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Is Downward Causation Possible?
How the Mind Can Make a Physical Difference

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No one doubts *upward (physical–mental) causation*, the idea that events in the brain can have a causal influence on the mind. Neural deficits, brain damage, and physical fatigue can all impair cognitive function; exercise, rest, and appropriate medication can all improve it. But can there also be downward (mental–physical) causation[1], in which the mind actually has effects on the brain? Folk psychology appears to say yes, for it assumes that agents perform physical actions because of their own mental reasons, and since bodily movements are controlled by the brain, those reasons must somehow influence that brain.

However, downward causation is controversial in the philosophy of mind. Physicalism in its minimalist sense asserts that all mental properties supervene, or depend, on physical base properties. Reductionist physicalism adds that mental properties can be *identified* with physical properties, making it pointless to talk of "downward causation," since mental properties are not on a higher level than physical ones. On the other hand, nonreductive physicalists (such as Terence Horgan[2]) have defended downward causa-

Abstract: Downward causation (mental to physical causation) is controversial in the philosophy of mind. Some materialists argue that such causation is impossible because it (1) violates the causal closure of the physical; (2) is incompatible with natural law; and (3) cannot be reconciled with the empirical evidence from neuroscience. This paper responds to these objections by arguing that (1) there is no good reason to believe that the physical is causally closed; (2) properly understood, natural laws are compatible with downward causation; and (3) recent findings in neuroscience reported by Schwartz, Beauregard, and others provide strong empirical support for downward causation.

1. Of course, there may be other kinds of downward causation, e.g., from socioeconomics to psychology, but this paper will focus on the mind-body question.

2. See, for example, Horgan's entry for "Reduction, reductionism," in *The Encyclopedia of Philosophy: Supplement*, ed. D. M. Borchert, (New York: Macmillan, 1996). Horgan also defends a position he calls "Robust Causal Compatibilism" in his "Kim on Mental Causation and Exclusion," in *Mind, Causation, and World*, Philosophical Perspectives 11, ed. James E. Tomberlin (Atascadero, CA: Ridgeview, 1997), 165–84.

tion. And so have emergentists[3] (those who claim that mental properties arise from sufficiently complex physical systems, and bring new causal powers into the world), not to mention other property dualists. However, Jaegwon Kim has argued persuasively that neither nonreductive physicalism[4] nor even emergentism[5] is compatible with downward causation so long as the positions are committed to affirming the causal closure of the physical (and to denying systematic causal overdetermination).

In a recent and sophisticated paper, John Gibbons, a physicalist who nonetheless affirms that the mental and physical realm are on different "levels," argues that downward causation is nomologically impossible (incompatible with the laws of physics):

> We can rule out on empirical grounds any kind of mental-to-physical downward causation that involves actually making a difference. . . . It would do something that wasn't already going to happen anyway. So the mental would have to be able to violate the laws of physics, or the laws of physics would have to be different inside and outside brains, or there would have to be new fundamental physical forces that only appear in brains.[6]

Within Gibbons's remarks one can distinguish three lines of argument against downward causation. First, the mind's "actually making a difference" to the physical world is declared impossible because in that world everything was "already going to happen anyway." In other words, the physical world is causally closed: every physical effect has a sufficient physical cause, so there is nothing for the mind to contribute to the physical realm. Second, it is claimed that if the mind did affect the physical world, this would somehow violate the laws of nature (or imply nonexistent laws). Third, such downward causation is excluded not merely by preconceived metaphysics, but on "empirical grounds," suggesting that neuroscience has removed any need to speak of the mind in explaining the brain's activity. In this paper, I will argue that all three of these arguments are mistaken, and that we have good reason to affirm downward mental causation.

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3. A useful survey of views on the mind-body problem that includes several versions of emergence is Robert Van Gulick, "Reduction, Emergence and Other Recent Options on the Mind-Body Problem: A Philosophic Overview," *Journal of Consciousness Studies* 8 (2001): 1–34.

