CHAPTER EIGHT

Hegel

THE REALITY AND PRIORITY OF IMMANENT

TELEOLOGY

James Kreines

Hegel defends a teleological metaphysics. But he is entirely dismissive of views on which the universe—or nature, or anything insofar as it is

I See especially the prominence, in Hegel's Science of Logic, of chapters called "Teleology" and "Life," falling on either side of the all-important transition to the final, concluding section, "The Idea," and on this my paper: J. Kreines, "Hegel: Metaphysics without Pre-critical Monism," Bulletin of the Hegel Society of Great Britain 57-58 (2008): 48-70. In what follows, references to the German text of Hegel's self-standing Logic are to the critical edition, Gesammelte Werke (Meiner, 1968-). Other references to the German are to the writings contained in the Werke in zwanzig Bände and are by volume: page in that edition, ed. E. Moldenhauer and K. Michel (Frankfurt am Main: Suhrkamp, 1970-1971). I cite the Encyclopedia by § number, with 'An' indicating Anmerkung and 'Zu' indicating the Zusatz. I also use the following abbreviations for translations (altering where necessary) and other editions: EL: Encyclopaedia Logic, trans. T. F. Geraets, H. S. Harris, and W. A. Suchting (Indianapolis: Hackett, 1991). PN: Hegel's Philosophy of Nature, trans. W. Wallace and A. V. Miller (New York: Oxford University Press, 1970). VGP: Lectures on the History of Philosophy, trans. E. S. Haldane and Frances H. Simson, 3 vols. (Lincoln: University of Nebraska Press, 1995). VPA: Aesthetics: Lectures on Fine Art, trans. T. M. Knox, 3 vols. (Oxford: Clarendon Press, 1975). WL: Hegel's Science of Logic, trans. A. V. Miller (London: George Allen & Unwin, 1969). KU: Critique of the Power of Judgment, trans. Paul Guyer

natural—is akin to an artifact, in having a purpose or telos in virtue of the work of an external designer, or any kind of external imposition.² Hegel, then, accords a great deal of importance to a distinction between immanent and external teleology. We can best approach his aim here by comparing two familiar claims about the fate of teleology after Aristotle and moving into early modern metaphysics. The first claim is that, while it would be too simple to say that most philosophers come to deny teleology altogether, there is a strong trend toward skepticism more specifically about immanent teleology—and with it the possibility of "unthoughtful" teleology, or teleology without dependence on intelligent agents representing goals.³ The second claim is that this shift away from immanent teleology is, in comparison with the Aristotelian background, a downgrade or limitation of the status of teleology in metaphysics.⁴ A central aim of Hegel's metaphysics is to reverse these trends, in both respects: he aims to defend the reality immanent teleology—and, in so doing, to reorient philosophy around a metaphysical priority of the teleological over the nonteleological.

In some respects, this is to advocate a return to views that Hegel sees in Aristotle. But what Hegel is doing—with respect to teleology, and consequently with respect to his metaphysics more generally—is also shaped in important ways by later philosophical developments, and

and Eric Mathews (Cambridge: Cambridge University Press, 2000). (German text from volume 5 of *Gesammelte Schriften* for the published version of the book, and from volume 20 for the "first introduction.") All references to Kant's writings are given by volume and page number of the Akademie edition of Kant's *Gesammelte Schriften* (Berlin: de Gruyter, 1902–).

² He compares such views to trivialities (PN \$245Z, 9:14/6; EL \$205Z; VPR 17:520; VGP 20:23) and superstitions (VGP 20:88, VPG 3:186).

³ On "unthoughtful teleology" in early modern philosophy see Don Garrett, "Teleology in Spinoza and Early Modern Rationalism," in *New Essays on the Rationalists*, ed. Rocco J. Gennaro and Charles Huenemann (Oxford: Oxford University Press, 1999), 310–335. On denials of unthoughtful and immanent teleology after Aristotle, see the chapters by Pasnau and Melamed in this volume.

⁴ Versions of both are present, for example, in Anneliese Maeir, "Das Problem Der Finalkausalität Um 1320," in *Metaphysiche Hintergründe Der Spätscholastichen Naturphilosophie* (Rome: Edizioni di storia e letteratura, 1955), 273–299 and Jeffrey McDonough, "The Heyday of Teleology and Early Modern Philosophy," *Midwest Studies in Philosophy* 35 (2011): 179–204.

especially by Kant. We can in fact best approach Hegel's arguments by seeing them as borrowing considerations from post-Aristotelian forms of skepticism about immanent teleology and turning these to Hegel's opposed purposes. And these kinds of arguments ultimately lead Hegel in some directions that, while influenced by Aristotle, are also distinctively Hegelian. Looking at these arguments and ambitions can help us to ask whether there might be, well after Aristotle, viable routes to a teleological metaphysics, and—if so—where those routes might lead.

8.1. KANT'S ANALYSIS AND HIS CASE FOR SUBJECTIVISM

It is important to begin by highlighting some features, crucial for Hegel, from Kant's account of teleology in the third *Critique*. Some are features from Kant's analysis of immanent teleology, which Hegel will accept. And some are features of the argument—to be contested by Hegel—for Kant's subjectivism about teleology.⁵

Kant's analysis pursues one of the organizing questions of this volume: What are the conditions required for genuine teleology? More specifically, Kant asks what is required for a genuinely teleological *system*. His analysis is shaped by consideration of examples like the arctic ecosystem, where the presence of "great sea animals filled with oil" is an "advantage" for humans (KU 5:369). Kant gives two reasons why teleology cannot be explained by saying that this sort of structure, within which some parts of a whole benefit others, makes for teleology. First, this would not explain natural or immanent teleology—or what it is to be an "end of nature"—because it makes sense "only under the condition that the existence of that for which it is advantageous . . . is in itself an end of nature" (KU 5:368). Second, it would be "bold and arbitrary" (KU 5:369) to conclude merely from the fact that sea life

⁵ For more on Kant's subjectivism, see section 7.4 of this volume.

benefits humans that this is a purpose or teleological function. This is especially clear in light of Kant's connection between teleology and normativity (KU 20:240): benefiting humans does not make it the case that sea life, if it starts to evade capture, would be malfunctioning or failing to fulfill its purpose.

Kant draws the conclusion that, for a teleological system, it is not enough to have any given structure, or parts standing in any given relations. Genuine teleology imposes rather a specifically *explanatory* demand concerning *why* a system is structured as it is. I call this Kant's "first requirement," best understood in this way:

R1 The parts must be present *because* of their relations to other parts, or to the roles they play within the whole.

