HEGEL

1

SPECULATIVE *NATURPHILOSOPHIE* AND THE DEVELOPMENT OF THE EMPIRICAL SCIENCES: HEGEL'S PERSPECTIVE

Terry Pinkard

As a possible source for ideas about the philosophy of science, Hegel might seem like an unlikely prospect. Many of his basic ideas about history have, after all, already been put to use (even if quite unconsciously and often in full ignorance of their source) by people in the history and philosophy of science. Hegel's shade appears throughout the post-Kuhnian picture of science that sees science as going through revolutions in which one scheme of thought (or "paradigm") replaces another such that the new scheme grows out of the very specific failures (or, as Hegel would say, the "determinate negations") of the previous scheme, setting itself up not merely as what just comes later but as the rational successor to what preceded it. Likewise, Hegel's refusal to comment virtually at all on the nature of scientific "method" or the structure of scientific theories, and his insistence instead on treating the individual sciences (mechanics, physics, meteorology, geology, biology) in detail, has at least a passing resemblance to the kind of close-grained contemporary philosophies of physics and biology that are very much the mode in contemporary philosophy of science, but what Hegel actually has to say about those sciences hardly seems to have any contemporary resonance to it.

Curiously enough, however, Hegel, who took a historical approach to almost everything he did, did not himself take such a historical approach to science. Instead, his writings and extensive lecture series on the topic were titled "*Naturphilosophie*," and, contrary to what one might have expected, in his *Naturphilosophie* he did not offer a Collingwood-style treatment of the history of the "Idea" of nature but instead a reconstruction of the picture of nature that was emerging from the sciences of his time, and how that picture related to his conception of agency, of *Geist*. Even worse, although Hegel himself cut a rather impressive figure as a reader and commentator on the scientific literature of his time, his status as a prognosticator about which developments in science were going to be the winners and the losers turned out not to be nearly as imposing. In almost all cases, he simply placed his bets on the wrong horses – most famously in siding with Goethe's delightful but wrong-headed theory of colors against the Newtonian tradition.

To be sure, many of Hegel's own failures in this regard cannot be laid entirely at his feet. After all, he lived and wrote before the advent of the twentieth-century

revolution in physics; in his time geology was dominated by the debate between vulcanists and neptunists – that is, by the debate over whether the earth's formations originate in internal fiery volcanoes or in more watery origins. Post-Euclidean geometries were barely even dreamed of in his time, and the fledgling efforts at creating them were for the most part unknown. Chemistry was still in its early infancy – Lavoisier's recognition of oxygen and banishment of phlogiston had not yet been fully accepted, and organic chemistry had not yet even been born. Modern biology was still several years off – Darwin's *Origin of the Species* was published in 1859, and Hegel died in 1831. It would be unfair to fault Hegel for failing to predict the upcoming "second" scientific revolution.

It is nonetheless worth attending to what Hegel took himself to be doing in offering a piece of what he called a *speculative* philosophy of nature in order to see whether there still is anything left to find in his lectures and writings on the topic other than matters now only of antiquarian interest.[1]

To get a grip on that, we need to understand what Hegel means by a "speculative philosophy." Hegel's use of the term originates in the post-Kantian predicament of how to use Kant to get beyond Kant, especially when the Kantian resolutions of certain key problems seemed so problematic.[2] Key to this was Kant's "third antinomy," which to his successors seemed to say that the problem of freedom in the modern world was not only theoretically irresolvable but was, literally speaking, theoretically unintelligible, and few seemed convinced by Kant's own solution to save freedom by appeal to the phenomenal/noumenal distinction. However, because so much of Kant seemed right, it also seemed especially important to the post-Kantians either to put the Kantian house in order (such as Reinhold and, at first, Fichte more radically tried to do) or to use Kant to get out of Kant into something appropriately post-Kantian.

The post-Kantian rejection of both Kant's hard-and-fast distinction between two separate faculties of knowledge – intuitions and concepts – and his language of an "imposition" of conceptual form onto intuitive content also put the issue of saving Kant from Kant high on the agenda. Hegel in particular joined in the arguments against intuition as an *independent* source of knowledge uninformed by concepts, arguing that Kant's own arguments to the effect that we could never be conscious of "unsynthesized intuitions" showed that intuitions could only play their epistemic, normative role as part of (or as a "moment" of) some larger normative "whole," that is, that classifying part of our experience as an intuition (as a representation) amounted to ascribing a normative status to it, an ascription which itself had to come from "reason." Likewise, Kant's own concern that concepts without intuitions were devoid of content showed that any attempt to completely unchain concepts from sense-experience was doomed to repeat the failures of previous metaphysics that Kant had so devastatingly diagnosed. Hegel's own leading idea, articulated partially in his first published monograph in 1801, *The Difference Between Fichte's and Schelling's Systems of Philosophy*, and then made more explicit in his long journal article the following year, "Faith and Knowledge," was that concepts and intuitions should be understood as having normative statuses within a larger "whole," that their epistemic roles and contributions could be separated only in light of understanding their place in that whole, which he identified as "reason," the capacity to draw inferences, which he

then developed into a more social conception of the *practice* of giving and asking for reasons. To use Hegelian language: we must begin from the *unity* of intuitions and concepts, not from their separation, which is rightfully done only within the larger whole in which they play their roles.[3]

Rejecting pure intuitions as a source of epistemic content independent of all conceptual shaping put all those post-Kantians making that move into a predicament that Kant himself had grasped (even if somewhat inchoately) with regard to his practical philosophy. On Kant's view, the moral law and its bindingness on us were, of course, independent of intuition, representing only the full, unfettered spontaneity of reason (expressed as autonomy in the practical sphere), and thus, as Kant put it in an often-cited passage in the 1785 *Groundwork*, the will can be subject only to those laws of which it can regard itself as the author.[4] However, since a lawless will cannot bind an agent, the will needs a law to guide it in authoring whatever law it institutes, which implies that such a prior law cannot itself be self-chosen, but the law, paradoxically, can obligate the agent only if it is self-chosen. This "Kantian paradox" – that the will must have a self-chosen law that is not self-chosen – found its expression in Kant's "fact of reason" in the 1788 *Critique of Practical Reason*, which in some ways just restates the "paradox" as a "fact," namely, that in undertaking any commitments at all, we cannot get "outside of" or "beyond" the claims of reason *even while* we regard them as self-authored – that we are committed to the absolute normative priority of reason as a "fact" that we ourselves have "made."[5]

