

# Naturalism, Explanation, and Identity

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## **Abstract.**

Some people believe that there is an “explanatory gap” between the facts of physics and certain other facts about the world—for example, facts about consciousness. The gap is presented as a challenge to any thoroughgoing naturalism or physicalism. We believe that advocates of the explanatory gap have some reasonable expectations that cannot be merely dismissed. We also believe that naturalistic thinkers have the resources to close the explanatory gap, but that they have not adequately explained how and why these resources work. In this paper we isolate the legitimate explanatory demands in the gap reasoning, as it is defended by Chalmers and Jackson (2001). We then argue that these demands can be met. Our solution involves a novel proposal for understanding the relationship between theories, explanations, and scientific identities.

## **1. Introduction**

Some people believe that there is a so-called explanatory gap between the facts of physics and certain other facts about the world—for example, facts about consciousness, in the most familiar version. Some thinkers take the explanatory gap very seriously. But many naturalistically minded thinkers view the explanatory gap as a “metaphysical” problem in the pejorative sense of the word. Practicing scientists tend to see the gap worries as the result of skepticism or ignorance concerning the empirical data. And philosophers of science diagnose the gap worries as symptoms of long since abandoned ideas about explanation.

We think that the scientists are correct that empirical data can help close or dissolve the gap. We also think that philosophers of science are right to insist on improved models of explanation. But we believe that scientists and philosophers of science have not adequately explained how and why these responses work. The advocates of the explanatory gap have some reasonable expectations that cannot merely be dismissed. In this paper we isolate the legitimate explanatory demands in the gap reasoning. Then we explain how those demands can be met.

## **2. The Explanatory Gap and Identity**

It is widely accepted by the advocates and opponents of the explanatory gap that whether there is such a gap is a matter of whether there is a kind of necessary connection between the physics facts and other facts, be they facts about water, genes, or conscious experience.<sup>1</sup> Moreover, it is widely accepted that if such a necessary connection obtains then it is possible to provide a “reductive” or “transparent” explanation of all facts in terms of physical facts. It follows that if no “reductive” or “transparent” explanation can be given, then there is no such necessary connection. It is supposed that physicalism requires that all facts be “reductively” or “transparently” explainable by physical facts. So if there is no necessary connection then there are some facts in the world that are not facts of physics or “reducible” to facts of physics, and physicalism is false.<sup>2</sup>

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<sup>1</sup> There is some dispute over whether any kind of necessity will do, or whether a special sort is required. We will return to this shortly.

<sup>2</sup> For the purposes of this paper, we use the labels *physicalism*, *naturalism*, and *materialism* indiscriminately. We are aware that some philosophers carefully distinguish among the three, but our argument does not depend on this distinction. Moreover, we take no stand on the precise content of physics, as we are mainly concerned with the relations between theories or explanations.

The key to understanding and responding to the gap reasoning is taking the demand for a necessary connection seriously.<sup>3</sup> This is where a straightforwardly empirical response goes wrong. The defenders of the gap (call them *mysterians*, adapting the terminology of Flanagan 1991) are correct that no amount of mere descriptive empirical data can yield the right kind of explanatory connection between physics facts and facts about consciousness. For the observation of a necessary connection will not be among this data.<sup>4</sup>

Where do we get the necessity to close the gap? One answer is familiar: There would be a necessary connection between the facts of physics and facts about water, genes, life or consciousness if the facts about water, genes, life or consciousness “just are” physical facts. Since Kripke, it has been generally accepted that identity is a relation that holds with necessity.<sup>5</sup> If facts about water, genes, life or consciousness can be identified with physics facts, then we will have the necessary connection that we are seeking. This is the identity theory solution to the explanatory gap. The question of how to close the gap is transformed into the question of how to establish the identity theory. Alas, just about everyone in the last thirty-five years or so has believed that the identity theory is, as a matter of fact, false. The main reasons for thinking that the identity theory is unavailable are the multiple realizability arguments of Putnam (1967) and Fodor (1974).