In Kant's terms, a teleological system requires that "parts (as far as their existence and their form are concerned) are possible only through their relation to the whole." To pursue an example of Kant's, one watch gear has a purpose—it is "the instrument for the motion of another" (KU 5:374)—insofar as a gear of this form or type is present here because of how it relates to the other parts, namely, in a manner that results in reliable indication of the time.

This is, in two respects, an *inflationary* account, in that it takes teleology to always carry a kind of explanatory implication. To appreciate the point, it is crucial that the sense of explanation at stake is not itself deflationary, as for example on a purely pragmatic or interest-relative account of explanation. Kant's argument cuts against this. Consider Kant's example: we could construct a purely pragmatic account of explanation, on which describing the arctic ecosystem in terms of how

⁶ KU 5:373. I defend this interpretation at length in my paper: J. Kreines, "The Inexplicability of Kant's Naturzweck: Kant on Teleology, Explanation and Biology," Archiv für Geschichte der Philosophie 87, no. 3 (2005): 270–311.

⁷ See the chapter by Forber in this volume on the impact of broadly pragmatic accounts of explanation on issues concerning teleology.

its parts benefit humans would count as explanatory in context of the interests of humans living there. But Kant's point is precisely that this fails to establish the kind of explanatory relation required for teleology: it is "bold and arbitrary" to take benefit as itself grounds for concluding that sea life is present "because" (Kant's emphasis) of that benefit (KU 5:369). The argument requires understanding explanation, and teleology with it, in more inflationary terms, as raising metaphysical issues—in the sense of issues about what the world must be like, independent of any varying subjective perspectives and interests, so as to support explanation.8 It is important to note, first, that the analysis of teleology does not require specifically *causality* in any particular narrow sense, such as a temporally prior efficient cause; as we will see, it is crucial to Kant's purposes that the analysis in itself leaves open the possibility of satisfaction by a kind of a kind of grounding that is not narrowly causal—by "a supersensible real ground for nature" (KU 5:409).9 Second, Kant's inflationism does not contradict but is rather needed in support of his subjectivism: only because teleology cannot be merely a perspective, but must raise metaphysical issues, might it follow that we can never have objective knowledge of the metaphysics required for specifically immanent or natural teleology. Deflationism and epistemic restriction are generally opposed philosophical strategies, and Kant generally favors what I call restrictive inflationism. 10

⁸ This is sometimes called explanatory realism. Note that my formulation would be compatible with the possibility that there are also—aside from metaphysical conditions—necessary conditions on explanation that are essentially pragmatic, contextual, or similar.

⁹ For Kant, causes (in the narrow sense involving temporal priority) are restricted to the sensible; a supersensible ground would be something else. For natural teleology or inner purposiveness, as opposed to artifacts, there is a strong limit on our ability to comprehend what the needed ground would be like.

¹⁰ I make this interpretive case about Kant on laws of nature in J. Kreines, "Kant on the Laws of Nature: Restrictive Inflationism and Its Philosophical Advantages," *The Monist* 100, no. 3 (2017): 326–341, and on teleology in J. Kreines, "The Inexplicability of Kant's *Naturzweck*: Kant on Teleology, Explanation and Biology," *Archivfür Geschichte der Philosophie* 87, no. 3 (2005): 270–311, sketching the route from teleology to a similar point about Kant on free will in J. Kreines, "Kant and Hegel on Teleology and Life from the Perspective of Debates about Free Will," in *The Freedom of Life*, ed. T. Khurana (Cologne: Walther König, 2013), 111–153.

Now the preceding is so far only Kant's general account of the concept of a teleological system, or what he sometimes calls a "purpose" or "end" (*Zweck*). Kant's aim is to narrow this to an account of specifically *immanent* teleology, or of "inner" as opposed to "external purposiveness," or to narrow from the concept of a purpose or *Zweck* to that of a *natural* purpose, or *Naturzweck*. This requires a second requirement, best understood in this way:

R2 The whole must have its form because of its parts.

That is to say: it must have its form because of what is within, rather than outside, as for example in a designer. Kant himself rolls the two requirements together to yield the requirement of a *reciprocity* between part and whole.¹¹

Having noted Kant's analysis, it remains to point out his argument from this to subjectivism. ¹² Some post-Aristotelians take considerations similar to Kant's—concerning backward causality and the nature of matter—to justify skepticism in the sense of a denial that there can be any immanent teleology; Kant argues that they support rather skepticism in the sense of the denial of the possibility of *knowledge* of real immanent teleology. (For concision, I refer to both views as different varieties of "skepticism.")

The nub of Kant's argument is this: the complex systems we can know about originate over time. In such a temporal development, we can know why the parts are present only in the sense of knowing efficient causes, beginning temporally prior to the initial formation and development of the system. Since the whole itself is not around temporally prior to serve as efficient cause of itself, we can only know R1 to be met where we know this cause to be an intelligent designer representing a

¹¹ For a Naturzweck it is required "that its parts be combined into a whole by being reciprocally the cause and effect of their form" (KU 5:373). See also Paul Guyer's chapter in this volume.

¹² On Kant's subjectivism, see this volume, Guyer, section 7.4.

concept of the whole. ¹³ But then any epistemic reason ¹⁴ we could have for thinking a system meets R_I, or is a teleological system, could only be a reason for taking it to be an artifact, and denying that it satisfies R₂, or that it is *immanent* teleology. Similarly, the complex systems we know about have parts that are ultimately matter, which Kant holds to be itself "lifeless," without "intention" or aim (*KU* 5:394); so any epistemic reason to think that a system has its form because of these parts, or satisfies R₂, is reason to deny that it satisfies R_I, or is a teleological system at all.

Given our epistemic limits, this is supposed to leave a coherent concept of immanent teleology. The basic idea here is that the analysis does not require that its explanatory demand be met specifically by the sort of temporal, efficient causality of which we can have knowledge; it could, then, be satisfied in some other way, beyond our epistemic limits. So Kant says that something could in principle be a case of immanent or natural teleology in virtue of a "supersensible real ground" (KU 5:409) that is unknowable and incomprehensible for us. Kant will argue that we necessarily, and usefully, think of nature in terms of that coherent concept of the immanent purposiveness of a natural purpose (Naturzweck). But for understanding Hegel what is crucial is the remaining epistemic limit: the concept Naturzweck is "problematic," in that when using it "one does not know whether one is judging about something or nothing" (KU 5:397).