Moving this "Kantian paradox" to the forefront informs the problem that animates virtually all post-Kantian conceptions of normative authority.[6] Hegel's own position develops in part out of the implications of dropping intuition as a separate, independent faculty that must then be combined with a conceptual faculty – the implications, that is, of dropping intuition as a separate source of "content" which must then be organized in terms of some "scheme." This paradox – about how I can be both author of the law and subject to the law – was for Hegel simply *the* speculative problem, the great "speculative truth" that post-Kantian philosophy was called upon to articulate and explain.[7] The problems surrounding the bindingness of the claims of reason (and of what even counts as "internal" and "external" to reason) is the pulse of the Hegelian dialectic, which, for example, in the *Phenomenology* narrative moves through various shapes of "consciousness" as those "shapes" try to hold fast to some type of external reason only to find it "dissolving," which in turn motivates "consciousness" to "return into itself" after having originally taken its standards to have been "external to itself." The *Logic* in turn traces the progress of thought's finding that it is, in Hegel's speculative language, the "other of itself" as it comes to grips with how it, as autonomous thought, can be the author of the norms to which it is subject.[8] On the Hegelian understanding, the "Kantian way out of Kant" thus has to take Kantian idealism not to consist in a contrast between the mental (the ideal) and the real (or the "inner" and the "outer"); it instead rests on the contrast between the normative order versus some kind of comprehensive naturalism (in a way very similar to Wilfrid Sellars's conception of the contrast between the "space of reasons" and the causal order).[9]

Turning either to a purely "externalist" or a purely "internalist" account of reason would only be one-sided and would, as Hegel stressed in his *Difference* book and the

monograph, "Faith and Knowledge," only lead to the endless seesaw between, for example, realism and subjective idealism so typical of modern philosophy.[10] The "Kantian way out of Kant" had to preserve the paradox while at the same time superseding it, and Hegel's solution involved a move both to *sociality* and a historical conception of *socialization* as a response to these problems.[11] Whereas Kant's monadic conception of agency effectively split the agent in two, with one side authoring the law, the other side being subjected to it – of which perhaps the clearest expression is Kant's discussion of conscience in *The Metaphysics of Ethics* in 1797 – Hegel argued that the "Kantian paradox" had to be resolved by a nonmonadic, *social* conception of agency and had to involve at least two agents, each of whom authors the law to which both they and the other are subject (or contends with the other to see who is to be the author and who is to be the subject, exemplified in the famous dialectic of mastery and servitude that shows that such a one-sided, nonmutual assumption of authorship and subjection fails). This kind of *sociality* is essential to the structure of agency; we assume authorship of such norms by virtue of our mutually subjecting ourselves and others to them, and the very idea of subjecting ourselves to a norm (or "following a rule") involves us in social practices. Subjecting ourselves to norms, that is, fundamentally involves us in the social practice of giving and asking for reasons.

Such sociality of agency, however, only takes the "Kantian paradox" and raises it to a higher level, since it now places the issue of subjecting ourselves to norms at a social instead of individual level. The "reflective" issue – in Kant's terms, of needing the law to determine the law, or in Wittgenstein's terms, needing an interpretation of the rule to determine what counts as the correct interpretation of following the rule – remains, and for that reason, we also require a *developmental* conception of agency as involving a kind of socialization, a way in which we find ourselves contingently thrown into a social world in which the determinate space of reasons that makes up that world is something to which we are initially subjected. We are *initiated* into the space of reasons, and our grasp of this space must be itself tacit, prereflective in order for us to be able to move about in that space. We could never learn to "follow the rule" by offering ever new interpretations of that rule (since we would need ever more interpretations to grasp the meaning of each interpretation); instead we require a kind of orientation that precedes all more reflective orientations, including the split between "subjectivity" and "objectivity" itself – a prereflective sense of what it means to have the world in view as an objective and public world which is already there for us as we participate in the practices of giving and asking for reasons.

Hegel rejects Kant's transcendental account of such agency (including, obviously, the account of freedom as involving noumenal causation) in favor of such a developmental and historical account of agency. (This is, of course, obviously a weighty topic that deserves much more space than can be given to it here; here I will have to content myself with just stating the rejection and looking at some of its consequences.[12]) For Hegel, agency itself is a kind of norm, something that is socially and historically instituted, not some metaphysical or natural fact. Our independence from nature, that is, is a normative historical and social *achievement*, not a fact (metaphysical or natural) about ourselves that we have only recently discovered. We are not agents who are constitutively or metaphysically independent of nature (either by virtue of being made of nonnatural "stuff" or by being noumenally free from nature's caus-

ation); rather, we establish or *institute* our freedom from nature by virtue of a complex historical process in which we have come to see nature as inadequate to agency's (that is, *Geist*'s) interests, not because of some kind of fundamental metaphysical mismatch between the two, but because by taking "nature" to be something to which we had to keep faith – by *making* nature normative for ourselves – we put ourselves in situations where the giving and asking for reasons in that kind of context turned out to be impossible and in which we therefore, as being *who we were* by virtue of holding fast to that conception of normativity, turned out not to be able to sustain our collective lives as those kinds of people – we could no longer *be* those kinds of agents. Our freedom, as the ability to understand our actions as coming from us and not as any kind of "agent-causation," is itself an achievement, not a transcendental condition of our agency, and it is bound up with the achievement of our normative independence from nature.