But in the past few years, multiple realizability has itself come into question (Bickle 1998, Sober 1999, Shapiro 2000, Polger 2002), opening the door for the identity theory. Hill

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<sup>3</sup> Some naturalistic philosophers, perhaps some logical empiricists and Quineans, would simply reject this demand outright. But we agree with the mysterians that explanations make use of necessary connections, so we accept the demand. We disagree about the nature of the necessary connection, however.

<sup>4</sup> On this conception, the theory of physics is a set of sentences, including only: (1) descriptions of states of affairs, (2) statements of laws of nature, and (3) definitions. We take issue with this conception of scientific theories, but that is a topic for another day.

<sup>5</sup> A notable holdout is Alan Gibbard (1975).

(1991), Hill and McLaughlin (1999), Perry (2001), and Block and Stalnaker (1999, hereafter B&S) have all advanced versions of the theory and argued that identity can be used to close the explanatory gap. For example, B&S write:

If we were to accept mere correlations instead of identities, we would only have an account of how something correlated with heating causes something correlated with boiling. Further, we may wish to know how it is that increasing the molecular kinetic energy of a packet of water causes boiling. Identities allow a transfer of explanatory and causal force not allowed by mere correlations.

Assuming that heat = [molecular kinetic energy], that pressure = molecular momentum transfer, etc. allows us to explain facts that we could not otherwise explain. Thus we are justified by the principle of inference to the best explanation in inferring that these identities are true. If we believe that heat is correlated with but not identical to molecular kinetic energy, we should regard as legitimate the question of why the correlation exists and what its mechanism is. But once we realize that heat *is* molecular kinetic energy, questions like this will be seen as wrongheaded. (1999: 23-24)

B&S make at least three distinct kinds of claims in this passage. First, they claim that identities allow us to explain facts that we could not otherwise explain. Without the identity, we cannot explain why increasing temperature causes boiling, rather than merely causing the increased molecular kinetic energy with which boiling is correlated. Second, they claim that identities relieve us of the obligation to explain why a correlation obtains. Whereas it is sensible to ask why a connection between correlated facts holds, there is no similar question about why things are identical to themselves. Identity does not require explanation. Thus, the discovery of an

identity dissolves any apparent explanatory gap between the correlated facts. Third, B&S claim that these explanatory values of identity themselves justify us in adopting the identity claims, by inference to the best explanation.<sup>16</sup>

B&S take seriously the mysterians' requirement to provide necessary connections in order to close explanatory gaps. They do this by defending identity claims. In response, some mysterians and, more surprisingly, some physicalists have argued that the identity theory is no solution at all—that even if identity theory is true, it does not close the gap. Chalmers and Jackson (2000, hereafter C&J) argue that the kind of identities that B&S invoke are not the right sort: they are metaphysically necessary but not “epistemically primitive,” and therefore are either *sui generis* or themselves in need of explanation. Jaegwon Kim (2005) argues that identities do not allow us to explain anything that we can not already explain. [Add for SPP: Kim's argument rests on assumptions similar to those of C&J, but in this paper we will focus on C&J.]

### **3. C&J on Explanation and Identity**

C&J argue that although identities (if true) would provide a metaphysically necessary connection between physics facts and other facts, hypothesized a posteriori identities (contra B&S) themselves require explanation. The only physically acceptable identities, on this view, are those that can be deduced from the facts of physics. But the identities proposed by B&S, Hill, and McLaughlin are not conceptually necessary a priori, and cannot be so deduced. They are additional claims, not part of or entailed by physics. Therefore, C&J complain:

At best, there is an explanation [of consciousness] in terms of physical processes  
*plus* psychophysical identities. And epistemically, the psychophysical identities

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<sup>6</sup> We are grateful to Jaegwon Kim for drawing our attention to this passage in B&S, and to its structure.

play exactly the same role as psychophysical laws. They are inferred from regularities between brain processes and consciousness... And most importantly, the identities are not themselves explained, but are epistemically primitive... it is precisely because we need these epistemically primitive psychophysical principles to explain the phenomenon that transparent reductive explanation fails. (2001: 354)

Earlier we emphasized that mysterians' demand for "transparent" or "reductive" explanation requires that the explanatory relation be necessary. But now we see that not any old sort of necessity will do. C&J require that the relation be conceptually or logically (in the broad sense) necessary. For example, they claim:

Once a subject knows all the truths about DNA and its role in reproduction and development, for example, the subject will be in a position to deduce that genes are DNA. ...subjects do not typically come to know these identities by deducing them from microscopic truths. But the identities are so deducible all the same, and their deducibility is what makes the phenomena in question reductively explainable. If the identities in question were epistemically primitive, then explanations of the macroscopic phenomena in terms of microscopic phenomena would have a primitive "vertical" element, and science would have established a far weaker explanatory connection between the microscopic and the macroscopic than it actually has. (C&J 2001: 355)

C&J understand physicalism as the thesis that all the facts about the world be deducible from the facts of physics. For any facts not so deducible, there is an explanatory gap.

The C&J line of reasoning is plain enough. Closing the explanatory gap requires that consciousness be given a “reductive” or “transparent” explanation. These explanations are understood to be deductions; there may be other kinds of explanations that are not deductions, but “reductive” explanations are, they maintain. These “reductive” arguments must contain as explanatory premises only (i) facts of physics, including laws of physics and the distribution of mass and energy, (ii) facts conceptually or analytically entailed by the facts of physics, and (iii) facts that are themselves “reductively” explainable by the facts of physics. Clearly, identity claims that are knowable only a posteriori are none of (i)-(iii). So they must be either (iv) facts in need of explanation, or (v) epistemically primitive. If the identity facts are in need of explanation but cannot be “reductively” or “transparently” explained by the physical facts, then according to C&J physicalism is false.<sup>7</sup> Likewise, if the identity facts are epistemically primitive, then they are *sui generis*, and although they may be physicalistic in letter they are dualistic in spirit. After all, they are not facts of physics, nor entailed by or explainable in terms of facts of physics. But the only kinds of facts that can be used in explanatory premises of “reductive” explanations are those that fall under (i)-(iii). So a posteriori identities, if there are any, cannot be used as premises in “reductive” or “transparent” explanations.<sup>8</sup>

[Cut for SPP: Before we evaluate this objection from Chalmers and Jackson, let us take a look at some similar considerations raised by Kim (2005).]

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<sup>7</sup> Up to this point, the argument is basically the same as Jackson’s co-called Knowledge Argument, involving Mary the color super-scientist (1984).

<sup>8</sup> On this view, if  $\text{water}=\text{H}_2\text{O}$  is part of a “reduction” of water, then (contrary to common opinion) it is not genuinely a posteriori but is in fact has an essential a priori component.

#### **4. Kim on Explanation and Identity [§4 removed for SPP presentation]**

Jaegwon Kim (2005)<sup>9</sup> maintains that there are three basic arguments in favor of identity theories: simplicity arguments, explanatory arguments, and causal arguments.<sup>10</sup> We will focus on the explanatory arguments. They, in turn, come in three varieties. First, some philosophers argue that identity is supported by inference to the best explanation; in particular, the identity may be supposed to explain an observed correlation. Second, some philosophers argue that identities allow us to explain some facts that are not otherwise explainable. Third, some philosophers argue that identities terminate explanatory demands. Elements of all these ideas can be found in the passage from Block and Stalnaker, mentioned earlier.

Let's begin with the third kind of explanatory argument. Contra Chalmers and Jackson, Kim agrees that a posteriori identities terminate explanatory demands. Where there is an identity, it no longer makes sense to ask why the identity holds. But, Kim observes, the mere fact that identities would block the explanatory gap reasoning (by revealing it to be based on a mistaken explanatory demand) is not itself a reason to believe that the identities are true. Identities can do the job, but we need some other reason to endorse them. This shifts the weight to the other two arguments for identity.

One suggestion is that we arrive at identity claims by inference to the best explanation. For example, the best explanation for the correlation between water (i.e., observations of instances of water properties) and H<sub>2</sub>O (i.e., observations of instances of H<sub>2</sub>O properties) is that water=H<sub>2</sub>O. Kim raises two problems for this proposal. First, correlations are not generally explained by identification. For example, correlation between cause and effect is not explained

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<sup>9</sup> This paper was prepared using a manuscript of Kim (2005), hence the imprecise citations.