4. Kim has made this case against nonreductive physicalism in many places, including his *Mind in a Physical World: An Essay on the Mind-Body Problem and Mental Causation* (Cambridge, MA: MIT Press, 1998), his *Philosophy of Mind*, 2nd ed. (Boulder, CO: Westview, 2006), and his essay "Causation and Mental Causation," in *Contemporary Debates in Philosophy of Mind*, ed. Brian P. McLaughlin and Jonathan Cohen (Malden, MA: Blackwell, 2007), see especially his critique of Horgan's views in section 6.

5. Kim develops this problem for emergentism most fully in "Emergence: Core Ideas and Issues," *Synthese* 151 (2006): 547–59.

6. John Gibbons, "Mental Causation without Downward Causation," *The Philosophical Review* 115 (2006): 84.

The Causal Closure of the Physical

The Exclusion Problem

One of the most influential proponents of physical causal closure (PCC) is Jaegwon Kim, who defines it as follows:

> Pick any physical event . . . and trace its causal ancestry or posterity as far as you would like . . . this will never take you outside of the physical domain. Thus, no causal chain involving a physical event ever crosses the boundary of the physical into the nonphysical.[7]

Kim's own use of PCC is to show that nonreductive physicalists and emergentists, both of whom claim that mental properties supervene upon, but do not reduce to physical properties, cannot account for mental causation. For suppose that it appears that an instance of mental property *M* produces an instance of physical property *P**.[8] Then, given causal closure, there must be some sufficient physical cause of *P**, the obvious candidate being the subvenient base *P* of *M*. But if *P* suffices to produce *P**, what work is there left for *M* to do? The idea of systematic causal overdetermination (that *P** is produced by both *P* and *M*) seems implausible, so it is natural to conclude that *M* has no causal power at all. This is called the exclusion problem because mental properties are excluded from any causal role. In fact, as several critics have pointed out, Kim's own attempt to explain mental causation, by understanding mental properties as second-order functional properties, does not evade the exclusion problem either, because it is, in each case, the physical properties that realize the functional roles that do all the causal work, making the functional properties causally redundant.[9] Indeed, Kim admits that his own "reductionism of the mental" is unpalatable:

> If we save mental causation by reducing mentality to mere patterns of electrochemical activity in the brain, have we really saved mentality as something special and distinctive?[10]

> [T]he causal powers of mental properties turn out to be just those of their physical realizers and there are no new causal powers brought into the world by mental properties. . . . [O]ne might think it makes

7. Kim, *Philosophy of Mind*, 2nd ed., 194–5. This definition of causal closure is very similar to the one Kim gave earlier in *Mind in a Physical World*, 40.

8. Kim's own preferred example begins with a putative case of mental–mental causation, which he argues, *contra* Gibbons, *requires* mental–physical causation. For the sake of brevity, I am directly considering a case of mental–physical (downward) causation.

9. See, e.g., Terence Horgan, "Kim on Mental Causation and Exclusion" (cited above) and Manuel Campos, "Kim on the Exclusion Problem," in *Content*, Philosophical Issues 6, ed. James E. Tomberlin (Atascadero, CA: Ridgeview, 1995): 167–9.

10. Kim, *Philosophy of Mind*, 2nd ed., 199–200.

> no sense to save mental causation while relinquishing mentality as a distinctive reality.[11]

One motivation for the dualist approach I will defend in this paper is that physicalists of any stripe seem to have few good options in responding to the exclusion problem. If they deny PCC, then they are admitting that non-physical causal agencies are required to understand some physical processes, which hardly sounds physicalist. But if they affirm it, then it seems the only way that mental properties can have causal power is if they only influence other mental properties on the same level, but without downward causation of the physical (the position of John Gibbons). And this is also implausible as a physicalist position: if mental properties do not influence the physical properties of behavior, then they are invisible to natural selection (which operates exclusively at the level of physical laws and contingencies), and the systematic tracking of that behavior by those mental properties becomes an extraordinary coincidence.[12] Why should appropriate beliefs and desires regularly precede actions if natural selection has no way to influence the relationship between the content of those attitudes and the physical movements constitutive of those actions? As far as natural selection is concerned, so long as adaptive behavior is produced, the content of these attitudes can be anything: provided one runs away from a devouring lion, it does not matter if one does so whilst thinking, "What a nice bunch of petunias!"