Nature, Hegel says, has "turned out to be the Idea in its otherness [*Anderssein*]."[13] Although this has quite traditionally been taken as evidence of Hegel's neoplatonist approach to philosophy – as if nature were only some kind of "emanation" from the eternal logos or mind of the world – that view is hard to square with Hegel's "speculative" approach to the nature of agency.[14] In terms of that approach, nature is to be taken as the "other" of the space of reasons, as that which is to be regarded as nonnormative, devoid of spirit (*geistlos*), as Hegel sometimes describes nature. *Naturphilosophie* and physics are both, as he stresses, modes of "conceptually knowing" nature (*denkende Erkenntnis der Natur*).[15] As Hegel saw, his own speculative approach to nature, in terms of the "Kantian paradox," puts great strains on itself if it is to square itself with nature's sheer "otherness," its "recalcitrance" to a priori investigation.[16] To study nature, we must, in Hegel's words, "step back from natural things, leaving them as they are and directing ourselves to them"[17] – to do what Wilfrid Sellars characterizes as letting "the claim ... so to speak, [be] evoked or wrung from the perceiver by the object perceived."[18] Such an approach always suffers from the temptation to rely on the all-too-prevalent metaphors of the "world's telling us" what we need to know about it, or the "world's cooperating" with our endeavors to know it. The problem, though, for speculative philosophy – how exactly are we to make sense of speculative thought and the fact that we must take in empirical information about the world in order to speak sensibly of it – is another version of the post-Kantian problem of how we are to reconcile thought's spontaneity with the necessity for attending to given fact.

Strikingly, Hegel simply has no problem with giving modern natural science the credit for finding out about the way the world is. In an often-cited passage – which if it were taken out of context might have been attributed to Quine – Hegel remarks, "Not only must philosophy be in agreement with the experience of nature, but the *origin* and *formation* of philosophical science has empirical physics as its presupposition and condition."[19] He goes on to add in several places, however, that the "basis" of empirical science must lie in the "necessity of the concept," and that philosophy converts the findings of natural science into some kind of conceptual structure that exhibits a non-empirical necessity.[20] Hegel speaks metaphorically of this as a "translation" of what physics has "empirically prepared" into conceptual form, into the "diamond net" of metaphysics in which things are first "made intelligible."[21] This of

courses suggests (and many have taken it to mean just this) that philosophy can simply unchain itself from empirical research and in its own unfettered spontaneity develop the concepts that science "presupposes" and "must use" in its otherwise empirical activities – that philosophy offers some kind of conceptual foundation for empirical science that empirical science cannot provide for itself.

That this is not Hegel's intent can be seen by other things he says, and, in any event, it contradicts his practice. He notes that Kant's attempt to provide a construction for matter in the *Metaphysical Foundations for Natural Science* has the "merit of having made a beginning towards a *concept* of matter and of having revived with this attempt the concept of a *Naturphilosophie*."[22] That is, he sees Kant's attempt at constructing what would count as the "conceptual paradigms" of natural science as orienting his own investigations, although, of course, Hegel accuses Kant of staying only at the level of the "understanding" and of not therefore adequately grasping the "speculative" nature of this enterprise. The Kantian philosophy, as Hegel often says, stays at the level of "consciousness," by which he means that it takes the opposition of subject and object as fundamental, as the "final dichotomy," together with its attendant and one-sided notion that it is the object that functions normatively as the "truth-maker" for our judgments about it. This attitude, which Hegel also identifies as the standpoint of "representational" thought (of *Vorstellung*), is on Hegel's account not so much false as it is one-sided: the subject/object split is not a metaphysical division already present at hand in the world but is itself normatively established as a moment in the space of the reasons – that is, the thinking subject, conceived as a locus of epistemic responsibilities, involves the concept of responsibility as responsibility *to* something independent of us that is nonetheless binding on us only insofar as we can regard it as authored by ourselves. The problem with the investigation of nature is to understand how it is that science tells us something true about nature but does not force us back into the pre-Kantian worries about whether our "representations" match up with an reality external to them. Or, as Hegel describes it, in investigating nature, we *set up* an opposition between "subject and object," in which our "intention is rather to grasp nature, to conceptually comprehend it, to make it our own ... [and] it is here that the difficulty enters onto the scene: how do we subjects cross over to those objects? If we set ourselves to working on how we would leap over this gulf, we are certainly letting ourselves be led astray in thinking of nature by making nature, which is an other to us, into something other than what it is."[23]

Hegel's answer to his own rhetorical question, of course, comes down to saying that this is the wrong question to ask. Instead, we are supposed to see that the "reflective" picture of our comparing two "things" – say, an internal mental representation and an external object – is at best only a moment of our (largely prereflective) comprehension of how it is that prior even to that picture of comparing two "things" (and prior even to the so-called subject/object gulf itself) are the socially instituted and sanctioned ways in which we make moves within the space of reasons – undertaking commitments, attributing entitlements, and so forth. Beginning our inquiries with the subject/object split already in place is beginning with too much conceptual baggage already in tow, since the split between subject and object is itself a normative distinction made within the "Idea" – the space of reasons as the basis of intelligibility itself – which must first be grasped prereflectively through socialization and training.

In his *Logic*, Hegel offers an analysis of what it would mean to think of the relation of mind and world as proceeding from this "Idea" instead of thinking of it by beginning with the distinction of subject and object as already presupposed – an analysis, that is, of what it would *mean* to speak of embodied subjects as having the world in view through the unity of concepts and intuitions, as operating within the whole that makes up the "Idea," the basis of intelligibility. Rather than looking to overcome the subject–object gulf, it would be more correct, Hegel says, to speak of a "*subject-object*," or an "intuiting understanding" rather than divide our thinking activities into distinct faculties that then have to be combined.[24] There nonetheless cannot be any purely *logical* or "analytical" transition from what it would *mean* for us to have the world in view to what that world *actually* looks like when subjected to empirical investigation; or, as Hegel says in the systematic transition from the *Science of Logic* to the *Naturphilosophie*, "in this freedom therefore no [logical] transition takes place."[25] Just as our agency itself is to be taken not as a metaphysical fact but as a normative, social, and historical achievement, this unity of concept and intuition, of having the world in view, is itself not something that is "given" but also something to be achieved. Or, to slip into Hegelian language again, the "certainty" that can be taken for the "truth" that we are grasping things as they are, not merely as they appear, does not come about naturally (as if the harmony between thought and reality were always already in place) but as a result of historical probing and error. As Hegel puts it, "This unity of intelligence and intuition, of the spirit's being-within-itself and its comportment to externality, must however not be the beginning but the goal, not be something immediate but rather a unity that is produced."[26]