<sup>10</sup> He concludes that only the causal arguments work if any do, but that they don't quite work either.



by identifying cause and effect. Second, and more importantly, identities are not laws of nature and so are not genuine explanatory premises. Explanations, according to Kim, work by drawing connections between one fact (or set of facts, the explanans) and a distinct fact (or set of facts, the explanandum). But the identities, if true, assert that the identified facts are really one and the same. So, “There is no movement here from one fact to another, something that surely must happen in a genuine explanatory argument” (Kim 2005, ch.5).

To see why Kim thinks about explanations in this way, consider his objection to the idea that identities allow us to explain facts that we could not otherwise explain, e.g., explaining why applying flame to water causes boiling rather than merely increased molecular kinetic energy. Suppose, to use Kim’s example, we discover from the pursuit of neuroscience, that neural state  $N_1$  causes neural state  $N_2$ . But these neuroscientific facts leave an explanatory gap with facts about, say, pain. To explain those, we might employ identity claims like  $\text{pain} = N_1$  and  $\text{distress} = N_2$ . Then we can explain that pain causes distress. But, Kim claims, this second “explanation” is not a new explanation at all, it is just a way of rewriting the neural explanation that  $N_1$  causes  $N_2$ . The explanatory work is done when we have the neural explanation; after that, the identities merely allow us to redescribe that fact. No new explanation is provided: “That is to say, the identities ‘ $\text{pain} = N_1$ ’ and ‘ $\text{sense of distress} = N_2$ ’ serve only as *rewrite rules*, and they are not implicated in the explanatory activity” (Kim 2005, ch.5).

## **5. Four Assumptions and the Standard Responses**

Without a doubt, there is more to say about the details of these arguments from C&J, and from Kim. But from what we’ve seen we can already distill some assumptions that are doing a great deal of the philosophical work. None of them, by itself, is particularly uncommon. However, we

find it somewhat surprising that they are willingly endorsed by both physicalists (e.g., Kim, and now Jackson) and anti-physicalists (e.g., Chalmers). Here are four such assumptions:

- (1) Physicalism is the thesis that all facts are facts of physics or can be “reductively” or “transparently” explained by facts of physics.
- (2) Explanations are deductions. (At least “reductive” or “transparent” explanations are deductions.)
- (3) Explanations require lawful or lawlike connections between explanans and explanandum. (In the case of “reductive explanation,” these may be “bridge laws” or “bridge principles.”)
- (4) A posteriori identities, if there are any, are not among or implied by the physical facts, they must be inferred or posited.

Needless to say, we find each of these assumptions, individually and jointly, problematic. (1) is precisely the assumption that B&S are challenging. We agree with B&S that it isn’t true for phenomena of life or genetics or water, so there is no reason to suppose that it would be true of consciousness.<sup>11</sup>

(1) is especially problematic when it is interpreted in light of (2), the idea that explanations are deductions. We think that this idea is an outdated remnant of the deductive-nomological model of explanation, long-since discredited. Applied to the special case of “reductive” explanations, it compounds the problems with the D-N model with those of the Nagelian “bridge law” model of reduction, which has also been abandoned by philosophers of

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<sup>11</sup> Frankly, we don’t see that Chalmers and Jackson have provided any argument for (1) short of the idea that it must be true because there is no explanatory gap for life or genes or water. But that is a clear case of affirming the consequent.

science.<sup>12</sup> Similar problems arise for assumption (3). Many philosophers of science doubt that there are any laws of nature at all. There are those who hold out hope for laws of physics, but they often deny that there are laws (even stochastic laws) of biology, psychology, anthropology, etc. We doubt that there are any laws in the classical sense usually talked about: universal, exceptionless, counterfactual supporting. So even if there are laws in some sense, it will be an open question about their implications for arguments like that of C&J.

Finally, some identity theorists deny that identities are inferred from data after the fact. Bechtel and McCauley (1999, 2001) argue that identities are adopted as heuristics as part of scientific practice, and are not inferred. They are therefore neither a priori nor entailed by the data.

Usually this is where the discourse ends. Naturalistic philosophers observe that the mysterians burden them with a raft of assumptions that they are willing to reject. Philosophers of science complain that philosophy of mind and metaphysics are stubbornly clinging to empiricist philosophy of science. And the mysterian metaphysicians call the naturalists scientific.

