

The Hard Problem of Consciousness

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[An abridged version of this will appear in the *Oxford Companion to Consciousness*, edited by Tim Bayne, Axel Cleeremans and Patrick Wilken]

1. The problem

As I type these words, cognitive systems in my brain engage in visual and auditory information processing. This processing is accompanied by subjective states of consciousness, such as the auditory experience of hearing the tap-tap-tap of the keyboard and the visual experience of seeing the letters appear on the screen. How does the brain's activity generate such experiences? Why should it be accompanied by conscious experience in the first place? This is the hard problem of consciousness.

The hard problem should be distinguished from various easy problems familiar to cognitive scientists. Examples include problems of explaining the reportability of one's own states of consciousness, the integration of information, the discrimination and categorization of environmental stimuli, the focus of attention, and the deliberate control of behavior. For all such phenomena, the challenge is to explain how some function is performed. By contrast, the hard problem does not appear to be a problem of explaining the performance of functions. For every function associated with consciousness, the question remains: why is the performance of that function accompanied by experience?

For contrast, consider reportability. This feature is functionally definable, roughly as the ability to accurately describe one's experiences. To explain this ability, one specifies a neurophysiological or cognitive mechanism that performs it. If the mechanism explains the ability, then nothing about reportability remains to be explained. Experience, however, does not seem to be functionally definable. Even after all the associated functions and abilities are explained, one might reasonably wonder why, for example, there is something it is like to see letters appear on a computer screen.

Neurobiological and cognitive theories of consciousness do not appear to solve the hard problem. Consider Francis Crick and Christof Koch's (1990) theory that 35-75 hertz oscillations in the cerebral cortex form the neural basis of consciousness.¹ This theory has implications for how the brain binds together separate pieces of information, such as information about the shape and color of a perceived object: binding is said to occur when neural groups that encode the information oscillate with the same frequency and phase. Even if this hypothesis is correct, this just raises the question of why binding is accompanied by experience.

Four points of clarifications are in order. First, 'consciousness' is ambiguous. In this article, I use this and related terms exclusively for subjective experience. But researchers tend to use them for a diverse variety of phenomena, including not only subjective

¹ For other examples of such theories, see Jackendoff 1987, Edelman 1989, and Baars 1988.

experience but also reportability, integration, etc. Insofar as the latter are functionally definable, no hard problem arises for them. The ambiguous use of terminology has encouraged the view that the standard methods of cognitive science, which were developed to explain the performance of cognitive functions, apply unproblematically to the hard problem. This view is less readily embraced when it is made clear that the explanandum is subjective experience.

Second, the easy problems are not so easy. When David Chalmers introduced the hard/easy distinction, he wrote, “Of course, ‘easy’ is a relative term. Getting the details right will probably take a century or two of difficult empirical work” (1995a, p. 10). But unlike the hard problem, the easy problems present no obvious difficulty for the application of standard cognitive science methodology.

Third, the hard/easy distinction must be drawn with care. Patricia Churchland (1996) construes the distinction as that between problems of (a) explaining consciousness and (b) explaining memory, attention, learning, and various other mental phenomena. But ‘memory’, ‘attention’, etc, pick out phenomena that have both cognitive and subjective aspects (Chalmers 1995b, p. 386). Therefore, there are hard and easy problems of memory, attention, etc. It is better to conceive of the distinction as that between problems of (c) explaining how consciousness arises from physical processes and (d) explaining functions associated with consciousness, in the various senses of ‘consciousness.’

Fourth, while it is important to distinguish the hard problem from others in the vicinity, we should not lose sight of connections to those other problems. Progress on the easy problems may contribute to progress on the hard problem. Also, some see ties between the hard problem and other enduring philosophical problems, such as that of explaining intentionality, i.e., explaining how mental states represent the world. Some philosophers (e.g., Dretske 1995, Harmon 1990) attempt to reduce consciousness to intentionality. If they are right, then explaining how conscious states represent should yield a solution to the hard problem. Others (e.g., Searle 1990) take the opposite view, arguing that intentionality is grounded in consciousness. Still others (e.g., Siewert 1998) do not attempt to reduce one feature to the other but argue that the two are deeply intertwined. On any of these three approaches, an adequate solution to the hard problem will appeal to theories of intentionality.