The enterprise of natural science is part of that story, and clearly (at least to Hegel) the practice of science does not aim at overcoming the so-called gulf between subject and object, since the idea that there is a metaphysical "gulf" is one of the "pictures" that his *Phenomenology* and *Logic* were supposed to overcome. However, the space of reasons is already in play in the enterprise of natural science, even though, as self-legislated, it is, like all of our other norms, subject to challenge. The "a priori" of nature that *Naturphilosophie* has as its object is not unrevisable, as Kant had held, but is instead dynamic – as Hegel puts it: "All revolutions in the sciences no less than in world history only come about in that spirit, in order to understand and examine itself with a view to possessing itself, has changed its categories, grasping itself more truly, more deeply, more inwardly, and more at one with itself."[27] Moreover, as a good post-Kantian, Hegel does not hold that all our beliefs are of a piece (that is, are all empirical) since he rejects the view according to which it follows that all our beliefs are empirical from the idea that both empirical belief and the conceptual background of the sciences are revisable. Like Kant, Hegel holds that certain parts of, for example, Newtonianism (the mathematical parts, to be specific) are on a different order from the inductively and empirically established laws of Newtonian physics. Those non-empirical components *orient* the whole investigation and not simply more entrenched items of a "whole." (Hegel's thought is thus not to be identified with the kind of holism in vogue these days.[28])

Nonetheless, scientific investigation, as empirical investigation, begins with the observations of particular things and attempts to grasp what laws and principles are operative in them. *Empirical* research is necessary because we cannot through any kind

of act of intellectual intuition simply read off the "universals" inherent in things, since, to cite Hegel again, "things are individual, and the lion as such does not exist."[29] We must instead *construct* our theories and test them, which implies more than merely inductively establishing laws, since such theory construction must take place against a background of an overall picture of nature. That we must construct our theories, however, does not mean that we should take an instrumental interpretation of the laws and principles established by science, as if, as Hegel puts it, they were not be taken as part of "objective actuality" but merely to serve as tools for "our convenience in order for us to make a note of things."[30] Like Kant, Hegel takes the construction of theories to be required in order for our experience to have any objective validity; but unlike Kant, Hegel does not hold that there can be a transcendental analysis of experience that will yield, for example, mathematics as constructed out of pure intuitions or the laws of inertia out of the constitutive rules of causality. Instead, we have only the way in which certain revolutions that have been achieved at the conceptual level have led to spirit's grasping itself more thoroughly. To that end, Hegel understands nature in the terms of his own jargon – itself constructed to express and explicate the "Kantian paradox" – as "externality" in general. Its basic laws and principles require an attention to that for which no purely "logical" (that is, a priori) reason can be given.

The philosophical issue therefore with which a *Naturphilosophie* is supposed to concern itself is the rationality, and therefore the truth, of those basic concepts themselves, which cannot be abstracted out of the findings of the natural sciences without begging all the questions at stake. To use the metaphor of levels: *Naturphilosophie* proceeds at a higher level than do the empirical sciences; its paradigms (or "shapes": "Gestalts," in Hegel's jargon) are reconstructions of the basic paradigms at work in the practices of the sciences themselves, and it is crucial to understand what the normative authority of those higher-level paradigms is – whether they can be seen to be norms of which we could regard ourselves as the authors by virtue of their rationality. This itself only points up what is Hegel's stated goal in his *Naturphilosophie*: to comprehend the normative authority of the modern scientific concept of nature without relying on "givens" in intuition and to understand how that concept fits into the true concept of our own agency as a normative status – that is, to get a better grip on who and what *we* are. Or, to put it a slightly different way, his concern is with those norms that we *bring to* empirical research and their status, even though he thinks those norms have historically developed *out of* the practice of empirical research. That we can bring certain concepts to empirical research means that they can be given an a priori status with regard to that research, even though that a priori is to be regarded as historically dynamic and not as some timeless set of conditions for possible experience.

Thus, like Kant, Hegel takes Newton's use of the concepts of absolute space and time to be paradigmatic for how proper science is to proceed, since these concepts function in just that kind of a priori way for Newton, although they were hardly there before Newton introduced them. Unlike Kant, of course, Hegel ascribes objective reality (not transcendental ideality) to both space and time. As part of nature's externality, (Newtonian) space and time are not purely logical conceptions but must be developed as the most abstract categories necessary to think of nature as an objective

world, as that *to which* our claims are *responsible*, and not, for example, simply as a construct out of experience or out of different languages (as if in making claims about space and time we were only answering to each other and not to the world). In turn we get the right construction of the concepts of both space and time (that is, three-dimensionality and temporal direction) by thinking of what is unavoidable in conceiving the world as a whole of individual things coming-to-be and passing-away (which Hegel takes himself to have shown in his *Logic* to be unavoidable for us if we are to articulate the difference between "being" and "nothing" itself). Likewise, such abstractions require the determination of both place and movement, which in turn requires a conception of something that moves, namely, matter. Our experience of an objective world independent of us, to which we are responsible in making empirical claims, requires as a condition of our having it in view as "externality" itself space, time, place, motion, and matter. Those concepts are not *logical* concepts (in Hegel's extended use of "logical") but are taken from our having the world "in view" and from what is required for us to be able to exercise our abilities to speak about and measure that world as we have come to experience it in light of the development of the modern scientific revolutions such that our experience can be shown to have objective validity. It is not an analysis of our untutored experience (as if there were such a thing), nor is it an examination of the conditions of the possibility of ordinary experience (as if we all experienced the world as little Newtons); it is rather Hegel's own attempt to show that the basic concepts and norms that lay at the heart of the scientific, Newtonian picture themselves are rational, that is, they have the feature of being the way in which we must think of nature as the "other" of the modern, post-Kantian conception of agency. It is the analysis and reconstruction of the normative force of the prereflective notion of nature as a whole that "we moderns" bring with us to experience in light of our modern experience of ourselves as free beings.

Hegel therefore takes the concept of matter, in its post-Newtonian sense, to be constructed out of the forces of attraction and repulsion, as Kant did, but he criticizes Kant as having tried to derive the concept of matter both from experience and in terms of "the understanding," instead of seeing it "speculatively," that is, as a historically constructed concept (or "norm") that we can nonetheless "regard" as authored by ourselves while at the same time obligating us to be responsible *to it* in our investigations of nature. Taking nature as "externality," as consisting of units that can be counted, means taking nature, at least in terms of mechanics, to be the kind of thing for which mathematics is the appropriate language for the accounts of it.