¹³ In the order of "real causes," an end or purpose (Zweck) cannot precede and thereby influence its own causes, so it can do so only as "ideal" or represented (KU 5:372). See also P. Guyer, "Organisms and the Unity of Science," in Kant and the Sciences, ed. Eric Watkins (Oxford: Oxford University Press, 2001), 265, and R. Zuckert, "Purposiveness, Time, and Unity: A Reading of the Critique of Judgment" (Ph.D. diss, University of Chicago, 2000), 136–140.

¹⁴ I mean "epistemic reason" and "reason" (unmodified) here to capture Kant's notion of "objectively sufficient" grounds; Kant's subjectivism allows "subjectively sufficient" grounds for teleology, or grounds relating to our ends, including the ends of reason.

8.2. RAISING THE STAKES: NO TELEOLOGY WITHOUT IMMANENT TELEOLOGY

My main focus throughout this chapter will be Hegel's argument, in response to Kant, for the reality and knowability of immanent teleology, in a part of the *Logic* called "Life." But before getting to this, I want to note why Hegel takes the stakes to be so high in this debate about immanent teleology. In particular, Hegel singles out, in a preceding part of the *Logic* ("Teleology"), the tendency within early modern philosophy toward dismissals of immanent teleology that claim to preserve a place for teleology in cases of intentional action. ¹⁵ But Hegel holds that arguments against immanent teleology would, if successful, have to be carried through to an elimination of all teleology altogether.

One place we can see this position of Hegel's is where he interprets Spinoza both as a destination toward which trends of modern philosophy point, and as denying or eliminating all final causes. ¹⁶ In both respects, Hegel is influenced by a worry of Jacobi's—extremely prominent at the time—that the trends in philosophy lead to Spinozism in a sense that is supposed to include this view:

[T]here are only efficient, but no final, causes....[T]he only function that the faculty of thought has in the whole of nature is that of observer; its proper business is to accompany the mechanism of the efficient causes.... We only *believe* that we have acted out of anger, love, magnanimity, or out of rational decision. Mere illusion!¹⁷

¹⁵ Even if some also worry about epistemic access to divine intentions, this can be one reason for denying a role for teleology in explanations of nature. For relevant background, see the chapters by Pasnau and McDonough in this volume.

¹⁶ For example, Hegel translates Spinoza's denial that God acts "sub ratione boni" as "God acts in accordance with no final causes" (VGP 20:178/3;267).

¹⁷ F. H. Jacobi, The Main Philosophical Writings and the Novel "Allwill," trans. and ed. G. di Giovanni (Montreal: McGill-Queen's University Press, 1994), 189.

Hegel's view is that arguments against immanent teleology would, if successful, force this conclusion.

There is not enough space here to explain Hegel's arguments for this raising of the stakes. But the gist is as follows: modern philosophers who claim to preserve intentional teleology tend to covertly assume some immanent teleology. For example, if they think of human beings as acting for the sake of subjective or represented ends, they are assuming that human beings have bodies to use as means to their ends—and that these bodies are fit for such use in virtue of being teleological systems with this immanent end or purpose.¹⁸ Of course, we can use artifacts, like a plow, as the means to our ends as well. But in thinking of a plow as a means to use in planting crops, we are thinking of the plow itself as the result of the intentional action of designing and building the plow in the first place. If intentional action does require some teleological system as means, then we can see how the threat of a regress might force us to abandon the idea that teleology could be external teleology all the way down, as it were—to conclude that there must eventually be a means that is a case of immanent teleology. 19 If one had general reasons to deny all such immanent teleology, then this might still leave the possibility of human beings having subjective ends: of their representing states of the world as desirable, or to be brought about. But Hegel takes the denial of immanent teleology to threaten the conclusion Jacobi worries about: our subjective representations would just take up a perspective on what is going on in the world, but without any of them having, qua ends or goals, the real explanatory relevance to what happens required to support teleology.²⁰ So the threat is that there would be no genuine teleology at all. On this kind of view, then, a "subjective end" would have "the form of

^{18 \$208} and its Zusatz. Hegel's lectures emphasize our hands, for example (VL 206/210).

¹⁹ See the regress in \$211.

²⁰ This depends on the inflationary position on teleology and explanation noted earlier.

objective indifference"; it would be "confronted by an objective, mechanical and chemical world to which its activity relates itself as to something already there" (*WL* 6:447/742).

Now one might object to Hegel's position by appeal to divine intentional action. Thus one might think of our bodies in terms of external teleology, as artifacts created by a God for our use, thus supporting the possibility of our intentional action. But the argument above gives us an approach to Hegel's famous antidualist opposition to the metaphysics of a transcendent God. In effect, Hegel holds that God would be in the same position with respect to the argument above: to realize purposes in the world—including the design and creation of artifacts—even God would need means within the world. In a dualist metaphysics, with a God distinct from the world, God could not act within the world, but only observe. Putting Hegel's positive views in these terms raises complexities that go beyond my scope here, but where Hegel expresses himself in terms of positive claims about divine purposes, what he says is that these are realized only through there being cases of immanent teleology—human beings, for example—acting on immanent purposes of their own (§209Zu). Sometimes Hegel expresses the point in terms of the purposes of "reason" rather than a God, and famously refers to the use of systems acting on their own immanent purposes as "the cunning of reason" (WL 12:166/663; §209).

Again, there is not enough space to do much by way of explaining Hegel's arguments for this way of raising the stakes; here it is more important to keep in mind that he takes the stakes to be high, in that a denial of all immanent teleology would be a denial of all teleology altogether. Similarly, if we cannot know whether there is any immanent teleology, then we cannot know whether there is any genuine teleology at all, even (as Jacobi worries) in the case of our own actions. So Hegel seeks to defend immanent teleology, which he sees as a return to Aristotle:

Aristotle's determination of life . . . stands infinitely far beyond the concept of modern teleology which has only the finite, the external purposiveness in view. (§204An)

Hegel sees this not as an isolated issue, but as promising benefits throughout philosophy, and he takes Kant's analysis as essential to this end:

One of Kant's greatest services to philosophy was in drawing the distinction between relative or *external* purposiveness and *internal* purposiveness; in the latter he opened up the concept of *life*, the *idea*, and with that he *positively* raised philosophy. (WL 12:157/654)

But Hegel also aims to refute Kant's subjectivism, establishing knowledge of real immanent teleology; with respect to subjectivism Hegel says that, "on the contrary," what really follows from Kant's analysis is rather that "purpose . . . is the truth that exists in and for itself" (*WL* 12:159/656). And so I turn to the explanation of this central argument.