2. History

The hard problem has long been appreciated in some form or other. T. H. Huxley formulates it memorably:

how it is that anything so remarkable as a state of consciousness comes about as a result of initiating nerve tissue, is just as unaccountable as the appearance of the Djinn when Aladdin rubbed his lamp in the story, or as any other ultimate fact of nature (1866, p. 193)

Locke (1690, Bk. IV) found the emergence of consciousness from “Matter...and Motion” so extraordinary that he proposed a supernatural (theistic) explanation. Leibniz’s appreciation of the problem emerged in a thought experiment. He imagined one entering a huge machine that “produces thinking, feeling, and perceiving...as if it were a mill” (1714, section 17), and opined that one would observe “nothing that could explain perception.”² Huxley, Locke, and Leibniz are by no means alone in recognizing the hard problem long before Chalmers coined the phrase: an appreciation for the problem informs virtually every philosophical position on mental-physical relations. Even those philosophers who dismiss the hard problem as confused typically recognize the substantial burden of explaining it away.

Until recently, however, the hard problem was often run together with other issues. Seventeenth and Eighteenth Century philosophers rarely distinguished it from the more general problem of how to explain mental-physical causal interaction. Descartes (1637, 1641, 1649), for example, tended to focus more on thought than experience, placing special emphasis on human linguistic abilities. These abilities are remarkable, but today they are not generally thought to give rise to a hard problem. Descartes (1644) also regarded all mental states as conscious and transparent to the thinker. Such doctrines, which have been widely repudiated since Freud’s day, muddied the waters further.

Recent writings have brought the hard problem into sharper relief. For example, Thomas Nagel’s 1974 article “What is it Like to be a Bat?” helped clarify the limitations of objective, physical explanations of experience: he argues that no such explanation could reveal to us what it is like, from the bat’s viewpoint, to echolocate. And Colin McGinn’s provocative argument that humans are constitutionally incapable of understanding how “technicolour phenomenology [can] arise from soggy grey matter” (1989, p. 1) made the depth of the problem even harder to deny. Then, in the mid-1990’s, Chalmers (1995a, 1995b, 1996) re-invigorated interest in the problem by drawing the hard/easy distinction, provocatively criticizing reductionist approaches to the hard problem, and developing and defending a non-reductionist approach. Since then ideas on the topic have continued to multiply.³

3. A threat to physicalism?

The hard problem is often discussed in connection to arguments against physicalism (also known as materialism), the view that the world is entirely physical. For example, consider the argument from the conceivability of zombies (Chalmers 1996). Zombies are defined as creatures that are physically and functionally identical to ordinary

² Leibniz would reject the assumption that the brain *generates* consciousness, but the basic problem can be formulated without it: we can instead ask why experience *accompanies* brain processes. This more neutral formulation (which I use here in places) is often used in the contemporary literature. See, for example, Robinson 1996 and Chalmers 1995a, 1995b, 1996.

³ Many other writings from the latter half of the 20th Century squarely address the hard problem. To name just a few: Smart 1959, Kripke 1972, Jackson 1980, 1986, Adams 1987, Searle 1992, Strawson 1994, Block 1995, and Churchland 1995. Some less recent discussions of the problem may be found in Tyndall 1879, James 1890, and Broad 1925. Chalmers posts his articles on the problem on his website: <http://consc.net/papers.html>.

consciousness human beings but lack consciousness. Such creatures are conceivable: there is nothing incoherent in the hypothesis that they should exist. Since they are conceivable, they are metaphysically possible. And their possibility shows that the physical truth fails to guarantee (metaphysically necessitate) that consciousness exists. Thus, the physical truth is not the whole truth: physicalism is false.