For the "speculative" philosophy of nature, we thus need not stand pat with the opposition of invention *or* discovery. Our norms for the investigation of nature are indeed instituted by us, but when successful, they capture that part of nature that makes a difference to our understanding of it. The success of the disenchanted Newtonian account of the universe grew out of the ways in which earlier accounts themselves fail to make sense on their own terms, and which as a result were driven to seeing nature as "disenchanted," as a sphere of *geistlose* "externality" best described mathematically. Thus, Hegel is also concerned to show that Newton's concept of universal gravitation effectively responds to and answers the issues raised by the earlier division between celestial and sublunary motion that comes out of the more modern conception of nature as disenchanted "externality." (Hegel also criticizes Newton

quite severely on some points, but since he draws on textbook accounts of his own day that themselves got Newton wrong, he is also off the mark in many places.[31])

Hegel tries to make a case for the irreducibility of other spheres of nature to the sphere of mechanics. The sphere of "physics" (heat, light, magnetism, electricity, sound, meteorology, and chemical processes) does not account for nature in terms of the pure externality of matter in motion; instead matter is said within those accounts to exhibit an affinity for other determinate matters (as in chemical processes), and, of course, he distinguishes organic life (and quasi-organic processes) from both of them. In each case, nature is said to become less and less "external," and in the case of organic animal life, as self-organizing, begins to prefigure the shape of subjectivity and self-direction themselves. In each case, mathematics comes to be less and less adequate to provide an account of that sphere.

The science of Hegel's own day was in all these regards undeveloped, and Hegel's own case for the irreducibility and uniqueness of each of these types of accounts cannot from a contemporary perspective be regarded as successful. In some respects, his regard for the working scientists of his own day in these fields was simply too high. This is not, however, the deepest failing in Hegel's own execution of his project. Like many people of his generation, Hegel was quite taken with the paradigm of comparative anatomy, and, in Hegel's own case, with the way in which Cuvier proposed that each species represents a fixed type that cannot be essentially changed. (Against Lamarck, Cuvier argued that evolution was an impossibility since it would require a species that is fully adapted in a fine-grained way to its environment as a whole to gradually alter itself, which would be impossible since any slight alteration would make it impossible for that species to survive at all.)

Hegel took that paradigm and expanded it to cover all of nature. Thus, Hegel thinks that there are three such "shapes" of nature (mechanical, physical, and organic), and within those shapes there are other, more determinate fixed shapes. Thus, by virtue of the requirements that thought imposes on itself to have "fixed shapes" for its thoughts, there is a requirement that we view nature as having certain natural kinds intrinsic to it, and that we see these natural kinds as being *in nature itself*, not merely in our own conceptual organization of the contingencies of nature. The division of nature into mechanical, physical, and organic systems is thus a division to be found *in nature* that is *required by thought* as it attempts to grasp nature as the "Idea in its otherness."

Following Cuvier's lead, Hegel argued against any kind of linear ordering of items in nature: in his words, "to seek to arrange in serial form the planets, the metals or chemical substances in general, plants and animals, and then ascertain the law of the series is a fruitless task, because nature does not arrange its shapes in such series and segments ... The concept differentiates things according to qualitative determinateness, and to that extent advances by leaps."[32] Moreover, as nature becomes organized into forms for which the category of "internal purposiveness" (or functional teleology) is necessary to render rational accounts of that sphere of nature, we are required to recognize an organism's intrinsic purposes in order for us to be able to sort out what counts as an aberration and what does not. In Hegel's own words, although nature "everywhere blurs the essential limits of species and genera by intermediate and defective forms, which continually furnish counter examples to every fixed distinction," the fact that we can recognize the existence of such transitional

forms requires us to have already recognized the intrinsic purposes of various organisms; and "this type cannot be furnished by experience, for it is experience which also makes these so-called monstrosities, deformities, intermediate products, etc. available to us. Instead, the fixed type presupposes the independence and dignity of conceptual determination."[33] Thus, for example, Hegel thought that the concept of disease was teleological in that it demarcates some way in which an organism was not functioning (or functioning at odds with) its own internal purposes. (This focus on self-contained "shapes" of nature that cannot undergo any fundamental developmental alteration but which require leaps to new shapes also colors Hegel's own views about shapes of spirit or shapes of consciousness in his philosophy of history and in the Jena *Phenomenology*.)

The picture of the unity of nature that thereby emerges at the end of Hegel's treatment is not one that could be maintained today except by virtue of a rather weighty denial of a good bit of modern science itself. In particular, it rules out any Darwinian evolutionary account of life, and it rules out more broadly developmental accounts of the universe as a whole. This is, of course, all the more peculiar in that Hegel is the philosopher who champions developmental accounts above all. But Hegel's own interest in the philosophy of nature lies with showing how the scientific picture still emerging in his own time was compatible with a conception of subjectivity as a normative status, and that in fact the "disenchanted" view of nature that was part and parcel of the modern scientific image emerges together with the new conception of subjectivity at work in modern life, such that one cannot ascribe any priority to one or the other. (Neither is the "independent variable" explaining the other one.)

What strikes any contemporary reader as puzzling in Hegel's account of natural science (at least at first) are his assertions about the "untruth" of nature. This has to do with Hegel's own conception of truth as a kind of "primitive," in the sense that "truth" cannot be defined in terms of anything more fundamental than itself – it cannot be reduced to something else; thus, instead of offering something like a *theory* of truth (as correspondence, coherence, or warranted assertibility), Hegel – like Frege and Wittgenstein – offers instead an account of truth in terms of its *unfolding* (an *Entfaltung*) within the proper kind of reflective theory (such as his *Phenomenology* or *Logic*).[34] Hegel's conception of truth is thus closely linked to his general views about normativity and mindedness and to his implicit view, to use Robert Brandom's phrase, that the difference between the normative and the nonnormative (that is, the factual) is itself a normative distinction, a matter of how we ought to treat things (or to put it in Hegelian terms, that the difference between *Geist* and nature is a distinction, an achievement, made by *Geist* itself, and is not itself a natural distinction).[35] On Hegel's account, our *concepts* inevitably embody within them a conception of what it would mean for something to be the *best exemplification* of what it is. The problem with *nature* as it is (truly) conceived on the scientific model is that is it disenchanted: on its own, nature is incapable of organizing itself into "better and worse exemplifications," something Hegel nicely calls the "impotence [*Ohnmacht*] of nature."[36] Indeed, only when *life* appears in nature does it even make sense to speak of "better" and "worse," since only organisms display the kind of self-directing, functional teleological structure that makes the application of such terms meaningful. Only with organisms can one speak, for example, of disease; a planetary system, a mountain

