Some Metaphysical Anxieties of Reductionism

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Word Count: 8838

By now it is cliché to observe that so-called reductionism is not one mammoth doctrine. There are, as it were, many reductionisms. Needless to say, there are at least as many antireductionisms. Despite the fact that neither reductionisms nor their counterparts are single and unified doctrines there do seem to be some family resemblances. One, it seems to me, is that both reductionisms and antireductionisms are acute responses to certain metaphysical worries. Some of these worries are metaphysical in nature, and others are worries about the nature of metaphysics. My contention is that these worries are by and large misguided, and thus that the anxious reactions of both reductionists and antireductionists are unwarranted.

For the present purposes I will distinguish between reductionist and antireductionist *theses*, on the one hand, and reductionist and antireductionist *approaches*, on the other. This is a perhaps clumsy distinction, and I don't know that it carves reductionism at its joints. But I think it can be made to do some work. By *theses* I have in mind particular views about the nature of reduction and reductive relations, which can be worked out in various ways some of which will be discussed below. By *approaches* I have in mind the motivations and background assumptions that go into formulating or adopting particular theses. Individual reductionists and antireductionists usually hold what we might then call a *theory*, a combination of an approach and a thesis. A great deal has been written about the merits of or truth of any number of

reductionist or antireductionist theses. Presumably there are some assumptions about approaches and motivations lurking in the background. But very little has been said about the merits of the various approaches themselves. Put another way: There is a lively debate over whether particular reductionist (or antireductionist) theses can solve certain problems or avoid certain objections. But not enough attention has been given to whether these are problems worth solving or objections worth overcoming. If the approaches are based on faulty assumptions, as I will argue, then they may misrepresent the available alternatives.

In this chapter I characterize four general approaches: Metaphysical Reductionism, Metaphysical Antireductionism, Antimetaphysical Reductionism, and Antimetaphysical Antireductionism. In each case I will offer some paradigm examples; my aim is to give representative samples rather than a comprehensive catalog. (So if there are some approaches that do not fit my framework I will not be bothered. On the other hand, if no views fit my model, that would be a problem.) In the process of distinguishing these approaches and presenting examples, I will make the case that each originates in a reaction to a metaphysical (or antimetaphysical) concern. Then I will argue that all four approaches accept an assumption that I call the *autonomy thesis*. If the autonomy thesis can be rejected, then we need not choose among the four approaches. Reductionism and antireductionism are not the only ways of resolving our metaphysical concerns.

I'll begin by motivating this new taxonomy of reductionist and antireductionist approaches.

1. Ontological and Theoretical Reductionisms

Before introducing my new taxonomy of reductionisms, it is useful to remind ourselves of what I aim to replace. The usual way to begin classifying reductionisms is by distinguishing those with ontological theses from those with explanatory or theoretical theses.[1] Ontological reductionism is a thesis about the furniture of the world. It says that we only need to accept into our ontology some limited set of "basic" entities, properties, events, or processes. Usually this basic set is supposed to be provided by physics (strictly speaking) or the physical sciences (broadly construed.) The ontological reductionist is usually contrasted with the explanatory or theoretical reductionist. Theoretical reductionism is a thesis not about the relations among objects, but about the relations among explanations, theories, or sciences. It says that the explanatory or predictive work that is done by some "higher level" theory can be done by a different "lower level" theory. Thus the higher level theory is said to be reduced to, translated to, or replaced by the lower level theory.

This traditional contrast between ontological and theoretical reductionisms has some virtues. Chief among those virtues is that it allows us to see how the ontological and theoretical theses can come apart. For while adherence to theory reduction is a reason to adopt ontological reduction (and vice versa), it is also possible to hold the ontological thesis while rejecting the theoretical thesis.[2] Indeed this combination has come to be the received view in philosophy of mind and philosophy of science, where it is often called nonreductive physicalism. (I'll prefer the expression "antireductionist" because it expresses the positive thesis that some phenomenon is not reducible better than the faux agnosticism of "nonreductive.")

The downside of drawing the distinction in this way is that it has seemed to license a certain willful negligence of problems that originate on the "other" side of the divide. For

example, those concerned with theory reduction may maintain that their theses are entirely insulated from ("autonomous from") ontological worries about the causal powers of higher level entities. Similarly, ontological reductionists may have little interest in shifting views as to what counts as an explanation in an "autonomous" science that ignores their ontological burdens. It seems that this framework has become an obstacle to understanding reduction, so it is time for a fresh perspective.

2. Metaphysical Anxieties and Reductionisms

There are two kinds of broadly metaphysical concerns that, it seems to me, drive most reductionist and antireductionist approaches. The first are classic problems within metaphysics, concerning causation, material composition, emergence, natural properties, and so forth. The second are concerns about the utility of metaphysics as an endeavor, about the meaningfulness of metaphysical claims or the justification for ontological commitments. These two sorts of concerns can motivate both reductionists and antireductionists.

