July 1972): 305–16.
- Harman, Gilbert. “Ethics and Observation.” In *The Nature of Morality: An Introduction to Ethics*, 3–10. New York: Oxford University Press, 1977.
- . “Moral Explanations of Natural Facts—Can Moral Claims Be Tested Against Moral Reality?” *Southern Journal of Philosophy* 24, no. 51 (Spring 1986): 57–68.
- Huemer, Michael. *Ethical Intuitionism*. New York: Palgrave Macmillan, 2005.
- Jackson, Frank. *From Metaphysics to Ethics: A Defence of Conceptual Analysis*. Oxford: Oxford University Press, 1998.
- . “In Defense of Reductionism in Ethics.” In *Does Anything Really Matter?* edited by Peter Singer, 195–211. Oxford: Oxford University Press, 2016.
- Jackson, Frank, Philip Pettit, and Michael Smith. “Ethical Particularism and Patterns.” In *Moral Particularism*, edited by Brad Hooker and Margaret O. Little, 79–99. Oxford: Oxford University Press, 2000.
- Kim, Jaegwon. “Multiple Realization and the Metaphysics of Reduction.” *Philosophy and Phenomenological Research* 52, no. 1 (1992): 1–16.
- Leiter, Brian. “Moral Facts and Best Explanations.” *Social Philosophy and Policy* 18, no. 2 (Summer 2001): 79–101.
- Lewis, David. *On the Plurality of Worlds*. Oxford: Blackwell, 1986.
- Long, Joseph. “In Defence of Cornell Realism: A Reply to Elizabeth Tropman.” *Theoria* 80, no. 2 (May 2014): 174–83.
- Mackie, J. L. *Ethics: Inventing Right and Wrong*. Harmondsworth: Penguin, 1977.
- Majors, B. “Moral Explanation in the Special Sciences.” *Philosophical Studies* 113, no. 2 (March 2003): 121–52.
- Miller, Alex. *Contemporary Metaethics: An Introduction*. 2nd ed. Cambridge: Polity Press, 2013.
- Moore, G. E. *Principia Ethica*. Cambridge: Cambridge University Press, 1903.
- Morris, Richard. *The Last Sorcerers: The Path from Alchemy to the Periodic Table*. Washington, DC: Joseph Henry Press, 2003.
- Nelson, Mark T. “Moral Realism and Program Explanation.” *Australasian Journal of Philosophy* 84, no. 3 (2006): 417–28.
- Parfit, Derek. *On What Matters*. Oxford: Oxford University Press, 2011.
- . *Reasons and Persons*. Oxford: Oxford University Press, 1984.
- Paul, L. A. “The Puzzles of Material Constitution.” *Philosophy Compass* 5, no. 7 (July 2010): 579–90.

- Place, U. T. "Is Consciousness a Brain Process?" *British Journal of Psychology* 47, no. 1 (February 1956): 44–50.
- Polger, Thomas W. "Two Confusions concerning Multiple Realization." *Philosophy of Science* 75, no. 5 (December 2008): 537–47.
- Putnam, Hilary. "The Nature of Mental States." In *Philosophical Papers, Vol. 2: Mind, Language and Reality*, 429–40. New York: Cambridge University Press, 1975.
- Railton, Peter. "Moral Realism." *Philosophical Review* 95, no. 2 (April 1986): 163–207.
- . "Naturalism and Prescriptivity." *Social Philosophy and Policy* 7, no. 1 (Autumn 1989): 151–74.
- Roberts, Debbie. "Thick Concepts." *Philosophy Compass* 8, no. 8 (August 2013): 677–88.
- Sayre-McCord, Geoffrey, ed. *Essays on Moral Realism*. Ithaca, NY: Cornell University Press, 1988.
- . "Moral Theory and Explanatory Impotence." In Sayre-McCord, *Essays on Moral Realism*, 256–81.
- Scanlon, T. M. *What We Owe to Each Other*. Cambridge, MA: Harvard University Press, 1998.
- Schroeder, Mark A. *Slaves of the Passions*. Oxford: Oxford University Press, 2007.
- Shafer-Landau, Russ. *Moral Realism: A Defence*. Oxford: Oxford University Press, 2003.
- Smart, J. J. C. "Sensations and Brain Processes." *Philosophical Review* 68, no. 2 (April 1959): 141–56.
- Sober, Elliott. "The Multiple Realizability Argument against Reductionism." *Philosophy of Science* 66, no. 4 (December 1999): 542–64.
- Sturgeon, Nicholas. "Moral Explanations." In Sayre-McCord, *Essays on Moral Realism*, 229–55.
- Svavarsdóttir, Sigrún. "Moral Cognitivism and Motivation." *Philosophical Review* 108, no. 2 (April 1999) 161–219.
- Thomson, Judith Jarvis. "Reply to Critics." *Philosophy and Phenomenological Research* 58, no. 1 (March 1998): 215–22.
- Tropman, Elizabeth. "Can Cornell Moral Realism Adequately Account for Moral Knowledge?" *Theoria* 78, no. 1 (February 2012): 26–46.
- Väyrynen, Pekka. *The Lewd, the Rude and the Nasty: A Study of Thick Concepts in Ethics*. Oxford: Oxford University Press, 2013.
- Zhong, Lei. "An Explanatory Challenge to Moral Reductionism." *Theoria* 78, no. 4 (December 2012) 309–25.