8.3. FOR IMMANENT TELEOLOGY: THE CONCEPT AS THE SUBSTANCE OF LIFE

Kant's argument for his subjectivism suggests two obvious openings for defenses of immanent teleology. One would be to contest Kant's analysis in favor of a more deflationary account, on which teleology might be something more like an additional useful perspective we may take on events of sufficient complexity. The other would be to assert knowledge of the reality of precisely what Kant himself thinks required to satisfy the analysis: either intentionally acting intelligent matter (which Kant thinks impossible), or a teleology-supporting supersensible ground of nature (which Kant thinks unknowable). Hegel takes

neither obvious route.²¹ He argues—in a subsequent part of the *Logic*, "Life"—that Kant's inflationary analysis can (contra Kant) be satisfied without need of any intelligence or supersensible ground of all nature, and can be known by us to be satisfied.

Strictly speaking, the direct focus of Hegel's *Logic* is not on objects like actual living beings, but on "forms of thought," including teleological forms. But while this point is important for some downstream issues concerning the metaphysics of Hegel's idealism, to which I return at the end, here what matters is that "Life" in the Logic includes an argument against skepticism about immanent teleology. The best way to approach Hegel's argument is to note how it can appeal to considerations drawn from post-Aristotelian arguments for skepticism about immanent teleology. Such arguments cannot rest on an analysis of teleology that is demanding in an ad hoc sense. So they tend to argue that their analysis captures a natural sense in which artifacts do qualify as teleological, but in a way that then supports skepticism about immanent teleology. In Kant's case, artifacts like a watch naturally satisfy Ri's demand that parts of a certain form are present only because of "their relation to the whole" (KU 5:373). For example, a gear is present because of the way it interacts with other parts, such that the whole reliably indicates the time. In such cases, "the producing cause of the watch" is "a being that can act in accordance with an idea of a whole" (KU 5:374). What Hegel is going to argue is that there can be natural cases, without any design, where something natural and not involving representations can substitute for the idea of a designer.

Hegel makes his argument by constructing an analysis of a concept of life, out of three requirements. This is not an attempt to give an a priori logical deduction of the features of real living beings.²² Nor should it

²¹ In my "Hegel: Metaphysics" and my "Kant and Hegel." I note arguments for those two contrary readings that I think are worthy of serious consideration and response, in Willem de Vries, "The Dialectic of Teleology," *Philosophical Topics* 19 (1991): 51–70 and K. Düsing, "Die Idee des Lebens in Hegels Logik," in *Hegels Philosophie der Natur*, ed. R. P. Horstmann and M. J. Petry (Stuttgart: Klett-Cotta, 1986), 276–289 respectively.

²² It is "quite improper" to try to "deduce" the "contingent products of nature" (PN §250).

be understood as an attempt to analyze our representation of life. It is a theoretical tool, and its ultimate purpose is to demonstrate that, for anything satisfying the three requirements of his concept of *life*, the nature or substance of tokens will be their type, species, or kind—and that this general type will play the role of a designer's idea, making for teleology without need of external design, or for immanent teleology.

In the self-standing *Logic*, the sections on the three requirements are titled "A. The Living Individual," "B. The Life Process," and "C. Kind (*Gattung*)." *First*, parts must be arranged in a way that benefits the whole; since the whole is made of the parts, Hegel follows Kant in taking this to require that the parts are "reciprocally" (*EL* §218) beneficial. *Second*, Hegel's concept of life demands that a complex system needs "assimilation" (*WL* 12:189/686); it "*preserves*, *develops*, and *objectifies* itself" (*EL* §219). *Third*, self-preservation is also required in an additional sense: preservation of a species or kind (*Gattung*) through mating (*Begattung*) or the mating or species process (*Gattungsprozess*) (*WL* 12:191/688).²³

What here is supposed to substitute for a designer's representation of an idea of a whole is the reproductive kind or species. That is, Hegel will employ some inflationary metaphysics, which Hegel takes to descend from Aristotle, to meet Kant's inflationary analysis: a metaphysics on which there are natural kinds, and in which the kind or type can be the very nature or substance of a token, so that the type is what it is to be the token. Hegel sometimes refers to these types as "universals," and sometimes (emphasizing the connection he sees to Aristotle) as "forms." What is crucial here is the idea that, if the type is what the token is, then an organism "produces itself": it "produces itself as another individual of the same *Gattung*." Hegel follows here

²³ On translation of Hegel's *Gattung* as "species" and "kind," rather than "genus," see my "Hegel: Metaphysics."

²⁴ The Philosophical Propaedeutic, trans. M. George and A. Vincent and ed. A. V. Miller (Oxford: Blackwell, 1986), 4:32/142.

a position that he sees in Aristotle; thus Hegel's *Lectures on the History of Philosophy* glosses a famous claim in Aristotle:

That which is produced is as such in the ground, that is, it is an end [Zweck], kind [Gattung] in itself, it is by the same token prior, before it becomes actual, as potentiality. Man generates men; what the product is, is also the producer. (VGP 19:176)²⁵

It is important at this point to note some unusual Hegelian terminology for this view. First, Hegel in general calls this type-token connection—where the type is what it is to be the token—"concrete universality." He says that this "contains . . . the two moments, the objective universal or the *kind*, and the *individualized* universal." Second, Hegel's metaphysics is concerned generally with the just-noted objective universals or kinds. These are neither representations nor mind-dependent in the sense of a representation, or "in" a mind—they are, in the contrasting sense, objective. Hegel's But, *if* grasped by mind, then this is not by sense perception but conceptual comprehension (*Begreifen*). That is part of the reason why Hegel calls such an objective universal also a "concept" (*Begriff*), or "objective concept." Page 18 of 18

We can now state in Hegel's own terms his central claim about life. In the case of life specifically, the *form* (to put the point in terms of Hegel's reference to Aristotle) or the "concept" is the reproductive kind, or *Gattung*. Thus Hegel's discussion of reproduction refers to "the realized *Gattung* that has posited itself as identical with the concept (*Begriff*)" (WL 12:191/688). Hegel's key claim is that the nature or

²⁵ E.g., Aristotle, Physics in The Complete Works of Aristotle: The Revised Oxford Translation, ed. J. Barnes (Princeton, NJ: Princeton University Press, 1984), 198a.