Before characterizing the four approaches that are my subject herein, some things must be said about "reductionism" in general. First, we should understand some common ground in the very idea of reduction. Reductionists and antireductionists agree that nature or science consists of some number of levels of objects or theories. One point of contention that crosscuts the reductionist/antireductionist divide concerns what it is to be or to be located in a level. (As Richardson has noted: Even eliminative reductionsists believe in levels—they simply believe that there is only one of them!) Reductionists and antireductionists agree that levels of objects or theories are organized hierarchically by something like a containment relation: if there are higher level objects or theories, then those are made or constructed out of lower level objects or

theories. Lower level objects are parts or realizers of higher level objects; lower level theories are more basic than or more logically primitive than higher level theories. A second point of contention that is orthogonal to the reductionist/antireductionist divide concerns whether there is any absolute "bottom" level of ontology or explanation, or for a particular reductive claim which (relatively) lower level of ontology or explanation should be taken to be the reductive base. Typically the lower level explanations or objects are said to belong to (in decreasing order of austerity) physics, physics and chemistry, inorganic sciences, or non-intentional sciences, and their respective ontologies. Finally, reductionists and antireductionists agree that there is some relation R that, if it held, would count as the "reduction" of a disputed ontology or theory to a more basic or absolutely basic ontology or theory. Candidates for the reduction relation R are myriad. Some of the most common accounts maintain that H is reducible to L if and only if: (a) H is (or facts about H are) logically derivable from L (or facts about L); (b) H is conceptually entailed by L; (c) H is nomologically necessitated by L; (d) H is nomologically necessitated by L and some bridge laws; (e) H can be exactly modeled in L; (f) H can be approximately modeled in L; (g) H can be replaced by L; (h) H is realized by L; (i) H is identical to L; (j) H can be transparently explained by L. The options on this list are neither exclusive nor exhaustive, but they ought to be familiar.

The bottom line is that any particular reductionist or antireductionist thesis will be cast in terms of some notion of levels, some notion of a base level, and some reductive relation. This much is common ground for reductionists and antireductionists, and much ink has been spilt over whether there is a correct or ideal variation, and whether (in any particular debate) the disputants are talking past one another by assuming different variations.

The second thing to be said about reduction in general is that there is variation among reductionist and antireductionist theses as to what is the reductive target, about the ontology or theory that is said to be reducible or irreducible. Among the most familiar targets are intentional states or explanations, phenomenal properties or facts, organic entities and biological explanations, genes and genetic theory, and everything at all. If we are interested in reduction generally, then the particular reductive target will generally be less crucial than the other variables.[3]

The final thing that must be said is that my discussion herein will abstract away from such details. This is because I focus on what I am calling reductionist and antireductionist approaches rather than detailed theses. To say this is not to say that the details of the theses do not matter to the approaches, for indeed they do matter. Rather I am suggesting that there are interesting similarities and differences among reductionist and antireductionist approaches that can be profitably explored while bracketing these in-house disputes. I will usually take it for granted that the reader will see how the particular theses may modulate the approaches, but in a few cases I will note these connections directly.

So there are, on the one hand, numerous particular reductionist and antireductionist theses that can be formulated by making choices about levels, reductive bases, and reductive relations. My present concerns, on the other hand, are four basic approaches to the question of reductionism that (I maintain) can be fruitfully explored without first selecting a particular reductive or antireductive thesis. It is to these four approaches that we now turn.

2.1 Metaphysical Reductionism

I am distinguishing between approaches to reduction (and antireduction) that are motivated by concerns that are metaphysical in nature and those that are motivated by concerns about the nature of metaphysics. Metaphysical Reductionism is the approach that advocates for reductive theses for reasons that are broadly metaphysical in nature. Of course I offer no account of what makes a concern broadly metaphysical, but I don't think we need to resolve that demarcation problem in order to recognize some examples.

Jaegwon Kim's causal exclusion argument is a clear case of a metaphysical approach to reduction (1993, 1998, 2005). Kim argues that higher level properties are either causally redundant or else causally inert. Discounting general causal overdetermination, they are causally epiphenomenal. But, by an ontological principle that Kim calls Alexander's Dictum, to exist is to have causal powers. Since higher level properties have no causal powers of their own, the only way to save higher level properties (and their bearers) is to reduce them to respectable lower level properties that are the genuine locus of causal powers. Most recently Kim has argued that this reduction must proceed by construing the higher level properties as functional properties that are realized by the causally potent lower-level properties (1998, 2005). That is, Kim endorses a particular way of formulating the reductive thesis that is motivated by the causal exclusion argument. But for present purposes the crucial bit is that Kim's general approach is driven by metaphysical or ontological concerns, namely the dedication to a certain ontology and a general ontological principle.

A somewhat different strand of Metaphysical Reductionism is represented by the analytic reductionism revived by David Lewis (1994), David Chalmers (1996), and Frank Jackson (1998). This approach has garnered much more attention in philosophy of mind and metaphysics

than in philosophy of science. According to Jackson, "serious metaphysics" requires accounting for everything that there is in terms of some relatively small privileged class of objects. This accounting problem is what Jackson calls the "location" problem, for all objects must be located vis-à-vis the privileged ontological class. More precisely, the truth makers for the H-facts must be located among the truth makers for the L-facts. Jackson holds that this requires reducing the H-facts to the L-facts, and that in turn requires that the H-facts be a priori "entailed" by the L-facts. The particular example of a serious metaphysical view with which Jackson concerns himself is physicalism, the view that the truthmakers for all facts can be located among the truthmakers for the strictly physical facts. Reversing his well-known previous dualism (1982), Jackson now believes that physicalism is true.

Jackson's physicalist reduction counts as a Metaphysically Reductionist approach for two reasons. First, Jackson's reason for thinking that physicalist reductionism must be true is that he now finds epiphenomenalism unacceptable and he believes that any non-physicalist or non-reductive view will make the irreducible properties epiphenomenal. In short, he accepts Kim's causal exclusion argument. Second, Jackson's "serious metaphysics" is itself a reductive enterprise that is based on explicitly metaphysical principles. As Jackson explains it, any serious metaphysics will locate all facts and entities (that it recognizes) among a privileged class of facts and entities. This is a metaphysical injunction that is stronger than Ockham's Razor. Ockham's Razor says that we should not multiply entities beyond necessity. Jackson's serious metaphysics assumes that we should not multiply entities, period. This is more than mere dedication to desert landscapes. It is unclear on what grounds a serious metaphysician could justify her selection of the privileged entities and facts. But it is clear that they cannot be ordinary Ockhamist grounds for those do not come into play until after the basic entities and facts have been established. And

it cannot be, as for Quine, that we look to science; for that will only give us the sets of facts that need locating. (The sciences themselves give us only a "Big List" ontology, as Jackson might say.) The important point, for our purposes, is not that Jackson could never give reasons for picking, e.g., physical facts as the base facts. Rather, our interest is in noticing that Jackson's choice will be a metaphysical one, and so provides a second reason for thinking of his reduction as a kind of Metaphysical Reductionism.