Further, by granting the existence of a realm of mental–mental causation autonomous from the physical, it is arguable that Gibbons's view supports the claim that the mental exists independently of the physical. It is unclear whether this is Gibbons's considered opinion, as he appears both to support some form of physicalism and the idea of many levels of properties above the basic microphysical ones. But, as Victor Reppert points out, the materialist program in which physicalism is advanced is committed to the view that "there cannot be causal explanations that require nonmaterialist ontological commitments,"[13] which is precisely what autonomous mental–mental causation appears to require. So, whether PCC is dropped or retained, it seems that physicalist attempts to accommodate mental causation will end up compromising the core values of physicalism.

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11. Kim, *Mind in a Physical World*, 118–19.

12. I take it that as a blind, automatic process, natural selection cannot distinguish between two movements identical in their physical effects, one of which is an intentional action, and the other an involuntary response (e.g., a reflex action). If so, it is not plausible that natural selection can select behaviors on the basis of the distinctively mental properties of the behaviors, thereby allowing selection of their mental causes. Therefore, if behaviors can only be selected on the basis of their physical properties, and there is no downward mental–physical causation, there is no mechanism for selecting mental causes of behavior, and hence no explanation of the way mental states track behaviors.

13. Victor Reppert, *C. S. Lewis's Dangerous Idea: In Defense of the Argument from Reason* (Downers Grove, IL: InterVarsity, 2003), 69.

Causal Closure and Downward Causation

PCC implies that downward mental–physical causation is impossible. But why should someone believe PCC? Kim argues that PCC is justified by commitment to the "in-principle completeness of physics" (IPCP):

> the possibility of a complete and comprehensive physical theory of all physical phenomena.[14]

If by a "complete and comprehensive physical theory," we mean one that only appeals to physical properties and that suffices to causally explain any physical event or process, then the possibility of such a theory implies PCC. But as Crane and Mellor have argued, there are serious worries about whether we have good reason to believe the completeness of physics in any sense that favors physicalism.[15]

The problem is that we do not know what the proper extension of "the physical" is. We cannot define it in terms of current physical theories, because they are not comprehensive and complete. But if we define it in terms of future, or ideal theories, then not only do we not know that such theories exist (maybe IPCP is illusory), but even if they do, we cannot rule out the possibility that all problematic properties (such as mental ones) are included as part of the physical theory. If mental properties are baptized physical by some comprehensive, complete theory, then IPCP may be *compatible* with (what we now call) downward causation, and PCC may reduce to the uncontroversial claim that everything that exists is causally connected to other things. So, for all we know, the complete theory might make room for God and angels, as well as downward causation! But then either physicalism has been refuted (by physics, no less) or rendered utterly trivial by the fact that it simply absorbs all those entities it had claimed to be problematic and in need of special explanation.

A related point is that physical theory might be completed without becoming a completely *physical* theory. In other words, it is more plausible that there is a complete and comprehensive theory of all physical phenomena than it is that this theory is itself exclusively physical. This claim can be defended by an analysis of our best current theories without speculating about unknown future or ideal ones.

14. Kim, *Mind in a Physical World*, 40. Kim later argues that "If closure should fail, theoretical physics would be in principle incompletable and . . . research programs in physics, and the rest of the physical sciences, presuppose something like the closure principle" (*Philosophy of Mind*, 2nd ed., 195).

15. Tim Crane and D. H. Mellor, "There Is No Question of Physicalism," *Mind* 99 (1990): 185–206.

In an important paper, Nicholas Maxwell points out that physical theories have certain goals that necessarily exclude the mental life of persons.[16] In physics, the primary virtues of a theory are scope and explanatory power, so physical theories focus on those features "which (as far as possible) everything has in common with everything else."[17] This allows the formulation of simple, universal laws that do not depend on how the world seems to particular observers. In a subsequent paper, Maxwell explains that a physical theory that was coordinated with the conscious mental life of every sentient being would be so complex and *ad hoc* that it would lose all explanatory power.[18] So the inevitable cost of the elegance and universality of physical theories is that the unique qualities of each person's mental life must simply be ignored. B. Allan Wallace agrees, highlighting the way consciousness has been excluded from physical theory.

