

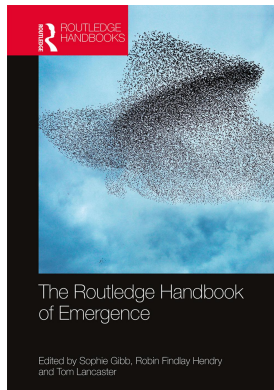
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## **The Routledge Handbook of Emergence**

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### **Emergence and Consciousness**

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## 17

EMERGENCE AND  
CONSCIOUSNESS*Robert Van Gulick*

Consciousness is at once the most familiar aspect of mind but also the most mysterious. It is a ubiquitous feature of our daily lives, and yet we lack a clear understanding of how it fits in to the larger world. As Thomas Nagel (1974) noted, “Consciousness is what makes the mind-body problem really intractable”, and thus it is the focus of many mind-body debates. Critics of physicalism argue that it is unable to adequately explain consciousness, while physicalists have offered many specific theories that aim to do so. Whatever their degrees of success, an air of mystery remains about how the “trick might be done”. Both sides of the debate agree that explaining consciousness as part of the physical world seems to involve special difficulties, and thus a wide variety of ideas and concepts have been invoked to explain the relation of consciousness to the physical, including identity, reduction, realization, panpsychism and emergence. Can the notion of emergence help us understand the nature and basis of consciousness and explain how it fits into the larger world? And would viewing it as emergent confirm or refute physicalism? The answer depends in part on how key concepts are defined. “Consciousness”, “emergence” and “physicalism” can each be defined in a variety of ways, and thus the question of whether or not consciousness is emergent is ambiguous, as are its implications for physicalism.

**Consciousness**

The terms “conscious” and “consciousness” are used in a variety of ways that differ both in their meaning and in the sorts of items to which they are applied. Philosophers often distinguish two families of relevant concepts: those concerning *creature consciousness* and those that concern *state consciousness*. Concepts of the former sort aim to explain the distinction between those creatures or systems that are conscious and those that are not. For example, are dogs conscious? And what of fish, honeybees, trees or robots? In what sense of “conscious” are such organisms or systems conscious or not? By contrast, concepts of state consciousness aim to demarcate a boundary within our mental life between those states and processes that are conscious and those that are not. Which of our memories, perceptions or desires are conscious? And what does a mental state’s being conscious consist in? What is the difference between those mental states or processes that are conscious and those that are not? Both families encompass a diversity of more specific concepts, specific ways of understanding creature consciousness or state consciousness.

Concepts of creature consciousness aim to distinguish between those organisms or systems that are conscious and those that are not. There are many such concepts, of which the following four provide a good sample.

*Sentience.* A creature counts as conscious insofar as it is sentient. Being sentient is essential and necessary to being conscious, but whether it is sufficient is less clear insofar as sentience admits of many degrees and varieties. A creature might count as sentient insofar as it has any sensors that allow it to gather and respond to information about its environment. In this basic sense, not only would dogs and crows count as sentient, but so too would ants, clams, earthworms and perhaps even plants, bacteria and off-the-shelf drones. It seems implausible to count them all as conscious. Thus, interpreting creature consciousness in terms of sentience would seem to require some additional constraints on the quality and nature of the relevant sentience, but it is not clear just what those conditions should be.

*Wakefulness.* A creature might have the capacity for sentience but still be judged unconscious if it is not actively exercising that capacity. We typically regard someone in deep sleep as unconscious and as returning to consciousness only upon awakening. Thus, consciousness is sometimes defined in terms of wakefulness or alert awareness, though questions about the exact conditions remain unclear. Wakefulness and alertness admit of degrees, and what of dreams? Should the dreamer count as unconscious because she is asleep and not aware of her current surroundings, or does dreaming itself suffice to count as being conscious?

*Self-Awareness.* A creature counts as conscious insofar as it is not only aware but also aware that is aware (i.e. self-aware of its own awareness). Animals that count as sentient because they are aware of their environments might still not count as conscious insofar as they lack any reflective awareness of their own minds. Such a creature might seem to be just an unconscious information processor that lacks any reflective self-awareness of its own awareness. If we interpret this in terms of explicit conceptual self-awareness, we may wonder whether most nonhuman animals or even young children are conscious (Carruthers 2000). However, the required self-awareness might be interpreted more loosely to involve a wider range of less explicit and conceptual forms of reflective understanding (Rosenthal 1997; Van Gulick 2004). Dogs may be not able to report or comment on their mental states, but it does not mean that they lack any self-awareness of their mental life; a dog in pain is aware that it is in pain.