Or consider the knowledge argument (Jackson 1982, 1986). Mary, a future super-scientist, learns the complete physical truth by watching lectures on a monochromatic television monitor from within a black-and-white room. Then she leaves the room and sees colors for the first time. If physicalism were true, then she would know everything about human color vision before leaving the room. But she learns something new when she leaves: she learns truths about what it's like to see colors. Because such truths cannot be deduced from the complete physical truth, the complete physical truth does not determine (metaphysically necessitate) the whole truth. Therefore, physicalism is false.⁴

If such arguments succeed, then solutions to the hard problem that assume physicalism must fail. More generally, positions on physicalism have implications for approaches to the hard problem, and vice versa. This will become clear in what follows.⁵

4. Deflationist approaches

Deflationists deny the existence of a genuine, distinctive hard problem. *Non-deflationists* do not. I will discuss these approaches in turn.

Deflationists claim that the hard problem reduces to a combination of easy problems or derives from misconceptions about the nature of consciousness (Dennett 1991). These thinkers sometimes support their view with analogies from the history of science. Those who take the hard problem at face value are compared to 19th Century vitalists worrying about a hard problem of life or to the scientifically ignorant worrying about hard problems of heat or light (P. M. Churchland 1996, P. S. Churchland 1996, Dennett 1996). Science has shown that such worries are misguided: life, heat, and light can be fully explained in terms of structure and function. Likewise, deflationists say, for consciousness: science will undermine the idea that there is something about consciousness over and above the performance of the various functions that needs explaining.

But on reflection, such analogies appear to break down. Vitalists sought to explain how organisms reproduce, move, self-organize, etc.: phenomena that are plainly functional. While vitalists doubted that mere physical systems could perform such functions, the performance of functions was what was at issue. Similar reasoning applies to light and

⁴ For precise formulations and defenses of these and other anti-physicalist arguments, see Chalmers forthcoming. Although Jackson 1982 is the locus classicus for the knowledge argument, he now (2003, 2006) rejects it. For a criticism of his reasons for rejecting it, see Alter 2006.

⁵ The notion of the physical is notoriously problematic: so much so that some reject the distinction between physicalist and non-physicalist theories as spurious (Chomsky 1988, Mellor and Crane 1990). For a defense of the distinction, see Chalmers 1996.

heat. Granted, there is a hard problem of how these features generate subjective experiences. For example, how does decoherent molecular motion cause the sensation of heat? But that problem is hard only insofar as it raises the problem of how brain processes generate that sensation, which is just an instance of the problem that the analogies are supposed to deflate.

There is a class of important views in the philosophy of mind that entail that there is nothing about experience to explain beyond the performance of functions. These views, which Chalmers (1996) labels *type-A materialism*, include philosophical behaviorism, analytic functionalism, and eliminative materialism.⁶ Some take the merits of such positions, including their relative parsimony, to provide grounds for a deflationist approach to the hard problem. But others regard the reality of the hard problem as evidence against these views. And direct, non-question-begging arguments for deflationism are few and far between (Chalmers 1995b).

5. Non-deflationist approaches.

Some non-deflationists, including McGinn, deny that we can solve the hard problem. But others are more optimistic. The latter group includes materialists and non-materialists.

How can a non-deflationist accept materialism? On non-deflationist materialism—which is more commonly known as *non-reductive* or *type-B* materialism—the impossibility of explaining consciousness in terms of structure and function has epistemic rather than metaphysical significance. The difference between type-A and type-B materialism comes out clearly in the way they respond to the anti-physicalist arguments mentioned in section 3 above. Type-A materialists deny that (i) zombies are conceivable: on this view, consciousness is a functional concept, and thus it makes no sense that a creature should be functionally identical to a conscious being and yet lack consciousness. Type-A materialist also deny that (ii) there are any truths about seeing red that Mary cannot deduce from the complete physical truth. By contrast, type-B materialists accept both (i) and (ii), but maintain that the complete physical truth nevertheless determines the truths about experience. On their view, the nature of experience can be known only by empirical investigation. Thus, zombies are a priori conceivable but metaphysically impossible; and although Mary cannot deduce what it is like to see red from the complete physical truth, there is nothing about what it is like to see red that the physical truth fails to determine.

To many, type-A materialism does not take the hard problem seriously enough, while non-physicalist views, such as Cartesian dualism, make too much of it. Type-B materialism may therefore seem a reasonable middle-ground position.⁷ But it faces

⁶ Neither philosophical behaviorism nor analytic functionalism entails physicalism. Even eliminativists can reject physicalism, if eliminativism is understood as the thesis that our ordinary mental concepts so radically misdescribe reality that they fail to refer. But most, if not all, philosophical behaviorists, analytic functionalists, and eliminativists are physicalists.