2.2 Antimetaphysical Antireductionism

Antimetaphysical Antireductionism is the approach to reduction paradigmatically represented by Jerry Fodor's "Special Sciences" article (1974) and Hilary Putnam's example of the square peg and round hole (1975). These two papers, along with Kitcher (1984), are responsible for making "nonreductive physicalism" the received view in philosophy of mind and philosophy of science.

The approaches of Fodor, Putnam, and Kitcher are antimetaphysical in the sense that they are suspicious of privileging metaphysical concerns. Instead they put explanatory concerns in the driver's seat and "let the ontological chips fall where they may" (Bickle 2003: 32).[4] For this reason, it is tempting to think that Fodor, Putnam, and kindred spirits are concerned with what the usual taxonomy calls explanatory or theoretical reduction, as contrasted with the ontological reduction that occupies Kim, Jackson, and their ilk. It would then be tempting to defuse their apparent disagreement by observing that one group is concerned with ontology while the other is concerned with explanation, and suppose that they are simply talking past one another. Indeed, I believe that this is more or less the standard view. But this view is incorrect, and it goes wrong because it undercounts the degrees of freedom in the debate over reductionism. The two groups may indeed be talking past one another, but it is not because they are simply concerned with

distinct questions. Rather, it is because their approaches differ doubly: on the truth of reduction, and on the approach to or motivation for reduction.

Fodor famously argues that, *pace* Oppenheim and Putnam (1958), the multiple levels of sciences should be thought of as disunified. It may be that occasional unifying reductions can be had. But the "working hypothesis" is that they need not be found in order to legitimate special science (i.e., higher level) explanations. On Fodor's view, reductionism is the very unlikely empirical hypothesis that every kind corresponds to a physical kind:

> The reason it is unlikely that every kind corresponds to a physical kind is just that (a) interesting generalizations (e.g., counterfactual supporting generalizations) can often be made about events whose physical descriptions have nothing in common; (b) it is often the case that whether the physical descriptions of the events subsumed by such generalizations have anything in common is, in an obvious sense, entirely irrelevant to the truth of the generalizations, or to their interestingness, or to their degree of confirmation, or, indeed, to any of their epistemologically important properties; and (c) the special sciences are very much in the business of formulating generalizations of this kind. (1974: 124)

So the doctrine of reductionism is false not because reductions are impossible, but because they are unnecessary. The popularity of reductionism, according to Fodor, owes to its confusion with the doctrine that physics is the most basic and most general science, and with the doctrine that every token of a special science kind is identical to a token of a physical kind, i.e., token physicalism. Fodor's antireductionism is antimetaphysical because it is motivated by the availability of higher level lawlike generalizations irrespective of their ontological relation to

lower level generalizations. In the same vein, Kitcher argues that molecular details are simply irrelevant to explanations of in terms of chromosomes (1984: 348).

Putnam (1975) advances a similar view using the example of a square peg and round hole. Describing a board with holes cut in it, one round and one square, and a square peg, he poses the question: "We have the following very simple fact to explain: *the peg passes through the square hole, and it does not pass through the round hole*" (1975: 295). The correct or best explanation, he insists, is an explanation of the higher level entities and phenomena:

> the board is rigid, the peg is rigid, and as a matter of geometrical fact, the round hole is smaller than the peg, the square hole is bigger than the cross-section of the peg. The peg passes through the hole that is large enough to take its cross-section, and does not pass through the hole that is too small to take its cross-section. (1975: 296)

This higher level explanation is superior to any lower level explanation because, among other merits, the higher level explanation can be applied to other geometrically similar pegs and holes that are made of different materials and so is more general than the lower level explanation. It is the higher level features that are relevant to the event and its explanation.[5]

Like Fodor and Kitcher, Putnam does not doubt that token pegs, genes, or psychological states are physical entities. But that fact is simply not relevant to the content of or the legitimacy of higher level explanations. In this sense, higher level explanations and sciences are "autonomous" from physics and other lower level explanations and sciences. We may say about pegs and genes, as Putnam says about mental states, that it does not matter whether they are made of "copper, cheese, or soul" (1975: 292). Ontology is secondary to the explanatory goals, and those do not depend on reduction, according to the Antimetaphysical Antireductionists.

2.3 Metaphysical Antireductionism

Thus far I have not been concerned with evaluating reductionist and antireductionist approaches, only with stating them. But to understand the Metaphysical Antireductionist approach it is useful to recognize two difficulties that face its antimetaphysical counterpart, Antimetaphysical Antireductionism. First, the autonomy of special sciences from lower level sciences can come into tension with the truth of special science explanations. Putnam himself is candid about this problem. Speaking of the autonomy of Newtonian mechanics from contemporary gravitational physics , Putnam writes, "I want to draw the philosophical conclusion that Newton's laws *have a kind of reality in our world* even though they are not *true*" (1975: 301). If one is at all inclined toward even mild forms of scientific realism or toward conceptions of explanation as ontologically committed, then this tension will be a genuine problem.[6] Second, the autonomy of the special sciences can come into tension with some explanatory claims such as causal claims. If both the autonomous upper level sciences and the lower level base sciences make causal claims, then questions will arise about the relations between the various causal claims. In short, the kinds of causal exclusion worries that motivate Kim's Metaphysical Reductionism will have to be dodged or answered. The upshot is that any particular Antimetaphysical Antireductionsist thesis will have to offer a way out of these tensions. And this has proven difficult.[7]

As I already noted, Putnam explicitly raises the problem about truth. It seems to me that Fodor, Putnam, and Kitcher all recognized the potential instabilities with the Antimetaphysical Antireductionist position, and each of them is tempted to avoid the above tensions by taking a stronger stand. They each gave in to this temptation in the very same articles discussed above, in which their official doctrines were in every case Antimetaphysical Antireductionist approaches.