*Phenomenal/Qualia/What It Is Like.* A creature is said to be phenomenally conscious (p-conscious) in so far as it has mental states that involve phenomenal or experiential qualities (i.e. properties involved in how things appear to us in experience). Of special note are so-called “qualia”, simple qualities of which we are supposedly directly aware in experience, such as the phenomenal look of red, the smell of coffee, or the hurt of pain. However, the phenomenal can also be interpreted to include not just simple sensory qualities but also more structural or relational features of our experience such as our subjective experience of time or causality. A phenomenally conscious creature is one that has a subjective experiential life. As Thomas Nagel (1974) put it in his seminal paper, “What Is It Like to Be a Bat?”, a creature is conscious just if there is *something that it-is-like-to-be* that creature, some subjective way in which it *seems from the inside*.

State consciousness also gets defined in a diversity of ways, of which the following three specific concepts provide a good range:

*State one is aware of.* Emphasizing the link between consciousness and self-awareness, conscious states are sometimes defined as simply those of one's own mental states *of which one is aware*. The difference between a conscious desire or memory and an unconscious one is simply that one is aware of having that desire or memory. We may be in unconscious mental states that affect our behavior, but we are not aware that we are in those states. Defining state consciousness in terms of self-awareness is especially common in so-called *higher-order theories* of consciousness according to which a mental state is made conscious by the presence of a simultaneous meta-state whose content concerns the fact that one is in the relevant first-order state (Lycan 1996; Rosenthal 1997; Carruthers 2000). My desire for coffee is a conscious desire because it is accompanied by a higher-order thought or perception about my having that desire.

*Phenomenal or qualitative state.* Conscious mental states might be defined as those that have phenomenal or qualitative properties, such as the experienced color of red or the subjective taste of chocolate. Other mental states might have content or carry information, but if they lack phenomenal or qualitative properties, then they would not count as conscious.

*Access consciousness.* Conscious mental states can be defined in terms of their supposed distinctive functional roles, in particular, the degree to which multiple personal and sub-personal systems are able to access and utilize the information or content associated with a given mental state. Ned Block (1995) thus contrasts phenomenal state consciousness with access consciousness. A mental state is access conscious just if its content is available for report, inference and widespread use by a diverse range of behavior-controlling systems. By contrast, the content or information associated with a state that is not access conscious is encapsulated and restricted to a specific and limited range of applications within the mind or brain.

## ***Emergence***

The notion of emergence can be defined in a variety of ways, but all the relevant concepts involve two key elements. On one hand, emergent entities or properties are said to *emerge from* some underlying *base* upon which they *depend*, and yet they are also said to *go beyond* what is present in the base introducing an element of genuine *novelty*. The relation between base and emergent is thus one of *dependence yet novelty*. Both conditions can be unpacked in a variety of ways, generating a range of concepts of emergence.

Concepts of emergence divide into two basic categories in terms of whether emergence is understood as an epistemological claim or an ontological claim (Van Gulick 2001). Claims of *epistemological emergence* concern what we can or cannot know or understand about the relation between the base and emergent, while claims of *ontological emergence* concern the metaphysical or logical status of the relation itself, the nature of the existential relation between base and emergent independent of what we can know or understand about it.

Both ontological and epistemological concepts of emergence occur in multiple forms that can vary in strength. Emergence concepts are often classed as *weak* or *strong* in terms of how radically they interpret the novelty aspect of emergence. In general, the strength of the emergence relation varies with the degree to which the novelty aspect is independent; the more independent the novelty, the stronger or more radical the emergence.