⁷ The view has numerous adherents. For representative examples, see Loar 1990/97, Levine 2001, or Papineau 2002.

objections. One concerns the idea, which most accept, that on physicalism the complete physical truth metaphysically necessitates all truths about consciousness. What grounds the necessity? For example, why are zombies metaphysically impossible? Type-A materialism provides a straightforward answer: since consciousness is a functional concept, there is no conceptual room for duplicating someone's experiential features without duplicating his or her functional features. On type-B materialism, however, consciousness is not a functional concept. How, then, can these philosophers explain why experience is metaphysically determined by the physical/functional?

Type-B materialists sometime invoke analogies to Kripkean (1972) a posteriori necessities. According to Kripke, the fact that heat is (decoherent) molecular motion is, though empirical, metaphysically necessary. This claim may seem implausible: can't we imagine a situation in which there is heat but, as scientists discover, no molecular motion? Against this, Kripke argues that the imagined situation is not one in which there is heat without molecular motion: rather, in this situation there is the *sensation* of heat—the experience typically caused by molecular motion—without molecular motion. Heat itself just is molecular motion and thus cannot exist without it. One might suppose that similar reasoning could be used to explain the psychophysical necessities entailed by type-B materialism.

But the analogy fails, as Kripke himself emphasizes. A distinction like that between heat and the sensation of heat does not appear to pertain to consciousness. For example, anything that feels like pain is *ipso facto* pain. Therefore, Kripke's reasoning does not apply to the a posteriori necessities to which type-B materialists are committed. Alternative explanations have been advanced. But there is much disagreement about whether any can succeed.⁸

Such difficulties have led some non-deflationists to explore alternatives to physicalism. On most non-physicalist views, consciousness is an irreducible component of nature. These views are often distinguished from one another by how they characterize the relationship between consciousness and the physical world. For example, on interactionist dualism consciousness has both physical causes and physical effects, whereas on epiphenomenalism consciousness has physical causes but no physical effects. Epiphenomenalists can accept the common assumption that the physical world is causally closed: every physical event has a complete physical explanation. But epiphenomenalism is often perceived as failing to adequately integrate consciousness into the natural order. Interactionist dualism is sometimes seen as providing a more integrated picture of how consciousness relates to the physical world. But on most versions, interactionist dualism violates the closure principle, which many regard as a serious cost.⁹

⁸ For some proposals, see Hardcastle 1996, Papineau 2002, and Block forthcoming. For criticisms of these and other proposals, see Chalmers 1995b, 1996, forthcoming, 2006, and Rosenberg 2004.

⁹ For a version of the view that upholds the closure principle, see Chalmers 2005, section 9, note 6.

A third alternative is neutral monism, on which phenomenal properties are the categorical bases of physical properties, which are at bottom dispositional.¹⁰ This view might or might not be considered a version of physicalism, depending on whether the intrinsic nature of physical properties is considered physical. The view provides experience with a distinctive role in the natural order without sacrificing the closure principle. But on some versions it entails panpsychism, on which everything—including non-cognitive systems such as rocks and molecules—has mental states, and many regard this consequence as a *reductio ad absurdum*. Some neutral monists (Rosenberg 2004) defend the consequence. Others block it, by holding that *proto*-phenomenal properties form the categorical bases of physical dispositions (Chalmers 1996, 2003). But all versions of the view face difficulties, including “the combination problem” (Seagar 1995): how do fundamental phenomenal or proto-phenomenal properties combine to create the sorts of unified, complex experiences with which we are familiar?¹¹

While non-physicalist views all have drawbacks, it should be noted that science does not entail physicalism. Many contemporary defenses of non-physicalist views accept the naturalistic orientation that leads many to embrace physicalism.¹² Still, rejecting physicalism has strong implications for how the hard problem might be solved. From a non-physicalist’s perspective, solving the hard problem may require positing a psychophysical theory that includes fundamental laws: laws that are explanatory but are not derived from more fundamental principles. Along these lines, Chalmers tentatively suggests that the basic link between the phenomenal and the physical may exist at the level of information. He writes,

Wherever there is a phenomenal state, it realizes an information state, an information state that is also realized in the cognitive system of the brain. Conversely, for at least some physically realized information spaces, whenever an information state in that space is realized physically, it is also realized phenomenally. (Chalmers 1996, p. 286).