The stronger stand is to assert that not only is reductionism not necessary for the legitimacy of the special science explanations, but that reduction is impossible because of the actual structure of the world. This stronger position is a version of Metaphysical Antireductionism because it maintains that there are entities, events, properties, or facts in the world that cannot be recognized by reductionists. Fodor, for example, writes,

> I am suggesting, roughly, that there are special sciences not because of the nature of our epistemic relation to the world, but *because of the way the world is put together*: not all the kinds (not all the classes of things and events about which there are important, counterfactual supporting generalizations to make) are, or correspond to, physical kinds…. Physics develops the taxonomy of its subject matter which best suits its purposes: exceptionless laws which are basic in the several senses discussed above. But this is not the only taxonomy which may be *required* if the purposes of science in general are to be served: e.g., if we are to state such true, counterfactual supporting generalizations *as there are to state*. (1974: 131, emphasis added)

The idea suggested by Fodor in this passage, and that is characteristic of the Metaphysical Antireductionist view, is that there are patterns in the world that simply cannot be noticed or stated in terms of lower level entities or generalizations. Such entities or generalizations are irreducible (and thus autonomous) because higher level terms and explanations are necessary ("required") in order to express them. On this view, the lower level stuff and the possibility of reduction are *not* irrelevant to the legitimacy of higher level entities and explanations. Quite the opposite, it is the failure of reduction due to the incompleteness of lower level ontology and explanation that justify the higher level explanations and their ontologies.

Putnam, similarly, flirts with Metaphysical Antireductionism when he suggests that, in the case of the square peg and round hole, the microphysical explanation is not an explanation at all and the macrophysical explanation is "correct" (1975: 296). Recognizing the strangeness of this claim, he explains:

> People have said that I am wrong to say that the microstructural deduction is not an explanation. I think that in terms of the *purposes for which we use the notion of explanation*, it is not an explanation. If you want to, let us say that the deduction *is* an explanation, it is just a terrible explanation, and why look for terrible explanations when good ones are available? (1975: 296, emphasis original)

The idea that Putnam is flirting with is that the lower level explanation is not an explanation at all of the phenomenon of interest, that the phenomenon of interest *must* be explained at the higher level. If it must be explained at the higher level, then it cannot be reduced to any lower level explanation. The suggestion is that the phenomenon will simply be missed by or invisible to the lower level viewpoint. As such, the lower level explanation is simply inadequate and reduction is ruled out.

Kitcher, too, leans on the stronger thesis. Like Putnam, he sometimes suggests that the lower level explanations are simply explanatorily inadequate: "appeal to molecular biology would not deepen our understanding of the transmission law [of chromosomes]. …In charting the details of the molecular rearrangements the derivation would only blur the outline of a simple cytological story, adding a welter of irrelevant detail" (1984: 347). But Kitcher also implies that there are facts in the world that a lower level account will simply miss: "The molecular derivation forfeits something important" because the cytological processes "cannot be identified as a kind from the molecular point of view" (1984: 349). Thus, "[t]he molecular account

objectively fails to explain because it cannot bring out that feature of the situation which is highlighted in the cytological story" (1984: 350).

So Fodor, Putnam, and Kitcher are tempted by the Metaphysical Antireductionist approach in some of their officially Antimetaphysical Antireductionist works. But others assert this stronger thesis outright. Louise Antony and Joe Levine write, "a property is real (or autonomous) just in case it is *essentially* invoked in the characterization of a regularity" (Antony and Levine 1997: 91). Antony and Levine argue that mental states and properties are both reducible and autonomous. Autonomy is usually understood by contrast with reduction, as per Fodor: "Simply to have a convenient way of talking, I will say that a law or theory that figures in bona fide empirical explanations, but that is not reducible to a law or theory of physics, is ipso facto *autonomous"*(1997: 149). So clearly Antony and Levine must have different reductionist theses in mind when they endorse one and deny another to arrive at reduction with autonomy. For the present purpose, however, I want to focus on the autonomy side of the claim, and on the approach to antireductionism that leads them to it. The answer, it seems, is that Antony and Levine are led to the autonomy thesis via metaphysical concerns, and so that aspect of their view fits the Metaphysical Antireductionist picture. The reason is that they assert the irreducibility of mental states in order to preserve the reality of those states and properties. For, by the principle quoted above, if a mental state or property is not essentially—irreducibly— invoked in a generalization at some level, then it is not a real state or property at all. That is, they see reduction as a route to elimination, so the motivation for asserting antireductionism is to preserve the higher level ontology.[8]

A quite different flavor of Metaphysical Antireductionism can be found in Ned Block's and Robert Stalnaker's response to the analytical reductionism that Chalmers (1996) and

Jackson (1998) suppose must be endorsed by any physicalist. On one reading, Block and Stalnaker (1999) can be seen as arguing that it is not true that all facts are reducible (in the a priori analytic way required by Chalmers and Jackson) to strictly physical facts, on the grounds that there are some a posteriori but metaphysically necessary facts that are not so reducible.[9] Among these, they think, are that water is identical to H_2O and that water boils at 100°C. This approach is metaphysical because it is motivated by ontological commitment to objects and facts other than those that belong to strict physical theory.[10]8

On the Metaphysical Antireductionist approach, there are generalizations about higher level entities and properties that literally cannot be seen, characterized, or captured at the lower level. These higher level generalizations are, therefore, indispensable. And their existence means that reduction must be false because the world does not cooperate with the reductionist paradigm. This is a view that Schaffner (1993) calls "in-principle emergence" and Chalmers (1996) calls "dualism."