²⁶ WL 6:349, 662. See also Hegel's connection between the concrete universal and Kant's analysis of inner purposiveness (WL 6:443, 739).

²⁷ E.g., WL 21:15/16.

²⁸ E.g., WL 12:20/527. For mention of another part of the reason, see the concluding thoughts on Hegel's idealism.

substance of a reproducing organism is its type or concept. So Hegel says that a philosophical position renders immanent teleology an "incomprehensible mystery" *if* it "does not grasp the concept, nor does it grasp it as the substance of life" (*WL* 12:181/678).

What difference does any of this make with regard to arguments for skepticism about immanent teleology? Consider an elm tree. To satisfy Kant's R1, an elm leaf (for example) must be present because of the way it relates to other parts, so as to maintain the whole. And if the elm satisfies Hegel's analysis, then this explanatory demand will be met. For a new leaf (the token) is only possible insofar as a leaf (of this type) relates to the whole elm (of this type) in just this way. For only in this way can the prior token survive and produce the new token. If the very nature or substance of the token is the type, or the token in this sense is its type, then the leaf is present because of its relation to the whole. Where we have such an organism, "all its members serve only as means to the one end (*Zweck*) of self-preservation" (*VPA* 13:193/1:145).

Why would this be *immanent* teleology? The short story is: it requires no external designer. The longer story is that Kant's R2 requires that the form of the whole be due to its parts, so that the parts reciprocally cause one another. In our elm tree, the parts (tokens) are present on account of the effectiveness of those very parts (type); the effectiveness of those parts (types) itself brings about a new token system. So the inclusion of assimilation and reproduction in the analysis allows us to explain or comprehend the origin of a *Naturzweck*: with these included, "its genesis, which was an act of presupposing, now becomes its production" (*WL* 6:484, 772–773). For example, again where Hegel praises Aristotle, "Leaves, blossoms, roots thus bring the plant into evidence and go back into it." And where some see grounds here for *as if* teleology, there is in fact ground for genuine natural teleology:

What has here been said is already contained in that which was asserted by those who do not represent nature in this way, but say, "that which is constituted as though it were constituted for an end,

will endure." For this is the self-productive action of nature. In the modern way of looking at life this conception becomes lost \dots either through a mechanical philosophy \dots or else theological physics. (VGP 19:180/2:176–177)

Thinking in terms of Kant's connection between teleology and normativity, say our token leaf has never assimilated energy well. If it never has, then in what sense is it malfunctioning, or failing relative to *its* purpose?²⁹ In the sense that its nature or substance is its role in the kind, on account of which it is present. So in the case of life, the possibility of "defect" or malfunction is relative to "the rule, the characteristic of the kind."³⁰

Or take the connection between the topic of teleological systems and of behavior: Insofar as the parts of an organism *have* purposes, what they *do* when working together is purposive activity. So Hegel's commitment is "[t]o see purpose as inherent within natural objects" and the (unthoughtful) growth of "the seed of a plant" is "purposeful activity" and "orientated solely towards self-preservation." And Hegel makes the same historical connection:

Aristotle had already noticed this notion of purpose in nature and he called the activity the *nature of a thing*. This is the true teleological view. $(E \S 245Z)$

This explains how thoughtful teleology is supposed to depend on unthoughtful: Only insofar as there are organisms, with bodies structured by immanent purposes, can it also be the case that some of these organisms can think and represent ends on which the availability of a purposive body as "means" (WL 12:162/659) makes possible intelligent action.

²⁹ I note contemporary considerations of such cases subsequently.

³⁰ EN §368Z. In the English edition this is §370Z.

Finally, in thinking of the whole argument here, recall that Kant himself cedes that we do in fact think of life in terms of immanent teleology; Hegel would add that this means thinking of life in terms of concrete universality. This point seems compelling, and in itself compatible with giving arguments for various forms of skepticism about that way of thinking. But arguments that concern teleology, in favor of such skepticism, do not—Hegel has effectively argued—work as advertised. For the arguments concede external teleology, or that artifacts are teleological systems, appealing to the causal role of ideas of a designer. And it turns out that this clears the way to understanding something playing the role of such an idea, without need of external design. So arguments meant to displace or cast doubt on our way of thinking of life in terms of immanent teleology in fact provide resources that support the immanent teleology of life.

8.4. Understanding the Argument via Objections and Replies

In seeking to better understand Hegel's argument, it can help to consider objections and replies.

OBJECTION: We know (the objection would argue) that nature does not include anything like Aristotelian substantial forms, and so neither Hegel's concrete universality nor immanent teleology resting on them. The argument would be that appeal to anything like substantial forms in nature is explanatorily superfluous, given explicability in terms of motions of material parts alone.

Reply: Hegel sees this worry in the early moderns, including Descartes.³¹ But note that this is a more general consideration,

³¹ E.g., VGP 3:242. On Descartes see, e.g., Oeuvres de Descartes, ed. Charles Adam and Paul Tannery (Paris: Vrin, 1978), vol. 11, p. 7.

not concerning teleology specifically. As such, Hegel's response is to be found elsewhere, earlier in the *Logic*, in a "Mechanism" chapter.³² There Hegel makes the case that arguments like the preceding one, for outright rejection of substantial forms, are incoherent. He argues that mechanistic explanation, appealing to motions of matter alone, would ultimately require appeal to something like a form or concept of matter. To argue that there are no such forms would leave nothing, not even matter, of any explanatory relevance to anything else—or, in Hegel's terms, would make "*explain*" into "only an *empty word*" (*WL* 12.135/633).³³ Hegel's position is that, insofar as we cannot in general dismiss forms, no such general dismissal can undercut his view of teleology.

OBJECTION: Hegel's account captures no genuine teleology, specifically because it requires no action of any intelligent agent.

REPLY: Skeptics cannot just assert or stipulate that genuine teleology requires an intelligent agent. Skeptics about immanent teleology need arguments for this, and they have them. In Kant's case: genuine teleology requires meeting the explanatory demand, RI, and we can know this to be met only in knowing about an originating intelligent agent. But any such argument commits to a standard of genuine teleology—in Kant's case, RI. Hegel argues that this standard—the one chosen by Kant to ground skepticism—can be met without any intelligent agent, evading the case for skepticism.