range, a piece of marble cannot be diseased. However, even "life," the stage at which "better" and "worse" exemplifications become meaningful, is itself still revelatory of the "impotence" of nature, since nature cannot organize itself even at the level of life into something like the "best" version of a lion, a rose, a trout. Nature *aims* at nothing. Only when human mindedness arrives on the scene does the issue arise of what it means for that kind of creature to be the best it can be, and that can only be formulated, as Hegel puts it, in terms of "self-consciousness," where we, as self-interpreting animals, have a historically developing conception of what it is to be the best exemplifications of the agents we are and actually aim at realizing those conceptions in our lives.

Hegel's ambition in constructing a speculative *Naturphilosophie* may be summarized succinctly: one can have science *and* subjectivity without having to sacrifice one or the other. Hegel's own philosophy of science would be opposed to any construal of science as a "mere" social construct – as if science were simply one more way of construing the world, no better, no worse than any other way – and it would be opposed to a comprehensively naturalized view of subjectivity, as if the causally oriented methods of natural science were adequate to grasp the meaning of things for human subjects and to provide any guidance for deliberation about what it means to lead a human life (even if *scientific* discoveries – as opposed to comprehensive naturalist philosophies – about, for example, our genetic makeup offer valuable insight relevant to deliberations on that normative question). He therefore does not think that philosophy must subordinate itself to science, or naturalize itself and just become one part of a holistic (that is, empirical) account of mind and nature. Science seeks to explain nature, and both science and philosophy seek to grasp the unity of nature as a rational, intelligible whole. Philosophy's role in looking for the unity of nature is thus twofold: it seeks to understand the basic conceptual paradigms at work in the various natural sciences and to reconstruct them in terms of their rationality and intelligibility; and it does this with an eye to understanding agency itself, to grasp the role of subjectivity in the world. In reconstructing the paradigms of science, philosophy plays a different role than empirical science; it aims at the normative reconstruction of those paradigms, not at offering alternative empirical accounts or metaphysical views about how natural processes occur. Our own agency, spirit, is, as Hegel puts it, both "prior to and posterior to nature, and is not merely the metaphysical Idea of it," and agency (spirit) is to be understood as having "come forth out of nature, not, however, empirically but so that spirit is already always contained in nature, which spirit presupposes for itself."[37]

The revolution in modern science was an essential part of the modern revolution in "spirit," in our grasp of what it means to be human, just as the revolution in spirit's grasp of itself correspondingly called for a revolution in our theoretical stance to nature. To grasp the revolution in spirit required, so Hegel thought, grasping just what nature was so that it would become intelligible how it could be that spirit had to define itself as a *self-instituted liberation* from nature – or more metaphorically as "nature having become an other to itself in order again to cognize itself as the Idea and to reconcile itself with itself"[38] – not simply as the actualization of natural powers already dormant in human beings. It is not a priori given that all the ways in which natural science proceeds will cohere with each other, nor is it given that natural

science, in its empirical procedures, will fit the concepts that we think in advance nature must have. Showing that there is a unity to nature by showing that the basic paradigms at work in the natural sciences all fit together – without their necessarily having to be reducible (in some sense of that word) to each other – is, on Hegel's view, something to be *achieved* in modern philosophy and science, not something that we can assume, and into which we can then shoehorn whatever results happen to turn up. The demand that our agency be subject only to a law that we can regard ourselves as authoring is correlative to the demand for the boundlessness, or "infinity," of the conceptual, a task made all the more daunting by the multifarious appearances of nature and the necessity of empirical research; but, in Hegel's words, "reason must nonetheless have confidence in itself, a confidence that in nature the concept speaks to the concept and that the genuine shape of the concept, which lies concealed beneath the externality of the infinitely many shapes [of nature], will show itself to reason."[39] In that rational faith, so Hegel claims, we find:

> Spirit thus *at first* grasps itself as emerging from that which is immediate but *then*, abstractly grasping itself, it wishes to liberate itself by developing nature out of itself; spirit's doing this is philosophy.[40]

Notes

1 There is a subtle difference between a "philosophy of nature" and a "nature philosophy" in the context of post-Kantian idealism. In Schelling's hands, it became an approach to philosophy itself, not an area within philosophy (like, for example, epistemology or metaphysics). I elaborate on this distinction in Terry Pinkard, *German Philosophy 1760–1860: The Legacy of Idealism* (Cambridge: Cambridge University Press, 2002).

2 On the notion of using Kant to get out of Kant, which played such a large role in the development of post-Kantian philosophy, see Rolf-Peter Horstmann, *Die Grenzen der Vernunft: Eine Untersuchung zu Zielen und Motiven des deutschen Idealismus* (Frankfurt a. M.: Anton Hain, 1991), and my own narrative of this movement in Pinkard, *German Philosophy 1760–1860*.

3 This is made all the more explicit in "Glauben und Wissen oder Reflexionsphilosophie der Subjektivität in der Vollständigkeit ihrer Formen als Kantische, Jacobische und Fichtesche Philosophie," in G. W. F. Hegel, *Werke in zwanzig Bänden*, eds. Eva Moldenhauer and Karl Markus Michel (Frankfurt a. M.: Suhrkamp Verlag, 1971), vol. 4, pp. 287–433. There Hegel says that "The original synthetic unity of apperception is also first recognized as the principle of the figurative synthesis, that is, of the forms of intuition: space and time are themselves conceived as synthetic unities, and the productive imagination, spontaneity, and the absolute synthetic activity is conceived as the principle of the sensibility which was previously characterized only as receptivity ... One and the same synthetic unity ... is the principle of intuition and of the understanding ... And the imagination is nothing but reason itself" (pp. 305–8).