> In the dualistic, mechanical philosophy that dominated the rise of modern science, nature was not only seen as devoid of consciousness but also was objectified to the point that it was divorced from perceptual experience altogether. . . . Thus, conscious experience was effectively removed from nature and, therefore, from the objective domain of science.[19]

But if that is the reason physics does not speak in mentalistic categories, it is no reason at all to say that those categories are somehow ontologically challenged. That would be like saying that small fish must not exist because they are never found in nets with very large holes.

> [T]he fact that physics *is* silent about such features . . . provides no grounds whatsoever for holding that such features don't exist, or are inherently unintelligible if they *do* exist.[20]

Maxwell's own proposal is that scientific explanation in general should be completed by a mode of "personalistic explanation," irreducible to physical explanations, in which one explains another person's experience or actions by imitating in one's imagination what it would be like to be him or her.[21] But while Maxwell's account does make it plausible that physical theories can only be completed by appeal to nonphysical features, his personalistic explanation is noncausal and so provides no defense of downward (or even mental–mental) causation.

16. Nicholas Maxwell, "The Mind-Body Problem and Explanatory Dualism," *Philosophy* 75 (2000): 49–71.

17. Maxwell, "The Mind-Body Problem and Explanatory Dualism," 51.

18. Nicholas Maxwell, "Three Philosophical Problems about Consciousness," *Ethical Record*, May 2002, 3–11.

19. B. Allan Wallace, *The Taboo of Subjectivity: Toward a New Science of Consciousness* (New York: Oxford University Press, 2000), 123.

20. Maxwell, "The Mind-Body Problem and Explanatory Dualism," 51.

21. Ibid., 57–8. In "Three Philosophical Problems about Consciousness," Maxwell says that this kind of explanation is "anthropomorphic" in a way physics strives not to be.

A more promising line of argument, due to Jeffrey Schwartz, Henry Stapp, and Mario Beauregard, argues that PCC is already obsolete because of advances in physical theory.[22] They agree that "classic physics" espouses a self-contained mechanical system of physical causes that makes downward causation impossible. But they argue that a proper understanding of the impact of quantum theory implies a causal role for the mind. What is fundamental here is not (or not merely) the indeterminism of quantum phenomena, but the way in which quantum theory incorporates the mental choices of the observer as causally relevant factors in a physical system's behavior.

> the choice made by an observer about what sort of knowledge to seek can profoundly affect the knowledge that can ever be received. . . . [T]he *choice* made by the observer about how he or she will act . . . has, at the practical level, a profound effect on the physical system being acted on.[23]

For example, it is well known that there is no determinate fact of the matter concerning a subatomic particle's position and velocity until it is measured, but this act of measurement reflects a choice by the experimenter which is, so far as we know, not determined by physical variables:

> according to the Copenhagen philosophy, *there are no presently known laws that govern the choices* made by the agent/experimenter/observer about how the observed system is to be probed.[24]

On this interpretation, we have an example of a current physical theory which completes itself by incorporating the downward causal influence of mental states, namely the choices of scientists. While this interpretation of quantum theory, or even the theory itself, may be rejected on the basis of future discoveries, the example suffices to show that a physical theory which presupposes downward causation cannot be dismissed as inconceivable. (Of course, *how* it is possible for mental causation to work in this way is another question, one we will address in the next section.)

So, both in its theoretical aims and in its current self-understanding, physics seems most likely to be completed with at least some nonphysical properties. If IPCP is not supported by the trajectory of our best current physical theory, why should we suppose it is supported by future or ideal theories we know nothing about? At the very least, IPCP appears too speculative to support commitment to PCC.

22. Jeffrey M. Schwartz, Henry P. Stapp, and Mario Beauregard, "Quantum Physics in Neuroscience and Psychology: A Neurophysical Model of Mind-Brain Interaction," *Philosophical Transactions of the Royal Society Series B* 360 (2005): 1309–27.