2.4 Antimetaphysical Reductionism

According to Antimetaphysical Reductionists, reductionism is true but it is motivated entirely by scientific or metascientific concerns. From this approach, it will look as though any antireductionist is appealing to suspicious metaphysical principles to justify questionable ontological commitments that can be shown by empirical means to be either false or untestable.

Paul and Patricia Churchland are perhaps the most often cited representatives of Antimetaphysical Reductionism. They have argued that intentional states (P. M. Churchland 1981, 1982) and conscious states (P. S. Churchland 1983) should be eliminated because nothing that science has discovered has the characteristics that intentional or conscious states are

supposed to have, explanations made at the psychological level are false, and better explanations can be given at lower levels, viz., the levels of the neurosciences.

John Bickle (1998) took a similar view, arguing that on a continuum of smooth (little revision of the reduced theory required) to rough (much revision of the reduced theory required) reductions, psychological states get relatively rough reductions.[11] But Bickle now regards his earlier (1998) view as too metaphysical:

> Even though scientists talk a "realistic"-sounding language, we should not interpret this talk as addressing questions "external to" the practices and concerns of a given scientific endeavor. The job of new wave metascience is simply to illuminate concepts like reduction as these imbue scientific practice. To what end? Not to achieve some better way of addressing reformulated "external' questions about the existence and nature of "theory- independent ontology." Rather, because a reasonable explanatory goal is to understand practices "internal" to important current scientific endeavors and the scope of their potential application and development. The tasks of this book are part of a metascience of contemporary psychology and neurobiology, not a part of some "ontology of mind." (2003: 32)

So Bickle's new wave metascience is suspicious of any metaphysical or ontological claims, drawing instead on Carnap's (1950) distinction between internal and external questions. Bickle joins Carnap as dismissing ontological or metaphysical questions as external to scientific practice and thereby literally meaningless. His reductionism, then, is itself a claim internal to science; and in particular it is supposed to be internal to the practices of molecular neuroscientists. (Better: It is supposed to be a description of the internal practices of molecular neuroscientists. It need not be part of their practices to spend time describing their practices, though of course it could be.)

Whether Bickle is correct is not our present interest. We are concerned with his antimetaphysical approach to reduction. It is antimetaphysical because it insists that reduction is an internal thesis, and it is reductionist then in an entirely descriptive mode. Bickle, in essence, tells us, "This is what [a certain group of] neuroscientists do."

2.5 Hard to Classify

These four options seem to me to reasonable organize the field of contenders (Figure 1). I said from the start that my taxonomy was meant to be useful but not canonical, and that some views may not be cleanly pigeonholed by this way of thinking. Before going on, I'll take a moment to point out one such view and indicate why it is not obvious where to situate it. By giving specific reasons for the lack of fit, I hope to assuage worries that the problem is with my own taxonomic principles.

Consider Daniel Dennett's "stances" approach to intentional explanation (1971, 1987). On this view, roughly, for a system to have intentional states is for its behavior to be usefully explained and predicted by treating the system as approximating optimally rational behavior. The utility of the intentional explanation is quite independent of whether any other explanations (particularly, for Dennett, physical or design stance explanations) are available. Thus Dennett's view is clearly antireductionist. But is it an example of Antimetaphysical Antireductionism or of Metaphysical Antireeductionism? On first pass, the stances approach seems to be antimetaphysical, giving priority to explanatory and predictive concerns. But matters are not so simple. For on Dennett's view, the question of whether a system can be treated as an intentional system and whether it "really is" an intentional system are the same. Having decided whether the

intentional stance is useful, no further question remains regarding whether a system is, metaphysically speaking, an intentional system.

Simply put, Dennett's instrumentalism or quasi-realism rejects the kind of distinction between metaphysical and antimetaphysical approaches that I am employing. A similar problem would arise if we try to classifying Bas Van Fraaseen's view (1980) that science is not in the business of fact stating. I don't doubt that issues of realism and antirealism are relevant to questions about reductionism and antireductionism. But I do think that we can understand why quasi-realist views fail to fit nicely into the standard framework, for they intend to reject assumptions of that framework that lie even deeper than the common assumptions that presently concern me. Dennett's approach is simply not a position on the dispute between reductionists and antireductionists. So it is no embarrassment that it does not fit neatly into my examination of that debate.

3. Metaphysical Anxieties and the Autonomy Thesis

I began by suggesting that various approaches to reductionism and antireductionism are responses to worries that are metaphysical in one of two ways: they are worries about some metaphysical problems, or they are worries about the nature and legitimacy of metaphysics as an endeavor. It is worth making these anxieties explicit.

As I see it, Metaphysical Reductionists like Kim are driven by the worry that any entities that cannot be reduced will prove to be epiphenomenal or unreal. Similarly, Jackson's approach to reduction begins with the idea that any non-basic entities that cannot be "located" (i.e., reduced) are at best mysterious, certainly epiphenomenal, and probably non-existent. So it is anxiety over having to deny the efficacy or existence of ordinary or important entities (e.g.,

tables or minds) that drives Kim's and Jackson's reductionism. The Metaphysical Antireductionist has the very same concerns about ordinary or important entities, but just the opposite view of what counts as legitimizing such entities. Antony and Levine are explicit about the anxiety that clearly nagged Fodor, Putnam, and Kitcher, namely that reduction amounts to elimination. To protect tables and minds, we must show that there are generalities about or regularities in the world that essentially involve tables and minds, so that any ontology that leaves them out would be plainly incomplete. Reduction, they say, would result in "losing our minds," so antireductionism is the only way to go.