Chalmers does not pretend that this “double-aspect” principle is anything more than “a sort of template for a psychophysical theory,” in terms of which detailed laws may be cast. But his principle illustrates one form a fundamental psychophysical law might take.

Chalmers proposes other psychophysical laws as well. One connects experience with *awareness*, which is “roughly explicable as a state wherein some information is directly accessible and available for the deliberate control of behavior and for verbal report” (Chalmers 1996, p. 220). The principle is that where there is experience, there is awareness, and vice versa. Unlike the double-aspect principle, this one is not a candidate for a fundamental law, since it mentions the high-level concept of awareness. But it

¹⁰ Bertrand Russell (1927) proposed neutral monism. It has historical antecedents in Leibniz (1714), and has recently been developed by Maxwell (1978), Lockwood (1989), Rosenberg (2004), and Chalmers (1996, 2003).

¹¹ Other non-physicalist views have been developed, though a number of versions that have been popular in past centuries—including Leibniz’s parallelism, Malebranche’s occasionalism, and Berkeley’s idealism—have long been unpopular. But for a recent defense of idealism, see Adams (forthcoming).

¹² See Chalmers 1995a, 1995b, 1996, 2002.

might form part of a psychophysical theory that takes phenomenal or proto-phenomenal properties as irreducible components of nature, alongside properties postulated by fundamental physics. Such a psychophysical theory would provide a kind of solution to the hard problem: the laws would enable deductions of specific instances of experience from underlying physical structures.

6. Methods

Views on the metaphysics of consciousness can affect methods for solving the hard problem. For example, physicalism limits one's resources to those provided by physical theories, which are formulated in terms of structure and dynamics. And certain interactionist dualists (e.g., Eccles 1986) argue that phenomenal properties affect brain processes by filling in gaps resulting from quantum indeterminacy. This view would encourage a quantum-physics based solution to the hard problem.

Even so, many avenues of investigation are largely independent of metaphysical views (Chalmers 2004). For example, accepting Chalmers' psychophysical laws does not require rejecting physicalism. One may instead regard such laws as grounds for psychophysical identities (Papineau 2002). Also, consider that perception, memory, and other cognitive capacities may be exercised both consciously and unconsciously (Merikle and Daneman 2000). Deflationists and non-deflationists alike could agree that increased understanding of this contrast and its neural basis might constitute progress toward a solution to the hard problem.

Similarly, philosophers of various persuasions may agree that psychological research on the contents of consciousness may play a role. Examples of such research include: psychophysics, which investigates such things as how the intensity of the subjective brightness associated with a visual experience relates to the intensity of corresponding physical stimuli;¹³ recent work on perceptual illusions and attention (e.g., Treisman 2003); and recent research on synesthesia and other abnormal experiential phenomena (e.g., Ramachandran and Hubbard 2001). In helping to refine our understanding of consciousness, such research may contribute indirectly to progress of the hard problem, in the same way that investigations into the neural correlates of consciousness may contribute.

More direct progress may result from combining psychological research with research in neuroscience. For example, as Chalmers writes,

When first-person data about the experiences of abnormal subjects are combined with third-person data about brain abnormalities in those subjects, this yields a new source of information about the association between brain [processes] and conscious experience. (Chalmers 2004, pp. 8-9).

¹³ This example comes from classical psychophysics, in the tradition of Gustav Fechner (1860). A modern psychophysicist would instead ask questions such as "How is physical intensity coded by a particular sensory system?" (Falmagne 1896, p. 3).

Whether any such methods will yield a fully adequate solution to the hard problem is anybody's guess. But as progress on easy problems accelerates, and as knowledge about the nature of subjective experience and its neural basis grows, an optimistic attitude seems increasingly hard to resist.

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