23. Ibid., 1315.

24. Ibid., 1318.

Natural Laws and Downward Causation

Another reason for denying downward causation of any kind (used to exclude miracles as well as mental–physical causation) is that any such causation would violate physical laws. For some, this is just another way of saying that the physical is causally closed, because they think that any physical event has a sufficient physical cause and that genuine causation is "covered by" or instantiates one or more causal laws. If any physical event is the result of some prior physical cause governed by physical law, then a mental feature could only make a difference by altering the event, thereby violating the law. More formally, if a *P**-event occurs because a *P*-event occurs and it is also a law that *P*-events produce *P**-events, then if *M* does something to change the effect (say from a *P**-event to a *P***-event), it violates the law. But there are a number of problems with this argument.

For starters, we do not know that every physical result occurs in accordance with a physical law, and this for several reasons. There is the fact just mentioned that in quantum experiments, the choice of the observer influences the system being observed. It may do so in quite a lawlike fashion; for example, in the well-known Quantum Zeno Effect, it is a regularity that the frequency of a quantum state's observation is proportional to the degree of its fixation. In other words, the more the state is measured, the more probable the system will remain in that state. But since the mental choices do not result from any physical antecedents in a lawlike fashion, there is no good reason to say that the law linking the mental choice and its effects is a physical law. More generally, the laws recognized by science are derived from empirical generalizations, and if there is a regular enough association between mental and physical events, scientists are warranted in inferring a psychophysical law as the explanation. But in that case, in the absence of a credible psychophysical reduction, there is no reason to suppose that there is an underlying, purely physical law to be violated by downward mental causation.

Secondly, there is the fact that we are not able to give a complete physical explanation of all singular, historical events, solely by appealing to physical laws, for example, while the physical laws of ballistics partially account for the assassination of Abraham Lincoln in Ford's theater, we cannot complete the account with further physical laws because no such laws link the motives of John Wilkes Booth to his firing the gun. Thirdly, complex physical events often do not have an explanation by a physical law, because they constitute a coincidence. In a complex bodily movement, such as a throw in Judo, there are numerous, parallel causal processes connecting different neurophysiological signals with different aspects of the movement. Let us suppose that each of these processes is law governed. This still does not explain the throw

as a unity because it does not explain how all of those processes were coordinated to achieve this unified, complex effect. As Crawford Elder argues,

> Each individual microphysical event comprised within such a complex does have a physical cause; but it does not follow, and is not true, that the complex, disjointed event as a whole does.[25]

In all of these cases it seems that the best we can hope for is a *psychophysical law*, which obviously will not be violated by downward mental–physical causation.

But even in cases where purely physical laws are normally in force, there seems no good reason to assume that downward causation *violates* these laws. This point is well-made by Victor Reppert, who notices that an argument parallel to one C. S. Lewis uses to defend the possibility of miracles also makes room for mental causation.[26] Lewis pointed out that even if laws have the logical necessity of arithmetic, they do not preclude intervention.[27] If five dollars are put in a drawer on one day, and ten dollars more on the second, arithmetic has not been violated if fifteen dollars are not found in the drawer on the third day. Arithmetic says that *if* you have five dollars and ten dollars together, *then* you will have fifteen dollars: it says nothing about events such as theft (or a generous contribution) that interfere so that you no longer have exactly those amounts together. Likewise physical laws do not say unconditionally that a certain physical result will occur. They say that *if* a certain physical cause occurs and *if* there are no interfering factors, then the result will occur. But it might be that a mental event prevents the physical cause from occurring, or it might be that though that cause occurs, a mental event interferes so that a different physical result occurs.

A good example of this is provided by neurological studies of self-regulation in response to emotionally negative pictures. K. N. Oschner's experiments,[28] cited by Mario Beauregard, contrasted "attend trials," where "volunteers were requested to attend to and be aware of, but not try to modify any feelings induced" with "reappraise trials" on which "volunteers were instructed to reinterpret the negative picture so that it no longer generated a negative emotional response."[29] The functional magnetic resonance imaging (fMRI) scans revealed that, as expected, the limbic system (specifically the right amygdala) was very active on attend trials. Let us suppose that this happens in accordance with physical laws, so that whenever these stimuli

25. Crawford Elder, "Mental Causation Versus Physical Causation: No Contest," *Philosophy and Phenomenological Research* 62 (2001): 112.