In contrast, the Antimetaphysical Reductionist and Antimetaphysical Antireductionist are anxious not about particular metaphysical results, but about the endeavor of metaphysics altogether. Usually their motivations are broadly empiricist: Our ontological commitments, if we call them that, should not outrun the evidence that we have. The Antimetaphysical Antireductionists typically accept the official views of Fodor, Putnam, or Kitcher. They observe that as a matter of fact the sciences (and disciplines within sciences) are more or less methodologically independent so that, for example, whether string theory proves to be correct is entirely irrelevant for explanations of evolutionary change. These sciences simply work at different levels. There may sometimes be interesting correlations between the levels, some of which may be explanatorily or methodologically fruitful. But that tells us nothing about the legitimacy of various explanations, nor bout their ontological commitments or even whether they have any.

Antimetaphysical Reductionists also shun the ungrounded claims of "speculative" metaphysics, but their anxiety is the antimetaphysical twin of Jackson's Metaphysical Reductionism: To recognize explanations or entities that cannot be located (here, scientifically

rather than analytically) among the basic stuff of the universe would be to commit oneself to a metaphysical claim that has no justification and no meaning from the perspective of the sciences. It is true that there are many sciences and many levels of explanation, and these may be methodologically or heuristically fruitful. But claims that cannot be reduced must be regarded as approximations at best, and at worst as simply false.

I have little trouble understanding how epiphenomenalism, eliminativism, meaninglessness, and falsehood can generate anxiety. If reductionism or antireductionism had those consequences, then I would be troubled as well. But I think they do not, and thus that antireductionism and reductionism are solutions to problems that we do not have. It seems to me that these concerns stem from a common but problematic assumption.

Consider the view about reduction and autonomy discussed earlier with respect to Metaphysical Antireductionism. Take as our starting point Antony and Levine's idea that "a property is real (or autonomous) just in case it is *essentially* invoked in the characterization of a regularity" (Antony and Levine 1997: 91). I call this the *autonomy thesis*. Let's clean it up a bit:

> Autonomy: a property x is real if and only if x is essentially involved in (the explanation of) a regularity G.

I'm not going to fuss too much about the exact formulation of the autonomy thesis, as long as we have the general idea that we will ontologically or epistemically commit ourselves to x if and only if there is some regularity Gx that cannot be reduced to any G*y such that $(y \neq x)$.[12] Autonomy says this, I believe, because I interpret the "essentially invoked in" clause in terms of irreducibility. Plausibly this irreducibility has as its domain any reductionist thesis rather than some particular reductionist thesis. So autonomy cuts across the in-house disputes over particular reductionist theses and relations R. According to me, both reductionist and antireductionist

approaches, be they metaphysical or antimetaphysical, accept the autonomy thesis and *ipso facto* make an assumption about the relation between explanations and ontological commitment.

The autonomy thesis is a broadly Ockhamist principle, for it asserts that there is only one real ontology and one true story of the world. This follows from the fact that autonomy only recognizes those entities that appear necessarily in the explanation of a regularity. If one could invoke an alternate explanation that does not appeal to some entity, including some regularity, then the entity is not recognized as real. Once we eliminate all the unnecessary and unreal entities, we will be left with the one true explanation and thus the one real ontology. Reduction is compulsory when it is possible: If some entity or explanation can be reduced then it must be reduced, for to recognize a reducible entity or explanation would be to allow redundant entities and explanations. Redundant entities and explanations do no work ontologically or explanatorily, they are at best epiphenomenal or approximate.

Reductionists and antireductionists disagree over whether, for example, pains or genes are reducible or whether they are essentially (irreducibly) involved in (the explanation of) some regularity G. Metaphysical Reductionists and Metaphysical Antireductionists agree, however, that whatever is real must be essentially involved in (the explanation of) some regularity. They both accept the autonomy thesis, and they interpret it as a constraint on ontological commitment in general. Thus the reductionist aims to preserve the reality of pains and genes by showing that they can be located among the basic constituents of reality. (For if they cannot be so located, then they are unnecessary and thus unreal.) And the antireductionist aims to preserve the reality of pains and genes by arguing that our ontology must be expanded to include pains and genes on their own. (For if they do not appear in their own right, then they will be demoted or eliminated in favor of the reduced ontology.)

The Antimetaphysical Reductionist also accepts the autonomy thesis, but interprets it in its antimetaphysical guise. The Churchlands and Bickle argue that scientific practice in fact reduces its ontology and explanations to the lowest available level whenever possible. Of course both the ontology and explanatory value are counted only internally to the practices of a scientific community. Likewise, Antimetaphysical Reductionists hold that a version of the autonomy thesis is part of and internal to scientific practice rather than a general constraint on ontology, for they eschew metaphysical claims about ontology altogether. If the autonomy thesis were interpreted metaphysically then it would make a claim that is external to scientific practice and therefore undecidable or meaningless. The antimetaphysical approach is metascientific. It appeals only to the practices of scientists, and not to any general ontological principles like Ockham's Razor or Alexander's Dictum. The Antimetaphysical Reductionist approach is doubly a response to the autonomy thesis: It rejects the metaphysical interpretations endorsed by the Metaphysical approaches on the grounds that external ontological claims are baseless or meaningless. And it accepts the internal interpretation of the autonomy thesis according to which it is simply a description of the actual practices of some scientists. There is no doubt that the view is radical, and that there is room to question the empirical claims (de Jong and Schouten 2005, Bickle 2005, Aizawa forthcoming). But it is clear how one could subscribe to this approach and what its appeal is meant to be.