4 Immanuel Kant, *Groundwork of the Metaphysics of Morals*, trans. H. J. Paton (New York: Harper Torchbooks, 1964), p. 98 (AA 431). "The will is therefore not merely subject to the law, but is so subject that it must be considered as also *giving the law to itself* and precisely on this account as first of all subject to the law (of which it can regard itself as the author)." ["Der Wille wird also nicht lediglich dem Gesetze unterworfen, sondern so

unterworfen, dass er auch als selbstgesetzgebend, und eben um deswillen allererst dem Gesetze (davon er selbst sich als Urheber betrachten kann) unterworfen, angesehen werden muss."] Kant then later claims (p. 100 [A432]): "We need not now wonder, when we look back upon all the previous efforts that have been made to discover the principle of morality, why they have one and all been bound to fail. Their authors saw man as tied to laws by his duty, but it never occurred to them that he is subject only to laws which are made by himself and yet are universal and that he is bound only to act in conformity with a will which is his own but has as nature's purpose for it the function of making universal law."

5 Paul Franks, among others, has stressed this root of *Faktum* in "making," *facere*, an idea that Fichte tries to render by resurrecting the German term *Tathandlung*, to express how a subject binds itself only to laws of its own making. See Paul Franks, *All or Nothing: Skepticism, Transcendental Arguments, and Systematicity in German Idealism* (forthcoming)

6 I go into the role that what I have called the "Kantian paradox" plays in the development of post-Kantian philosophy in Pinkard, *German Philosophy 1760–1860*. This notion of the kind of paradox present in Kant's conception of autonomy and how post-Kantians generalized it into a problem concerning all issues of normative authority was first presented, to my knowledge, by Robert Pippin in his "The Actualization of Freedom," in Karl Ameriks (ed.), *Cambridge Companion to German Idealism* (Cambridge: Cambridge University Press, 2000). The issue of how such autonomy "binds itself" is also a leading theme in the writings of Christine Korsgaard. Her most recent and comprehensive statement is in Christine Korsgaard, *The Sources of Normativity* (Cambridge: Cambridge University Press, 1996). I do not see how Korsgaard provides a solution for how a will moves from a state of nonobligation to obligation in an act of will, except by restating the "fact of reason," that we always already in legislating these laws for ourselves assume that we are under the claims of reason. That seems to me to restate the paradox (as Kant himself did) rather than come to terms with it; but adequately making that point in a way that took Korsgaard's fine-grained reading of Kantian texts into proper account would require at least another essay.

7 See *Enzyklopädie der philosophischen Wissenschaften*, §436, *Zusatz*, where Hegel offers the relation between two subjects involving "universal self-consciousness as the affirmative knowing of oneself in an other self" as the paradigm of speculative truths. All references to the *Enzyklopädie*, unless otherwise noted, are to vol. 9 of G. W. F. Hegel, *Werke in zwanzig Bänden*, eds. Eva Moldenhauer and Karl Markus Michel.

8 The phrase, "*das Andere seiner selbst*," a phrase Hegel himself claimed to take from Plato, occurs in several places. See G. W. F. Hegel, *Wissenschaft der Logik*, (Hamburg: Felix Meiner, 1971), vol. 2, p. 494; *Science of Logic*, trans. A. V. Miller (Oxford: Oxford University Press, 1969), p. 834. In the *Enzyklopädie* see particularly §448, *Zusatz*. It also occurs in the *Enzyklopädie*, vol. 8, §81, *Zusatz*; vol. 8, §92, *Zusatz*; §389, *Zusatz*; §426, *Zusatz*.

9 Sellars makes this distinction in all of his works. The classical loci are Wilfrid Sellars, "Philosophy and the Scientific Image of Man," and "Empiricism and the Philosophy of Mind," in Wilfrid Sellars, *Science, Perception, and Reality* (London: Routledge and Kegan Paul, 1963), pp. 1–40, 127–96.

10 See G. W. F. Hegel, *Differenz des Fichteschen und Schellingschen Systems der Philosophie*, in *Werke*, eds. Moldenhauer and Michel, vol. 2, p. 48: "Die Einheit ist in einer nur relativen Identität erzwungen, die Identität, die eine absolute sein *soll, ist* eine unvollständige. Das System ist zu einem Dogmatismus – zu einem Realismus, der die Objektivität, oder zu einem Idealismus, der die Subjektivität absolut setzt – wider seine Philosophie geworden, wenn beide (was bei jenem zweideutiger ist als bei diesem) aus wahrer Spekulation

hervorgegangen sind." ["The unity is forced into an only relative identity, the identity that *ought* to be an absolute identity, *is* an incomplete identity. The system has changed into a dogmatism – into a realism that absolutely posits objectivity, or into an idealism that absolutely posits subjectivity – contra its philosophy, if both (which is more ambiguous with respect to the former than the latter) are to have emerged from pure speculation.]

11 On using "Kant to get out of Kant" in the move to Hegelianism, see Pinkard, "Virtues, Morality, and *Sittlichkeit*: From Maxims to Practices, Or: Using Kant to Get Out of Kant (and Using Hegel to Get Out of Hegel)," *European Journal of Philosophy* 7(2) (Aug. 1999).

12 I offer a fuller discussion of the issue in Pinkard, *German Philosophy 1760–1860*. On the issue of freedom in Hegel, see Robert Pippin's pathbreaking "Naturalness and Mindedness: Hegel's Compatibilism," *Journal of European Philosophy* 7(2) (Aug. 1999): 194–212.

13 *Enzyklopädie* §247: "Die Natur hat sich als die Idee in der Form des Andersseins ergeben." ["Nature has turned out to be the Idea in the form of otherness."]

14 The best statement in English of this way of reading Hegel (and of the implausibility of such an overall view) is Michael Rosen, *Hegel's Dialectic and Its Criticism* (Cambridge: Cambridge University Press, 1982).

15 *Enzyklopädie*, "Einleitung," p. 11: "Physik und Naturphilosophie unterscheiden sich also nicht wie Wahrnehmen und Denken voneinander, sondern nur *durch die Art und Weise des Denkens*; sie sind beide denkende Erkenntnis der Natur." ["Physics and *Naturphilosophie* are thus not differentiated as perception and thought are from each other, but rather *through the kind and mode of thought*; they are both a thoughtful cognition of nature."]