26. Reppert, *C. S. Lewis's Dangerous Idea*, 110.

27. C. S. Lewis, *Miracles* (New York: Macmillan, 1960), 58.

28. K. N. Oschner et. al., "Re-thinking Feelings: An fMRI Study of the Cognitive Regulation of Emotion," *Journal of Cognitive Neuroscience* 14 (2002): 1215–29.

29. Mario Beauregard, "Mind Does Really Matter: Evidence from Neuroimaging Studies of Emotional Self-regulation, Psychotherapy and Placebo Effect," *Progress in Neurobiology* 81 (2007): 218–36.

are processed passively, such limbic activation occurs. This is clearly consistent with Oschner's demonstration that subjects on reappraise trials who are instructed to actively suppress their emotions (by viewing the stimuli more objectively) are able to do so, and thereby produce different physical results in their brain (diminished activation of the limbic system, increased activation of the prefrontal cortex). Even if this is, as it surely seems to be, downward mental causation, and even if it requires what John Gibbons dismisses as new fundamental forces that "only appear in brains,"[30] it does not violate physical laws specifying what normally happens to the limbic system *if* no reappraisal of the stimuli occurs.

What is more, Schwartz, Stapp, and Beauregard have proposed a quantum theoretical model which explains how downward causation is possible. Because of the extreme narrowness at some points in the brain's calcium ion channels, quantum theory is needed to give an adequate account of the brain.

> At their narrowest points, calcium ion channels are less than a nanometre in diameter. . . . The narrowness of the channel restricts the lateral *spatial* dimension. Consequently, the lateral *velocity* is forced by the *quantum uncertainty principle* to become large. This causes the *quantum cloud of possibilities* associated with the calcium ion to *fan out* over an ever increasing area as it moves away from the tiny channel to the target region where the ion will be absorbed as a whole, or not absorbed at all, on some small triggering site . . . the quantum state of the brain has a part in which the neurotransmitter is released and a part in which the neurotransmitter is not released.[31]

At the level of templates for action plans, this means that in accordance with purely physical laws—"the quantum generalization of the Newtonian laws"—no one of them will definitely be executed because "all of the various alternative possible plans of action will exist in parallel." Our experience of performing a particular action requires a selection from "the smeared-out mass of possibilities," which is accomplished by mental acts of the agent.[32] The authors propose that these are acts of sustained, repeated, conscious, selective attention to one of the action templates, which tends to fixate it, thereby elevating the probability it will be executed. They suggest that this is an example of the Quantum Zeno Effect wherein repeated acts of measurement can increase the probability that a system will remain in a certain state, even though, in the absence of such measurement, other states are just as

30. Schwartz, e.g., argues that selective attention is or invokes a "mental force," which can alter the state of the brain.

31. Schwartz, Stapp, and Beauregard, "Quantum Physics in Neuroscience and Psychology," 1319 (emphasis in original).

32. Ibid., 1319.

probable.[33] What is different in this case is that, in effect, it is the mind measuring, and thereby fixating, the state of the brain. So there exists a known means by which the mind could exert downward causation on the brain. And this model also explains an independently established problem in psychology, the "bottleneck" between perceptual processes that proceed in parallel and "the postperceptual processes of planning and executing actions" which "form a single queue." The transition is strongly correlated with "the attentive selection of a motor action," just as the Quantum Zeno proposal predicts.[34] But do we have more direct empirical evidence for downward mental causation? I believe we do.

The Evidence from Neuroscience

Standard arguments for downward causation point to the obvious correlations between the beliefs and desires of an agent and his physical actions, but they are vulnerable to the reply that the brain is doing all the work, leaving the mind as either a redundant rider (epiphenomenalism) or nonexistent (eliminativism). Recently, however, neuroscientists have begun to produce evidence that the brain cannot provide a complete account of behavior, because the brain's processing of its signals can itself be changed by acts of the mind.