Matters are a bit more complicated for the Antimetaphysical Antireductionist. This was the official doctrine of Fodor, Putnam, and Kitcher, recall. According to this view, the legitimacy of higher level "special science" explanations and their ontologies does not require their reduction. But on the official view, while the special sciences do not require reduction, they are nevertheless compatible with reduction. And this looks like a rejection of the autonomy thesis. If

so, then I am mistaken that all four approaches endorse the autonomy thesis. But recall that the Antimetaphysical Antireductionists, while attempting to marginalize reduction, still views reduction as a threat to the legitimacy of higher-level sciences and explanations. This much is clear from the very fact that Putnam, Fodor, and Kitcher all flirt with the stronger position according to which reduction is not just irrelevant but moreover impossible. And Fodor, for example, is explicit that psychological kinds are functional, irreducible, and autonomous (1997).[13]

If I am right, then all four of the above approaches to reductionism can be understood as ways of responding to the perceived consequences of the autonomy thesis, of saving precious ontological commitments or of avoiding the entire ontological business. But what can be said in favor of the autonomy thesis? Why should we suppose that an object exists only if it figures essentially in an explanation? And why should we suppose that an explanation is legitimate only if it is compulsory? Of course two explanations may come into conflict in any number of familiar ways. But it is open to us to reject the idea that two explanations must come into conflict merely because they are two.

This may seem like the kind of metaphysical speculation that the Antimetaphysical Reductionists spurn. But even their internal claim that the autonomy thesis is a descriptive fact of some sciences can be drawn into question. For we may wonder whether the metascientist can give us independent grounds for individuating sciences and their practices, so that we can usefully answer the question of whether autonomy is accepted in a given science or practice. Clearly, given antimetaphysical commitments, there can be no appeal to any an external perspective from which to individuate sciences. But, on the one hand, if we cannot have independent grounds for individuation then the claim that some science accepts autonomy and is

reductive in its practices will appear ad hoc. And on the other hand, it seems that the only way for an independent individuation to be is to take up the non-authoritative perspective of another science, thus beginning a regress for the question of how to count sciences and their practices. This dilemma is the practical face of the philosophical puzzle of demarcating internal and external perspectives.

Needless to say, to question the autonomy thesis is not to show that it is false. For present purposes we can settle for the recognition that the four approaches to reductionism are responses to anxieties about the consequences of the autonomy thesis. That recognition allows us to take seriously the possibility that we could tame our anxieties by adopting one of the four responses, or by rejecting the autonomy thesis. I prefer the latter route, and I believe that arguments against the autonomy thesis can be given (Polger 2004). The dispute over reductionism becomes secondary once the autonomy thesis is rejected. Still it is useful to consider what the terrain looks like, to borrow an expression, after reductionism.

4. Pluralism and Naturalism

To reject the autonomy thesis is to reject the idea that there is only one true explanation or theory whose ontological commitments tell us all that there is. It is to adopt a form of pluralism. The Antimetaphysical Antireductionists hoped to advance a view like this, but because they accepted the autonomy thesis they had to fall into Metaphysical Antireductionism. The pluralistic view is genuinely nonreductive—that is, neither reductive not antireductive. Whether reductionism is true is simply not the right question to ask. So the view that I advocate might be called nonreductive pluralism, and it might just as well (though more awkwardly) be called

nonantireductive pluralism. I call it pluralism, naturalistic pluralism or, in some moods, simply naturalism.

Pluralism should not be a free lunch. There are many questions that a pluralist must answer and I am not going to offer you those answers herein. Some of the problems for pluralism are successors to the puzzles that used to face reductionism or antireductionism. But I am optimistic that we can make better progress on them once we leave behind the constraints imposed by the reductionist/antireductionist framework. Only time will tell whether that optimism can be borne out. But it is worth mentioning a few salient features of pluralism as I understand it.

First, pluralism, as I have structured my discussion, is an approach rather than a thesis. There are many particular pluralist theses, and a responsible pluralist will have to figure out how to decide among them. Here I have proposed only the approach, and not any specific pluralistic thesis or theory. If my reasoning is at all compelling, then I may hope to restructure the debate but not to settle it.

Second, pluralism, as I use the label, is simply the rejection of the autonomy thesis: it is the view that there may be more than one explanation for a phenomenon, and that ontology may include items that are not mentioned essentially in a compulsory explanation. Pluralism, therefore, does not guarantee that there is more than one explanation for a phenomenon, or that there is even one. And it certainly does not claim that all explanations are correct or otherwise acceptable. It is an open question to what extent this brand of pluralism (i.e., denial of the autonomy thesis) resembles other forms of pluralism, and whether for better or for worse. Still, it is clear enough that the present thesis deserves the label.

Third, pluralism is not dualism. Dualism is the view that there are two kinds of stuffs or two kinds of properties, the physical and the mental or the inorganic and the organic, for example. According to dualism, these two kinds of stuff or properties are such that one cannot be used to explain or understand the other. But it is not part of pluralism that life or minds cannot be explained in terms of inorganic physical properties or entities. Nor is pluralism a return to the ancient view that there are more than one or two basic kinds of stuff that compose everything else. Pluralism is not a view about how many basic kinds of things or properties there are, or even about whether there are any basic things or properties. It is merely the denial of the autonomy thesis.