³² See my J. Kreines, "Hegel's Critique of Pure Mechanism and the Philosophical Appeal of the Logic Project," European Journal of Philosophy 12, no. 1 (2004): 38-74, and J. Kreines, Reason in the World: Hegel's Metaphysics and Its Philosophical Appeal (Oxford: Oxford University Press, 2015), chapter 1.

³³ Some take Descartes's denial of substantial forms to generate this kind of problem for him, and take him to put God to work in place of eliminated substantial forms. E.g., Garber 2004, 206.

OBJECTION: Hegel captures no genuine teleology, because he does nothing to rule out the possibility that life or a reproducing species could have begun by chance.³⁴

REPLY: This is more difficult for Hegel. What I would say on his behalf is this: Kant's argument requires, for a teleological system, that there be a certain kind of reason why it is as it is; it does not disallow any chance in the reason for this reason, and so on *all the way* through a regress of reasons. That would seem ad hoc when considering artifacts: it suggests that we cannot know a watch to be a teleological system even having seen the designer produce it, since we would have to know the cause of the designer, and so on, ruling out any chance all the way back. If Hegel's argument in reply to Kant works, then the immanent teleology of life can be defended without *any* commitment concerning any ultimate origin of life or a species, including any commitment to any historical development toward a supposed broader purpose.

OBJECTION: For all Hegel tells us, the *matter* composing organisms is unintelligent and without purpose; this (the objection holds) rules out genuine teleology.

Reply: Kant argues by allowing artifacts as teleological systems. Surely the idea is not that the matter composing artifacts must be intelligent or represent ends. Rather, the matter does what it would do anywhere, without regard to purpose; but material parts of certain forms or types are present, in a certain arrangement, on account of an end or purpose. If skeptical arguments cede this possibility of teleological systems without intelligent matter, then the way is open to try to argue that the same is true of living beings, without need of intelligence.³⁵

³⁴ Cf. Kant at KU 5:419.

³⁵ Hegel again interprets Aristotle as holding his view on this (e.g., VGP 19:173/2:156).

OBJECTION: Still the teleology would not be *immanent* or *natural*, again because it does not show that the very matter has any purpose.

REPLY: Kant's own R2 is not a constraint requiring anything specifically of constituent *matter*. It cannot be, because Kant's aim is to leave open but unknowable the possibility that, even though matter itself is "lifeless" and without intention, the analysis of immanent teleology might be satisfied in the case of living beings by something that comes *after* the matter in a regress of explanatory grounds—namely, by a "supersensible real ground" (*KU* 5:409) of nature. If that possibility is open, then there is an opening to argue that R2 can also be satisfied also by something that comes *before* the matter in a regress: by parts whose substance or nature is their type, kind, form, or "concept."

OBJECTION: Hegel's defense of teleology—one might argue, now from a contemporary point of view—has been rendered simply and obviously obsolete by subsequent progress in the biological sciences.

REPLY: As far as consideration from a contemporary perspective goes, I have space only for a quick meta-level consideration: There is today among philosophers of biology a debate about whether organisms are cases of immanent teleology. There are those on both sides of the question today who are scientifically well-informed, equally opposed to any place for anything like intelligent design in biology, and so on. So immanent or natural teleology does not seem outdated.

Some may think it obvious that today's neo-teleologists are doing something so different as to be entirely irrelevant to the philosophical evaluation of Hegel's case. I argue elsewhere that there is room for an argument to the contrary.³⁶ Neo-teleologists, like Kant and Hegel,

³⁶ Kreines, Reason in the World, chapter 3.

certainly understand teleology as carrying explanatory requirements; and there is room to argue that, regardless of whether they would agree, their way of satisfying those requirements must involve something like metaphysical resources akin to those that Hegel labels "concrete universality." The gist of the argument would be this: Neo-teleology, as in Neander, "makes a trait's function depend on its history, more specifically... on its evolutionary history." And "its history" refers to tokens *via types*:

Selection is always of types, not tokens. So . . . function attributions in biology belong primarily to types . . . because it is types, not tokens, that are selected for their effects.³⁸

The explanatory requirement is that a trait token must be present in an organism because of *its* effects. But this is not to say that the token trait has effects which then, via backward causation, cause that trait to become present in that organism. Rather, the token is present because of the historical effects of a type of trait in a type of life. So one could argue that holding the trait to be present because of *its* effects is to see this token trait as unified with others of the type—or to see the *type* as the nature unifying all of them. And that is a form of the metaphysics Hegel employs in his response to Kant.

Or consider neo-teleologists on biological normativity. They hold that an organ, for example, can fail relative to its own immanent function. Here they seem to require biological type, with a normative function, to determine the *nature* of a token trait, or *what it is to be* that trait. Consider Neander: "The heart that cannot perform its proper

³⁷ Karen Neander, "Functions as Selected Effects: The Conceptual Analyst's Defense," *Philosophy of Science* 58 (1991): 168.

³⁸ Karen Neander, "The Teleological Notion of 'Function," Australasian Journal of Philosophy 69, no. 4 (1991): 460.

function (because it is atrophied, clogged, congenitally malformed, or sliced in two) is still a heart."³⁹

Is neo-teleology entirely distinct from Hegel in aiming to *naturalize* teleology? Not if the conception of *nature* at stake is one on which the nature of something is its type, or what Hegel calls the "concept."

Granted, Hegel shares only Neander's focus on history, not any requirement that this be specifically an *evolutionary* history. If Hegel's argument works, then it would show that the resource of concrete universality is enough to defend natural teleology, without need of appeal to a philosophical interpretation of natural selection.

Also granted, Hegel is ignorant of, or contradicts, any number of subsequent scientific results in biology. But, if Hegel's argument appealing to "concrete universality" works, then those others details need not affect the philosophical issue concerning the reality of immanent teleology—even if they are crucially important in any number of other respects.

Finally, there are many important and powerful philosophical worries about contemporary neo-teleology, including those covered in Patrick Forber's chapter in this volume. Here I have only pointed out that, thinking from Hegel's perspective, there is an opening to argue that the philosophical resource he draws on still plays a role in debate within contemporary, scientifically informed philosophy of biology.

8.5. Broader Issues in Hegel's Teleological Metaphysics

There is not enough space to discuss the whole of the metaphysics in which Hegel's account of immanent teleology plays such an important role. But it is worth mentioning some of the directions in which Hegel proceeds from the arguments we have considered.

³⁹ Neander, "Functions as Selected Effects," 180. Cf. Ruth G. Millikan, White Queen Psychology and Other Essays for Alice (Cambridge, MA: MIT Press, 1993), 55.