While we are sympathetic with the naturalists, we believe there is more to be said. Naturalists are right to reject the four assumptions. But mysterians are right to be unsatisfied. The reason is that the mysterians are reasonably expecting that explanations—especially “reductive” explanations—are necessitating explanations. As we see it, they mistakenly interpret this as a requirement for deductive, D-N, “reductive,” or otherwise “transparent” explanations. But these are just symptoms of the demand for necessitating explanations. So rejecting these symptomatic assumptions should not by itself satisfy the mysterian. Naturalists are responsible for providing an alternative explanatory model that yields necessitating explanations, or to

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<sup>12</sup> See Salmon (1989) for a survey of the standard problems for explanation as deduction, and for the covering-law or D-N models specifically.

demonstrate that necessitating explanations are not required. Fortunately, naturalism has the resources to meet this demand.

## **6. Identities and Theories**

It seems to us that C&J, Kim, and many others all imagine that scientific theories are merely sets (or conjunctions) of explanations.<sup>13</sup> Explanations, then, are deductions or are like deductions, and they work by expressing “horizontal” causal regularities within scientific domains. This is the layer cake picture of science as consisting of many levels, with the explanations of any one science confined to its level. This picture is encouraged by the D-N model of explanation, and also (influentially for C&J) by Lewis’s (1972) account of theories and theoretical terms.

On this picture of theories, identity claims are either “horizontal” definitions or they are “vertical” intertheoretic bridges. And, of course, identity claims can only come from two places: inside the theory, or outside the theory.

- (a) Identity claims may come from inside the theory, either as sentences in the theory (for example, explicit definitions) or by being logically or analytically entailed by the theory. As Lewis puts it, “theoretical identifications in general are implied by the theories that make them possible—not posited independently.”<sup>14</sup> On this view, theories give the content of the distinctive concepts of the theory. As a result, these identities will be analytic and a priori (Lewis 1972, C&J 2001).

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<sup>13</sup> As with the subsidiary assumptions discussed above, we regard this view of theories as a relic of logical positivism/empiricism.

<sup>14</sup> For Lewis, as for Chalmers and Jackson, this only works when combined with a descriptivist or partially descriptivist (in the case of Chalmers’ two-dimensional semantics) account of linguistic or conceptual content.

- (b) Identity claims may come from outside the theory, as inferences about intertheoretic relations (Nagel 1961, B&S 1999).
- (c) Identity claims may come from outside the theory, from metaphysical considerations. Kim (2005) argues that causal considerations justify the identity claims, if anything does.
- (d) Identity claims may come from outside the theory, as heuristics. These may enter as part of theorizing (Bechtel and McCauley 1999; McCauley and Bechtel 2001) or merely as interpretive devices (Bickle 1998).

This structure gives us the framework for the general anti-physicalist argument: All facts are either facts internal to physics (fundamental physical facts or entailed by fundamental physical facts), or are external to physics and thereby something extra (Chalmers 1996, C&J 2001, Lynch and Glasgow 2003). Physicalism denies that there is anything extra, so physicalism requires that all facts are internal facts.<sup>15</sup>

There are, however, alternative conceptions of scientific theories. If theories are not flat but are interlevel, then there may be “vertical” relations that are internal to theories. There is good reason to think that theories are often interlevel (Schaffner 1967, Bechtel and Richardson 1993, Machamer, Darden, and Craver 2000). If so, then identity claims may be part of the empirical content of a theory, necessitated by it without being analytically entailed by any other empirical content. That is, identities may be internal to theories without being a priori entailed by their horizontal claims; such identities would be internal yet epistemically primitive.

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<sup>15</sup> We adopt the language of “internal” and “external” facts to remind ourselves of Carnap’s distinction between internal and external questions, and thereby to remind ourselves of the logical empiricist heritage of this way of thinking about physical theory.

How is this supposed to work? The proposal has two parts, one that concerns the content of theories and a second that concerns the structure of theories.