Finally, as I have already noted, pluralism does not make every metaphysical or explanatory question go away. It simply resituates them. For example, I take it that explanatory exclusion problems get no traction for an explanatory pluralist, more or less by definition. On the other hand, pluralism splinters the question of which explanation to prefer into equally pressing questions about the relations among explanations and about when explanations come into genuine conflict. And while explanatory exclusion is no problem, it seems like causal exclusion concerns simply get a new formulation but otherwise look much as they always did. Understanding the relations that hold among plural explanations looks to be at least as troublesome as finding some unified reduction relation. If it is too much trouble then we shall have to think about abandoning pluralism for a still better alternative. I claim only we need not restrict ourselves to the false choice between reductionism and antireductionism.

5. Acknowledgements

The approach sketched in this paper is an elaboration of the view I defended in 2004, and it is a response my own meta-anxieties that arise from the competing tugs of all the first-order anxieties. I am not sure that I have found the cure, but I sometimes think that I am making progress. I would like to thank the following therapists for their assistance on this matter: Ken Aizawa, John Bickle, Marica Bernstein, Robert Brandon, Carl Craver, Owen Flanagan, Carl Gillett, Greg Johnson, Larry Jost, Tony Landreth, Michael Lynch, Bob Richardson, Larry Shapiro, Rob Skipper, and the editors and reviewers for this volume.

6. Notes

[1] See, e.g., Kitcher (1984), Schaffner (1993).

[2] It's not obvious that it makes sense to hold the theoretical thesis while denying the ontological thesis. At any rate I cannot think of any examples.

[3] But not always. For example, if, as in John Bickle's (2003, this volume) "new wave" reductionism, reductionism should be understood as a descriptive claim about the actual practices of a certain group of scientists, then the choice of reductive target (and the group of scientists) will be absolutely crucial. If Bickle is right then reductionism is not a general doctrine after all and we have no reason to expect various reductionisms to have much in common.

[4] This quote reveals that Bickle now views his earlier (1996, 1998) "new wave reductionism" as having been, paradoxically, a version of what I am calling Antimetaphysical Antireductionism. Perhaps this recognition explains why he has shifted to a more "ruthlessly" reductive "new wave metascience" (2003).

[5] A fuller discussion of this view can be found in my (2004, ch. 6).

[6] It seems fair to say that reduction is mainly an issue among realists, but see §2.5, below.

[7] I do not mean to suggest that there are not similar problems for the other approaches. I'm merely trying to make clear, in this case, how an Antimetaphysical Antireductionist might be attracted to Metaphysical Antireductionism in the way that I suggest below.

[8] For the record, the reductive part of the Antony and Levine "reduction with autonomy" view seems to involve an endorsement of the Metaphysical Reductionist approach followed by Kim,

which worries that irreducible states or properties will prove unreal due to causal exclusion and Alexander's dictum.

[9] And Chalmers himself acknowledges that facts about causation will be exceptions to the reductive picture that he paints for the physicalist, so causal generalizations will not be reducible to non-causal physical facts (1996).

[10] There are senses in which one might think of Block and Stalnaker as reductionsists. But the dispute between them, on the one hand, and Chalmers and Jackson, on the other hand, is over which relations yield the demanding kind of reduction that Chalmers and Jackson suppose that physicalism requires. Block and Stalnaker deny that the Chalmers and Jackson style reduction obtains. Thanks to an anonymous referee for this chapter for reminding me of this point.

[11] Bickle's (1998) model of reduction is similar to that suggested by Schaffner (1967).

[12] Obvious the notion of a 'regularity' will be ambiguous between a real pattern in the world and a statement characterizing such a pattern, in the same way that the notion of 'law' is ambiguous. And context will normally disambiguate the interpretation of 'regularity' just as it does for 'law'.

[13] This interpretive point requires further elaboration. For some of that elaboration, see my 2004.

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FIGURE 1

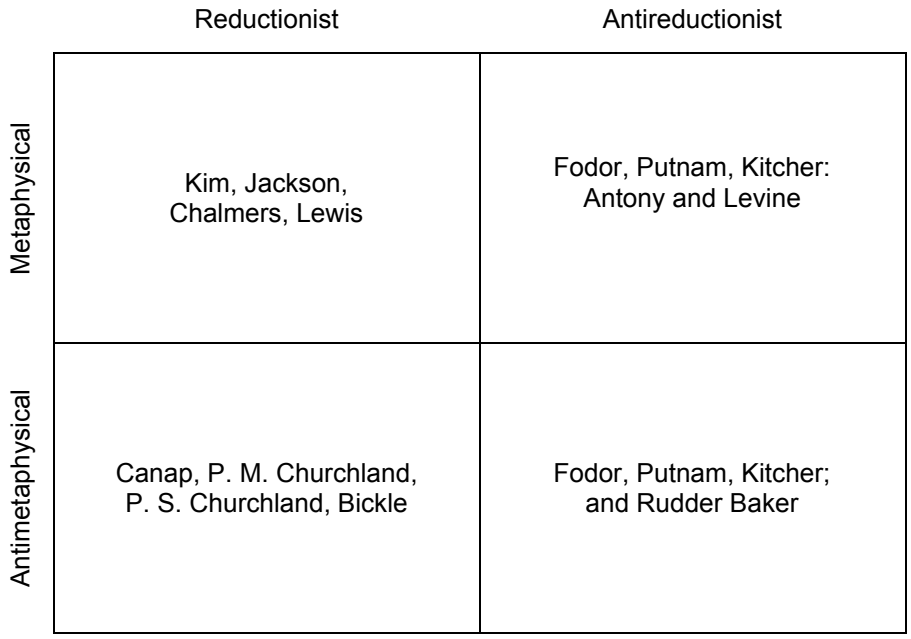

Figure 1. Four approaches to reductionism and antireductionism, and some paradigm advocates of the approaches.