To begin with, Hegel aims to argue for the metaphysical priority of the teleological over the nonteleological. A first sense of metaphysical priority is this: Hegel orients all of metaphysics around explanatory power, and the idea that teleological kinds or concepts are supposed to have greater explanatory power. Nonteleological phenomena, governed by laws of nature or "natural necessity" 40 connecting distinct natures of kinds, have general natures that are merely relational in this sense: it is just the nature of basic kind X to, e.g., attract kind Y; each, then, "is not comprehensible from itself, and the being of one object is the being of another" (WL 12:149/646), and so on throughout a whole web of natural necessity. A teleological nature or concept is supposed to be what it is more independently from anything else, and in this sense have more explanatory power in itself. With an organism, for example, many complex features and behaviors are explained by something about its own nature, namely, the way in which, again, "all its members serve only as means to the one end (Zweck) of selfpreservation" (VPA 13:193/1:145). The Logic expresses the contrast by saying that "cause" in the sense of "blind necessity" must "pass over into its other and lose its originality," while "[t]he purpose, by contrast, is posited as in itself the determinacy . . . does not pass over . . . but instead preserves itself" (E §204R).

And then there is a second sense of metaphysical priority as well: The nonteleological is itself supposed to be a lesser form of teleology; it is not the case that teleology is a greater or enhanced form of nonteleology. Another way to put the metaphysical point is to say that the nonteleological is what it is only in a way that depends on the teleological; the teleological is more completely what it is in virtue of itself. What it is to be a nonteleological form of explanatory relation is to be an approximation that falls well short of the greater explanatory

⁴⁰ Under "natural necessity" Hegel includes both what he calls "Mechanism" and "Chemism" (WL 12:155/652). The specific case I mention here is about "Chemism," or kinds connected by necessary laws.

completeness of the teleological. The downstream epistemological consequence of this metaphysics is that the nonteleological can only be correctly understood by thinking of it in terms of its relation to the teleological. One way Hegel expresses the priority is by saying that teleology is "the truth of mechanism" (*WL* 12:155/652). But the idea is not to eliminate the nonteleological, or to hold that everything (once correctly understood) is teleological; rather, the nonteleological *is*, but it is *what it is* only in this dependent manner.

The best way to briefly consider further this metaphysical priority is to compare an unusual combination of views that Hegel sees in Aristotle: On the one hand, Aristotle defends various kinds of explanatory priority of form over matter. For example, take the claim that this explanatory priority makes form the substance of something:

[T]he question is *why* the matter is some definite thing; e.g. . . . why is this individual thing, or this body having this form, a man? Therefore what we seek is the cause, i.e., the form, by reason of which the matter is some definite thing; and this is the substance of the thing. (*Metaphysics* 1041b)

On the other hand, Aristotle seems to maintain this priority of form even while recognizing a sense in which it is interdependent on its embodiment, so that form must be embodied (e.g., 1026a), and Platonists are criticized for a contrary kind of separation of forms (e.g., 1086b).

Hegel carries over this general pattern, which he sees in Aristotle's views on form, to Hegel's own view of the "concept" of a thing. 41 And Hegel applies this model to his view of teleology: on the one hand, Hegel's metaphysics accords the teleological the two kinds of explanatory priority over the nonteleological, previously noted. On the other hand, this is not diminished by a kind of interdependence of teleology

⁴¹ E.g., WL 21:15/17 and \$24Zu.

and nonteleology, so that the existence of immanent teleology depends, for its realization, on there being some nonteleological elements in which to be realized. This is supposed to not conflict with the metaphysical priority of teleology, because the underlying nonteleological realizers have an "indifference . . . to purpose," or to how they are used by teleological systems (*WL* 12.188/685). This Hegelian position on the priority of teleology in metaphysics goes far beyond an account of life and the argument for the reality of immanent purposiveness found in the part of the *Logic* titled "Life." For there are some respects in which life is not, on Hegel's view, the most complete or perfect case of immanent teleology, explanatory power, and metaphysical priority.

First, the case of life in particular is limited because the analysis of life does not require a form of self-consciousness—it does not require that life's concept or kind is "for itself." Hegel proceeds on these grounds from "life" to what he calls "spirit" (*Geist*).⁴² "Spirit" is supposed to be another form of immanent purposiveness, but where being "spirit" involves its concept or kind being "for itself," in a way that makes its immanent purpose not just preservation but rather a kind of freedom. The "spirit" following "life" is, then, "*free kind [Gattung] for itself*" (§222). Hegel also argues that human beings are instances of spirit. In our own case, then, self-consciousness is supposed to shape what we are and how we develop though history, giving this development the immanent purpose of a kind of freedom. One way to approach Hegel's position here would be through his influence, via Feuerbach, on the early Marx's position that we are conscious of our universal species or kind in a sense that makes us self-shaping and free:

Man is a species-being [Gattungswesen] not only because in practice and in theory he adopts the species (his own as well as those of other

⁴² In the *Logic*, see *WL* 12:191/688; *E* §222. In the broader system, see the transition from the *Philosophy of Nature* to the *Philosophy of Spirit*. There are many different accounts of the relation between these treatments in different locations.

things) as his object, but . . . also . . . because he treats himself as a *universal* and therefore a free being.⁴³

For Hegel, human history—on a sufficient level of abstraction and distance—is supposed to exhibit a kind of teleology, with the immanent purpose of freedom. But this is a complex issue in Hegel. For, first, this is *immanent* purpose of our own: the idea is not that we are just tools of something external, whether the purposes of a God, or the cosmos, etc. And, second, the influence of this end or telos must somewhat stem from the way in which our concept or kind is "for itself," or self-conscious: this cannot be any kind of mechanism working behind our backs, as it were.

And there is also a respect in which this teleological account of human history still leaves us short of Hegel's arguments for "the absolute," or a kind of absolute case of immanent teleology, with absolute explanatory power. Given the previously noted marriage in Hegel between a priority of teleology and an interdependence with the nonteleological, this absolute will not be a metaphysical foundation, in the specific sense of something existing independently of everything else, providing an independent reason for the existence of everything else, so that everything ends up completely explicable. Hegel sees Spinoza as defending a metaphysical foundationalism: Spinoza's God would be the foundation, in terms of which everything real is completely explicable. But Hegel rejects this kind of view. While Hegel's absolute would be something that is what it is in virtue of itself alone, and something on which everything else depends for its being what it is, the absolute is nonetheless in another sense interdependent on, or reciprocally mediated by, everything else. So, in criticizing Spinoza for example, Hegel says that "the absolute cannot be a first, an immediate" (WL 11:376/437).