The nature of the novelty, as well as its degree, varies across different concepts of emergence. At a minimum, the relevant complex or system must have a specific property not possessed by its parts or components, nor by the mere sum of its components. In a case of emergence, the whole is

supposed to be *more than the sum of its parts*, and in that sense *emergents* are sometimes distinguished from mere *resultants* (McLaughlin 1992). The mass of a complex or system will have a specific value different from the mass of any of its proper parts, but that greater mass is merely the additive sum of the masses of its parts and thus simply a resultant. By contrast, in cases of emergence the properties of the system or whole differ from those of their parts not merely in their specific value but also in their basic type. For example, a complex (e.g. a structured collection of atoms) may have a color even if none of its basic atomic parts has any such property. Similarly, a large collection of H<sub>2</sub>O molecules at room temperature will have the property of being liquid, but it makes no sense to attribute liquidity to individual H<sub>2</sub>O molecules. Liquidity may be a *micro-based* property, but it is a *macro-property* that applies only to large collections and structured wholes.

The macro level of the system may also show novel *patterns, regularities* and *dynamics* that conform to special science laws or models that have no general application at the underlying base level. For example, living organisms show many patterns of behavior that biologists aim to describe and explain in distinctively biological terms (e.g. population genetics) that appeal to macro biological and environmental properties and relations that do not appear in the laws of chemistry, even though the properties of living organisms ultimately depend on the base facts of their chemistry.

As a matter of actual scientific practice, the special science laws and models that describe the macro-behavior of the complex systems may be explanatorily autonomous from those of the underlying base level (Fodor 1974, 1997). Explanations at the macro and micro levels may use very different concepts and formal structures; biology, psychology and economics do not frame their explanations and laws in the language and concepts of physics. Indeed, given our human limitations, we may be unable in practice, or even in principle, to explain or derive those macro laws or regularities from the laws and facts at the base level (Van Gulick 1992, 2004). However, that need imply only a form of epistemological emergence; the higher-level laws appear emergent from our cognitive perspective.

By contrast, with respect to ontological emergence the issue is not whether we can *explain* the dependence relation, but whether the higher-level laws in fact *logically follow* from the base-level laws and facts. Do the base-level facts and laws by themselves logically entail or metaphysically necessitate the higher-level properties and laws? In cases like that of the liquidity of water, the answer is apparently yes. The macro liquidity of the water *logically supervenes* on the micro-interactions among the H<sub>2</sub>O molecules that compose it, and those interactions are fully explained by the laws of the micro-level base. It supervenes logically because liquidity can be functionally defined at the macro level, and the micro-interactions determined by the micro-laws guarantee that the collection of H<sub>2</sub>O molecules will satisfy those functional conditions. Thus, the liquidity of water is typically regarded as, at most, a case of weak ontological emergence. It might be regarded as emergent because the higher-level property is novel in type, but only as weakly emergent insofar as it can be fully explained in terms of base-level facts and laws that logically entail it.

The move from weak to strong ontological emergence typically involves the addition of new special emergence laws, fundamental laws that link properties at different levels as a brute nomic fact (McLaughlin 1992). These emergence laws are fundamental, in the sense that they do not derive from the base-level laws or facts. If there were such special emergence laws, then they would be an essential part of the way in which the emergent property depends upon its base. The emergent property would not follow logically from the base-level laws and facts alone, but only if the emergence laws were also added in. In that sense, the emergent property is independent of the base-level laws and facts. They in themselves do not necessitate the emergent property; more is needed, new special emergence laws. The philosophical debate about ontological emergence

turns largely on whether or not any properties are emergent in that strong, more independent sense. Most physicalists deny that there are any such cases of strong ontological emergence, but other philosophers argue that cases do exist (Hasker 1999) and that consciousness provides a prime example.

Concepts of epistemological emergence can also vary in strength, though the dimension of strength is somewhat different than in the case of ontological emergence. Properties or regularities are epistemologically emergent when we are unable to predict or explain how they arise from their dependence base. Epistemological emergence is a claim about our lack of knowledge or inability to comprehend the link between base and emergent property. Thus, strength with respect to epistemological emergence can be interpreted in terms of the severity of the epistemic limitations. A claim of weak epistemic emergence might merely concern our actual current lack of understanding how the higher-level property arises from its base. *In practice*, we do not see at present how the facts and laws of the base level could give rise to the higher-level property, but perhaps we will be able to do so in the future with better theories. A stronger claim of epistemic emergence might deny that we humans will *ever be able to understand* the relevant link, perhaps because of some limitations in our cognitive structure (McGinn 1989). Going even further, one might assert that it is *in principle* impossible to explain or understand the emergent property solely in terms of base-level facts and laws. No cognitive agent, no matter its cognitive capacities, could do so.