16 *Enzyklopädie* §376, *Zusatz*: "Die Schwierigkeit der Naturphilosophie liegt eben darin, einmal, daβ das Materielle so widerspenstig gegen die Einheit des Begriffes ist, und dann, daβ ein Detail den Geist in Anspruch nimmt, das sich immer mehr häuft" (p. 539). ["The difficulty of *Naturphilosophie* lies just in materiality being so recalcitrant to the unity of the concept, and then in its details continuing to pile up and making their claim on spirit."]

17 *Enzyklopädie* §246, *Zusatz*.

18 Wilfrid Sellars, "Empiricism and the Philosophy of Mind," para. 16, p. 144.

19 *Enzyklopädie* §246.

20 See *Enzyklopädie* §246 and *Zusatz*.

21 Ibid.

22 *Enzyklopädie* §262.

23 *Enzyklopädie* §246, *Zusatz*. "Unsere Absicht ist aber vielmehr, die Natur zu fassen, zu begreifen, zum Unsrigen zu machen, daβ sie uns nicht ein Fremdes, Jenseitiges sei. Hier also tritt die Schwierigkeit ein: Wie kommen wir Subjekte zu den Objekten hinüber? Lassen wir uns beigehen, diese Kluft zu überspringen, und wir lassen dazu uns allerdings verleiten, so denken wir diese Natur; wir machen sie, die ein Anderes ist als wir, zu einem Anderen, als sie ist."

24 "This identity has therefore been rightly determined as the *subject-object*, for it is as well the formal or subjective concept as it is the Object as such" and "having proceeded from the Idea, independent objectivity is immediate being only as the *predicate* of the judgment of the self-determination of the concept – a being that is indeed differentiated from the subject, but at the same time is essentially posited as a moment of the concept." Hegel, *Science of Logic*, p. 593; *Wissenschaft der Logik*, II, p. 232 in Moldenhauer and Michel (eds.), *Werke*, vol. 6, p. 266.; on the notion of the "intuiting understanding" see *Science of Logic*, pp. 758, 765; *Wissenschaft der Logik*, II, pp. 411, 418; *Werke*, 6, pp. 466, 475.

25 *Science of Logic*, p. 843; *Wissenschaft der Logik*, II, p. 505.

26 *Enzyklopädie* §246, *Zusatz*, p. 18.

27 *Enzyklopädie* §246, *Zusatz*: "Alle Revolutionen, in den Wissenschaften nicht weniger als in der Weltgeschichte, kommen nur daher, daβ der Geist jetzt zum Verstehen und

Vernehmen seiner, um sich zu besitzen, seine Kategorien geändert hat, sich wahrhafter, tiefer, sich inniger und einiger mit sich erfassend."

28 This obviously brings Hegel into conversation with the line of thought developed by Michael Friedman's attempt to construct a dynamic a priori in light of Kant's philosophy – Friedman's own version of "using Kant to get out of Kant," as it were. Friedman's own construction of a dynamic a priori in some kind of post-Kantian (or neo-Kantian) framework is indebted to his reading of Ernst Cassirer, who in turn was influenced by Hegel's own historicism. (Thus, the correspondences between a post-Kantian interpretation of Kant influenced by Cassirer and this kind of Hegelianism are not completely accidental.) Friedman's original interpretation of Kant is found in his now standard work: Michael Friedman, *Kant and the Exact Sciences* (Cambridge, MA: Harvard University Press, 1992). The development of his views on the dynamic a priori and Ernst Cassirer are to be found in Michael Friedman, *A Parting of the Ways: Carnap, Cassirer, and Heidegger* (Chicago: Open Court, 2000); his working out of a "dynamic" a priori in light of Kant and Cassirer is to be found in Michael Friedman, *Dynamics of Reason* (Stanford: CSLI Publications, 2001).

29 *Enzyklopädie* §246, *Zusatz*, p. 16.

30 *Enzyklopädie* §246, *Zusatz*, pp. 19–20.

31 See Wolfgang Neuser's helpful discussion in his contribution to Hermann Drüe, Annemarie Gethmann-Siefert, Christa Hackenesch, Walter Jaeschke, Wolfgang Neuser, and Herbert Schnädelbach (eds.), *Hegel's Enzyklopädie der philosophischen Wissenschaften (1830): Ein Kommentar zum Systemgrundriß* (Frankfurt a. M., 2000), pp. 139–205. The other comprehensive treatment of Hegel's *Naturphilosophie* that is virtually indispensable in this regard is Wolfgang Bonsiepen, *Die Begründung einer Naturphilosophie bei Kant, Schelling, Fries und Hegel: Mathematische versus spekulative Naturphilosophie* (Frankfurt a. M.: Vittorio Klostermann, 1997). In English, there is Michael Petry's indispensable and very learned commentary accompanied by his translation of the *Naturphilosophie*: see, *G. W. F. Hegel's Philosophy of Nature*, trans. with an Introduction by Michael John Petry (London: George Allen & Unwin, 1970).

32 *Enzyklopädie* §249, *Zusatz*.

33 *Enzyklopädie* §250.

34 Among the many passages that can be cited to illustrate this point, *Enzyklopädie der philosophischen Wissenschaften* §14 nicely sums up Hegel's point: "The science of this is essentially a system, because what is true exists as concrete only as unfolding itself and in both holding itself together and sustaining itself, i.e., as totality, and only through the differentiation and determination of its differences can the totality exist as the necessity of those differences and the freedom of the whole." ["Die Wissenschaft desselben ist wesentlich System, weil das Wahre als konkret nur als sich in sich entfaltend und in Einheit zusammennehmend und – haltend, d. i. als Totalität ist und nur durch Unterscheidung und Bestimmung seiner Unterschiede die Notwendigkeit derselben und die Freiheit des Ganzen sein kann."]

35 On this distinction between the normative and the nonnormative being itself normative, see Robert Brandom, "Freedom and Constraint by Norms," *American Philosophical Quarterly*, April 1977: 187–96.

36 *Enzyklopädie* §250.

37 *Enzyklopädie* §376, *Zusatz*, pp. 538–9.

38 Ibid., p. 538.

39 Ibid., p. 539.

40 Ibid.