Concerning the content of theories, we agree with Lewis and C&J that (at least some) scientific theories give the identity conditions for the distinctive entities and properties of the theory. We deny, however, that these identity conditions must be given as definitions or conceptual truths. Thus, there is no reason to expect the identity conditions to be analytic or a priori knowable.<sup>16</sup> Chemistry may tell us what water is—it may tell us about the nature of water, viz., that it is H<sub>2</sub>O—but it does not do so by telling us the meaning of the term ‘water’ or the concept *water*. Obviously this is a controversial assumption in this context, and we acknowledge that Chalmers attempts to provide an independent defense of the alternative view. There is not space here to settle the matter, so we will simply have to register the disagreement and move on.

The second part of the proposal is the observation that theories can be interlevel. Theories do not consist only of laws that causally connect their entities and properties to one another. Of course theories may include such horizontal “functional” connections.<sup>17</sup> But they also include connections to other theories and entities. As such scientific theories are not in general pure functional theories. Scientific theories are generally impure functional theories that are anchored to other theories and their entities or properties.<sup>18</sup> These vertical anchoring connections could be causal, constitutive, or identifying.<sup>19</sup> If a theory can be interlevel, then some vertical “bridging”

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<sup>16</sup> See also Polger (2003), ch. 3.

<sup>17</sup> We, however, doubt that they will take the form of laws. But that is another matter.

<sup>18</sup> The terminology of “anchoring” is borrowed from Rey (1997). Polger (2004) argues that only pure functional theories deserve to be counted as functional. For more discussion of pure (strong) and impure (weak) functional theories, see Van Gulick (1983) and Shoemaker (1981).

<sup>19</sup> This should not be taken to endorse upward or downward causation, just explanations of the form: “When the circuit opens, the car (of which it is a part) starts.”

connections can be internal to the theory. And these vertical connections may contribute to the identity conditions of the theory's entities.

Consider how chemical elements are treated by the atomic theory of chemistry. The atomic theory tells us that certain kinds of things (atoms) are made of certain other kinds of things (protons, neutrons, electrons, and so forth). It is part of the empirical content of the theory that atoms are made of these other particles (and necessarily so), but that does not require that these identity conditions be encoded as conceptual truths. (Indeed, the latter claim would be an additional—and as noted above, controversial—premise about the meanings of terms or concepts, which is not itself part of any scientific theory.) Atoms are made of other particles. The identity conditions for being an atom involve not just which (horizontal) causal relations a thing can stand in to other atoms (per molecular chemistry), but also what it is (vertically) composed of. Moreover, types of atoms are individuated by the types of things of which they are composed. In short, elements are identified with particular subatomic structure kinds: gold is the element with the atomic number 79, and so forth. These are vertical identity claims that are part of the empirical content of the theory. The general idea is that atomic theory presupposes that its entity and property kinds can be systematically identified with entities and properties at other levels. It is not a conceptual truth that gold is the element with the atomic number 79. It is not even a conceptual truth that element kinds are identified by their atomic numbers. That is an empirical discovery that is captured by the theory. But once that content is part of the theory, it follows by necessity that gold has the atomic number 79 (rather than 78 or 80) and that things with atomic number 79 are gold (not lead). It is not a good question to ask, given atomic theory, whether gold could have a different atomic number. This is not because 'gold has the atomic number 79' is an

analytic truth.<sup>20</sup> It is because it is a necessary truth which follows from the a posteriori necessary identity that the elemental kind gold is identical to the atomic kind of things with atomic number 79. That identity is not primitive, it is entailed by the empirical theory of matter, which tells us that chemical elements are individuated by their atomic structures.

## **7. Conclusion**

In this paper we have only begun to sketch an alternative to the conception of scientific theories widely held by philosophers of mind and metaphysicians. The alternative we are proposing allows us to jettison the empiricist assumptions that have hampered the debate without ignoring reasonable explanatory demands. In particular we are able to meet the demand for necessitating explanations and show how they can come from inside theories without being conceptually entailed by them. As naturalists we do not have to settle for rejecting the mysterian framework and correcting our explanatory expectations. Naturalism has the resources to give necessitating explanations.

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<sup>20</sup> Someone who claims that gold has the atomic number 80 has said something false, but has not uttered a contradiction.



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