The various forms of epistemological and ontological emergence are distinct, and one should avoid conflating them. Though some forms are no doubt linked, specific supporting arguments are needed to infer one sort of emergence from another.

### **Physicalism**

Physicalism also occurs in many versions. In essence, physicalism is the metaphysical thesis that everything real is physical. But just what counts as the physical and in what sense everything must be constituted by the physical is less clear. Most contemporary versions of physicalism appeal to the entities and properties that fall within physics proper, that is, to whatever items are posited in our best physical theories. However, recognizing that our current physical theories may not be complete or fully correct, the claim is usually relativized to future ideal physical theories. In what sense then are other real entities that are not mentioned in physics supposed to be physical? Physics proper does not mention mountains, birds or economies, yet they all seem real. How must they be related to the strictly physical items in order to also count as physical? There are many proposals appealing to notions such as identity, composition and realization. On realization accounts, for example, the physical includes the strictly physical plus everything that is ultimately realized by the strictly physical, which may involve many stages of realization. If atoms are strictly physical, then molecules realized by atoms would also be physical. Membranes and proteins realized by molecules would count as physical, as would cells realized by membranes and proteins and organisms realized by collections of cells. Whether the physicalist appeals to realization, composition or some other relation, the bottom line is that the existence of everything real can ultimately be accounted for solely in terms of the entities, properties and laws of physics.

### **Consciousness and emergence**

Having distinguished among varieties of emergence and types of consciousness, we can now ask which forms of consciousness might be emergent in one or another relevant sense. Several forms of consciousness appear to be at least weakly ontologically emergent, though it is far less clear if

any are strongly ontologically emergent. As to epistemological emergence, again weak emergence seems plausible for several forms of consciousness, and there may also be reasons for regarding at least some types of consciousness as strongly epistemologically emergent, though the matter remains controversial. However, even if some forms of consciousness are strongly epistemically emergent, it is unclear that this would entail any conclusions about strong ontological emergence or pose any problems for physicalism.

Creature consciousness in the sense of sentience and wakefulness both appear to be at least weakly ontologically emergent. Both are novel properties of whole systems or organisms that are not properties of their parts or components. Neither eyes nor cortical neurons are sentient, though they may contribute to the sentience of a sighted organism. Moreover, the novel system-level properties give rise to distinctive patterns of activity and new dynamics that are not present in nonsentient or nonwakeful systems, and thus such properties play a key role in our practical ability to explain, predict and understand the behavior of such systems. However, neither sentience nor wakefulness per se appears to be strongly ontologically emergent. There is a good deal that we do not presently understand about both, but in so far as we think of them in terms of information processing systems, there is little reason to believe that they cannot in principle be explained in terms of the underlying structure and organization of the relevant systems and the lower-level interactions among the components that compose them.

If we interpret creature consciousness as self-awareness, a similar result seems to follow: self-awareness seems to involve weak but not strong ontological emergence. Endowing a system with reflexive awareness, the ability to monitor and regulate its own states, can change its operation and dynamics in major ways that are not present in its underlying components nor in systems without it. New models, theories and perhaps even logical structures may be needed to adequately describe and understand systems that exhibit reflective self-awareness. Nonetheless, it seems the relevant functional capacities and operations of self-aware systems are realized by the organization of their underlying non-self-aware components. In so far as reflexive self-awareness can be realized in complex systems through such functional organization, there seems little reason to regard it as strongly ontologically emergent.

Thus, at least as in so far as they are understood as information processes, self-awareness, sentience and wakefulness would all seem to fall within what David Chalmers (1995, 1996) has called the “easy problems of consciousness”, which are to be distinguished from the so-called “hard problem” of explaining how phenomenal consciousness might arise from purely physical, neural or neurochemical processes. Indeed, it is our supposed inability to analyze phenomenal consciousness in solely functional terms that may seem to prevent us from explaining its existence by appealing to the organization and interaction of components lacking any phenomenal properties. Thus, phenomenal, qualitative or what-it-is-like consciousness is the form of creature consciousness most likely to lead toward stronger claims of ontological emergence. The relevant system-level property (i.e. phenomenal qualitative experience) is not only of a radically different type than those present in its physical, neural and neurochemical components, but it is difficult to see how its existence could result from those components acting solely according to lower-level laws. There is said to be an *explanatory gap* (Levine 1983, 1993), one that perhaps cannot be bridged. At least at present, we have no satisfactory story to tell about how the trick might be done, no way to make intelligible how qualitative phenomenal consciousness might be realized by the organized activity of non-phenomenal components. Indeed, some have argued that *in principle* no such explanation is possible, and thus more radical metaphysical options must be considered, including dualism and strong ontological emergence (Chalmers 1996; Strawson 2006; Nagel 2012). If it were impossible *even in principle* to explain how phenomenal consciousness is produced by the interactions of micro-level components obeying micro-level laws, then