⁴³ Karl Marx, Economic and Philosophic Manuscripts of 1844, in Marx-Engels Collected Works, vol. 3 (New York: International Publishers, 1975), 275.

We can at least note two ways in which Hegel approaches his absolute. One approach is Hegel's argument that there is a kind of absolute case of "spirit." What this "absolute spirit" is, and how it relates to what Hegel calls "finite spirit," is—given Hegel's antidualism—a difficult topic. A second approach is Hegel's case that the direct object of the *Logic*—a series of "forms of thought"—is itself an absolute case of immanent, teleological development. The final paragraphs of Hegel's system, on "philosophy" as a form of "absolute spirit," argue that these two approaches lead to a "unification," or the same destination—to an absolute case of self-consciousness which is also an absolute case of a form or structure of thought (§§574-577). Hegel here compares this to Aristotle's account of God as thought thinking itself (§577). However difficult these claims are, it is clear that Hegel's metaphysics is some kind of idealism: given the second kind of metaphysical priority, mentioned earlier, in the end everything real is supposed to be what it is in virtue of its relation to something that is at once the absolute case of a kind of self-consciousness and the absolute case of a form or structure of thought.

We should keep the unusual aspects of this philosophy in mind when addressing the common association of Hegel with the view that everything real is completely explicable in virtue of having a place in one teleological process of development throughout history. *On the one hand*, there are clearly senses in which this is not Hegel's view. For Hegel holds that some things exist, but are only incompletely explicable. For example, the nonteleological is only incompletely explicable. It is not the case that there must be a metaphysical foundation, existing independently of any given nonteleological phenomenon, which is responsible for its existence, rendering it completely explicable. And it certainly is not explicable in terms of any historical process, because it has no history. With biological species, there can be historical change in biological species, but without any purpose.⁴⁴ Only spirit is

⁴⁴ A biological species can go extinct, without a purpose explaining why (VGP 19:175/2:158; and EN §339Z, p. 280). In general, "even the species are completely subject to the changes of the

supposed to develop through history in a goal-directed manner. Hegel says, for example,

Merely animate natures, as mere objects, like other things at lower levels on the scale of being, do not have fate. What befalls them is a contingency. . . . Only self-consciousness has fate in a strict sense, because it is free. (WL 12:141/639)

Finally, even Hegel's account of human history is not itself his account of something completely or absolutely explicable in terms of itself; it is not the absolute. On the other hand, there is a sense in which parts of the common suggestion do grasp Hegel's view. For Hegel does hold that anything truly substantial and actual must be something completely intelligible in terms of an immanent purpose of development. This allows that some things fall short of this explanatory completeness to some degree, and are to that degree not truly substantial and actual. This is the point of the famous claim, "What is rational is actual / and what is actual is rational"; the point is not that everything is rational, but that "[a]ny sensible consideration of the world discriminates . . . what truly merits the name 'actuality'" (EL §6).

Finally, I want to end with consideration of the relation between teleology and the good. For Hegel, where something is a case of immanent teleology, it has a purpose, the realization of which is good for it; and where there is a good for something, there is immanent teleology. But to say this is not yet to assign any priority either way. Some read Aristotle as understanding teleology in terms of a prior notion of goodness. ⁴⁵ This is not Hegel's position. Hegel is rather explaining goodness in terms of immanent teleology, and immanent teleology in

external, universal life of nature" (EN §368A [in the German edition] = §370A [in the English translation]).

⁴⁵ On Cooper and Kahn, see Allan Gotthelf, "The Place of the Good in Aristotle's Teleology," Proceedings of the Boston Colloquium in Ancient Philosophy 4 (1988): 13–39.

terms of the idea that the substance of something can be its form or "concept." We can see this position in some of the complaints Hegel wants to lodge against philosophies that make an independent goodness prior: First, Hegel takes such views to fall within the scope of his criticisms of portrayals of the absolute as something "immediate" rather than a result: the goodness of the good, in such a philosophy, would not be mediated by anything else. Hegel has this worry, for example, about the form of the good as discussed in most of Plato's dialogues (VGP 19:68-69/3:56). Second, Hegel considers near the end of the Logic the possibility of a philosophy making "the idea of the good" or just "the good" into the absolute. Hegel takes this to separate the good from being; we might compare the Republic's famous line: "[T]the good is not being, but superior to it in rank and power" (509b8). Hegel's worry is characteristic of his antidualism: there will be nothing immanent within the nature of anything in particular that makes "the good" something good for it. The result is what Hegel often calls a *mere* ought:

The good thus remains an *ought*; it exists *in and for itself*, but *being*, as the ultimate abstract immediacy, remains over against it. (*WL* 12:233/731)

In response to that problem, Hegel argues that a better understanding of the absolute requires "a turning back to *life*," to build on the account of *immanent* purposiveness (*WL* 6:548/735).

Is there then, for Hegel, something like a cosmic good, as opposed to what is good for this as opposed to that? As is common with Hegel, we find two sides to the answer: *On the one hand*, there cannot be any such cosmic good. For there are, again, nonteleological elements, for which there is no good at all. *On the other hand*, there is a cosmic good, in this sense: everything, to the degree that it is substantial and actual, approximates an "absolute" that is a complete case of immanent teleology, with the immanent purpose and good of a kind of freedom.

And, further, there is a sense in which everything else is what it is in virtue of its relation to—its approximating but falling short of—this ultimate and complete case of something with an immanent purpose and good. In that sense, then, a kind of freedom is supposed to serve in Hegel's metaphysics as *the* purpose and *the* good.

It has of course not been my focus here to try to take on all of these last and very large issues in Hegel's broader metaphysics; my main focus has instead been Hegel's argument for the priority of immanent teleology over external forms, and his argument defending the reality of immanent teleology. These arguments are shaped by an engagement with strong Kantian arguments. I have focused here on trying to bring out Hegel's best case for a route back to a metaphysics of real and knowable immanent, natural teleology, and on some initial exploration of where that route might lead.

ACKNOWLEDGMENTS

Thanks for helpful comments and questions, on this and similar work, to seminar participants and the Radcliffe Institute, to participants in a colloquium presentation at Columbia University, and to Anton Kabeshkin, Karen Koch, Edgar Maraguat, Jeff McDonough, and Dean Moyar.