strong emergence with its appeal to special inter-level emergence laws might seem a plausible alternative. However, the possibility or impossibility of giving such an explanation remains a matter of dispute.

With respect to the various forms of state consciousness, the result is similar. Most seem to involve weak but not strong ontological emergence, though again it is the phenomenal qualitative forms of state consciousness that most often inspire claims of more radical emergence. For example, if we interpret conscious states as *mental states we are aware of*, we get a result like that we saw earlier with creature self-awareness. Self-awareness can transform systems and produce states that behave in novel ways. Nonetheless, it seems possible at least in principle to explain how it might be realized by the interactions of suitably organized lower-level mechanisms governed solely by lower-level laws. The same would seem to be true of *access consciousness*, which is defined in terms of functional features, such as broadcasting information for widespread use, that are of just the sort that seem open to explanation in terms of functional realization by lower-level mechanisms.

It is only the phenomenal and qualitative concepts of state consciousness that seem metaphysically problematic in ways that have led some to consider the option of strong ontological emergence (Hasker 1999; Silberstein and McGeever 1999). As noted earlier, there is an air of mystery about how a state with phenomenal properties might result purely from the interactions of nonphenomenal states governed solely by lower-level laws. We cannot, at least at present, see “how the trick is done”, and that raises the question of whether special emergent laws might be required. The attractiveness or plausibility of strong ontological emergence thus depends in part on what one takes the status of the hard problem to be. If one believes that phenomenally conscious creatures and states cannot even in principle be explained in terms of lower-level processes and mechanisms governed solely by lower-level laws, then strong ontological emergence may constitute an attractive metaphysical option, especially if one is not inclined to full-blown mind-body dualism. Emergence may seem to offer at least the possibility of still making consciousness in some way depend on the physical even if special emergence laws are required.

Regarding epistemic emergence, weak emergence again seems likely for many forms of consciousness, and even strong epistemic emergence may apply with respect to phenomenal, qualitative and “what-it-is-like” forms of creature and state consciousness. With regard to the functionally definable forms of consciousness associated with Chalmers’ so-called “easy problems” – such as sentience, wakefulness, self-knowledge, and access consciousness – there is still much we do not understand about the details of how they are produced by physical or neural substrates. Thus, at least at present, there is some degree of practical epistemic emergence with respect to some aspects of those forms of consciousness. However, despite those current practical limits, there is little reason to believe there are insurmountable *in principle* barriers to our eventually knowing or understanding how such forms of consciousness are produced or realized. It is a difficult research problem, but one that seems solvable. Thus, consciousness of those sorts seems at most weakly epistemically emergent and not strongly so. With respect to phenomenal, qualitative, “what-it-is-like” consciousness, the gap in our current understanding is far greater. It is not merely that we do not have a complete theory, but at a deeper level we do not really know what such a theory might look like. There appears to be a problematic “explanatory gap” (Levine 1983, 1993). We have a sense of staring at a blank wall with little idea of how the gulf might be bridged. How could phenomenal qualitative consciousness – like my present experience of smelling and tasting dark roast coffee as I type these words – be produced or realized by the physical activity of neurons? Though we have many promising neural and psychological theories of the functional aspects of consciousness (e.g., Koch 2012; Prinz 2012; Dehaene 2014), the phenomenal link remains mysterious, and we have as yet no intelligible story to tell about how to bridge the gap.



However, the depth of our current perplexity does not itself entail strong epistemic emergence. Perhaps our puzzlement can be relieved by future explanatory theories. The limits on our understanding may be merely practical and simply the result of our early state of research rather than an insurmountable epistemic obstacle. To the contrary, supporters of strong epistemic emergence argue that the two sides of the gap are so unlike each other that there is no possibility of making the link intelligible. Thus, they claim that if the phenomenal in fact depends upon the physical or neural, it must do so in a way that cannot be intelligibly explained, that is, it cannot be explained in a way that lets us see in more general terms *why* and *how* the link holds, rather than holding as a matter of brute fact or as the result of special primitive psycho-physical emergence laws. There is no consensus on these issues, and thus the question of whether phenomenal consciousness is strongly epistemically emergent remains open.

Moreover, even if the answer were yes, it is not clear what the implications would be for ontological emergence or physicalism. Some have appealed to the supposed strong epistemic emergence of p-consciousness to argue for its strong ontological emergence (Jackson 1982, 1986; Chalmers 1996). Though the former does not strictly entail the latter, it might give a reason in support of it, perhaps as a form of inference to the best explanation. If p-consciousness were strongly ontologically emergent, that would explain why it is strongly epistemically emergent. Strong ontological emergence would entail and thus explain strong epistemic emergence.

However, whether it would be the best hypothesis to explain strong epistemic emergence would depend on the alternatives. Are there better options for explaining strong epistemic emergence that do not appeal to strong ontological emergence? One could, of course, be an ontological dualist about the phenomenal and the physical. Dualism would also explain our epistemic limits: we cannot explain the phenomenal in terms of the physical because they are separate. However, most contemporary philosophers and scientists would prefer to avoid dualism and its extra ontological commitments if possible.

An attractive and less radical option might be some version of nonreductive physicalism (NRP). According to NRP, the mental, including phenomenal consciousness, is ontologically physical in that it is *fully realized by* underlying physical processes and mechanisms. Realization in the relevant sense is a *constitutive* relation in that the mental features and properties are not merely *caused by* but also *fully constituted by* the underlying physical structures and are thus in a strong ontological sense *nothing over and above* the physical.

However, the nonreductive aspect of NRP denies that the concepts and resources of physical or neural theories suffice to describe or understand all that we want to about the mental. Indeed, the supporters of NRP argue that in many scientific cases the representational and conceptual resources of lower-level theories do not suffice to allow one to fully describe and understand all the higher-level phenomena that are constituted or realized by lower-level structures and processes. We should not in general expect that higher-level theories can be conceptually reduced to lower-level theories or that higher-level concepts or contents can always be translated into lower-level ones (Fodor 1974, 1997; Van Gulick 1992).

Moreover, some versions of NRP explain why we should not expect such conceptual or representational reductions even when the higher-level phenomena are fully realized by lower-level structures (Van Gulick 2011). The key move in such accounts is an appeal to the pragmatic and contextual nature of understanding and to the view that knowledge is not simply a matter of correctly picturing reality but of being able to successfully engage it as situated epistemic agents. On such a view, theories and models are better thought of as cognitive tools rather than as mere pictures of reality. Given the affordances available to us as the embedded cognitive agents that we are, we cannot use the “tools” available from physics or neuroscience to engage p-consciousness in the ways that duplicate all those provided by our first-person

mental and phenomenal concepts. Thus, there are forms of understanding that cannot be achieved even in principle through the use of physical science theories and models. Such versions of NRP thus explain the strong epistemic emergence of p-consciousness as a predictable and expected result of the essentially pragmatic and contextual nature of knowledge and understanding. Rather than conflicting with strong epistemic emergence as other versions of physicalism do, NRP and strong epistemic emergence are mutually supporting views. Each predicts and explains the other.

To sum up, it seems that most forms of consciousness are weakly ontologically emergent. Most forms do not seem strongly ontologically emergent, though some philosophers argue that phenomenal consciousness is, especially if they are inclined to regard the so-called “hard problem” as unsolvable. With respect to epistemic emergence, again most forms of consciousness are to some degree weakly epistemically emergent, and some forms, especially p-consciousness, may also be strongly epistemically emergent. However, even if they are strongly epistemically so, that in itself does not support any claims about strong ontological emergence. Though the latter entails the former, the reverse does not hold. Nor does the latter obviously provide the best explanation of the former. In particular, nonreductive physicalism provides a plausible means of accommodating strong epistemic emergence while remaining ontologically physicalist in a robust sense.

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