As Jeffrey Schwartz and Sharon Begley have shown, enormous advances in neuroscience have made it possible to map the specific neural pathways employed in many cognitive tasks.[35] Among the most surprising results from this field has been the discovery of an unsuspected level of neuroplasticity. The orthodox view in neurophysiology had been that only young children can compensate for deficits in the brain by "remapping," the employment of alternate regions and pathways in the brain to accomplish the same cognitive task. After maturation, it was assumed that new pathways could no longer be developed and alternate regions of the brain could not be reassigned to compensate for failure elsewhere. The only neuroplasticity left for adults was Hebbian plasticity, the ability to learn by increasing synaptic strength, "known by the maxim 'Cells that fire together, wire together.'"[36]

In the background, what drove the orthodox view was the materialist assumption that the mind was the passive product of the brain and environmental conditioning. The idea that the mind, and particularly consciousness,

33. Ibid., 1322. A very good question for John Gibbons is whether he thinks the Quantum Zeno Effect can be explained by the normal physical processes acting outside of brains. If so, what is the force? If not, why is he confident that PCC is true?

34. Schwartz, Stapp, and Beauregard, "Quantum Physics in Neuroscience and Psychology," 1322.

35. Jeffrey M. Schwartz and Sharon Begley, *The Mind and the Brain: Neuroplasticity and the Power of Mental Force* (San Francisco: Harper, 2002).

36. Schwartz and Begley, *The Mind and the Brain*, 107.

could act back on the brain, was rejected as inherently unscientific. A materialistic view of the mind led psychiatrists to assume that their patients were passive entities who could only be helped by subjecting them to bottom-up causal processes, such as drugs designed to change their brain chemistry and conditioning designed to reinforce alternative behaviors. Both of these approaches do have a limited amount of success, but there is also a significant number of patients who fail to make progress or who refuse to accept these treatments. Schwartz was among the minority of scientists who wondered if patients could learn alternative behaviors by harnessing the power of their own mind.

Schwartz's own specialization is therapy for Obsessive Compulsive Disorders (OCDs). An OCD is "a condition marked by a constant barrage of intrusive thoughts and powerful urges."[37] These urges are "ego-dystonic: they seem apart from and at odds with, one's intrinsic sense of self."[38] Unlike depressives who may genuinely believe they should harm themselves or retreat from others, patients with OCD experience an urge to do X even when they know there is no good reason to do X. Examples of OCD include:

> Excessive and ritualized hand-washing . . . alphabetizing the contents of a pantry, repeatedly checking to see whether a door is locked or an appliance is turned off, checking over and over to see whether you have harmed someone . . . following rituals to ward off evil . . . touching or tapping certain objects continuously, being unable to resist counting . . . or even excessively making lists . . . obsessions about order or symmetry . . . an obsession about hoarding . . . .[39]

The more the patient yields to these irrational urges, the worse the OCD becomes. Any therapy must therefore find a way to help the patient resist the urges. Following a materialist paradigm, psychiatrists have used a method of behavioral conditioning called "exposure and response prevention." The idea is to expose the patient to what they are reacting to, and then to remove the ability to carry out the obsessive response so that the patient learns to withstand the urges. However, this can be demeaning or even dangerous: patients with hand-washing obsessions are required to touch soiled toilet seats and rub themselves (exposure) and are then deprived of hand-washing facilities (prevention)[40]; patients who obsessively check the mirror for (nonexistent) people they fear they have run over are required to drive (exposure) without a rearview mirror (prevention)![41] Rather than subjecting patients to these ethically questionable treatments, Schwartz wondered if patients could actively choose strategies to weaken the grip of their obsession. He hypoth-

37. Ibid., 1.
38. Ibid., 55.
39. Ibid., 56.
40. Ibid., 3.
41. Ibid., 5.

esized that if patients could gain an objective perspective on their own disorder and then consciously refocus on alternative behaviors, they might be able to overcome OCD.

From a materialist perspective, this hypothesis looks quite incredible. Indeed, advances in brain imaging techniques (using Positron Emission Tomography or PET scans) showed that OCD patients have a detectable physical abnormality, "brain lock," causing them to repeatedly feel that something is wrong (even though they know there is not) which requires a response, and to be unable to move on to another thought and related behavior:

> Our PET scans had shown that the orbital frontal cortex, the caudate nucleus, and the thalamus operate in lockstep in the brain of an OCD sufferer. This brain lock in the OCD circuit is undoubtedly the source of a persistent error-detection signal that makes the patient feel that something is dreadfully wrong.[42]

However, Schwartz's results provide evidence that purely mental events, such as conscious attention, actually change the physical structure of the OCD circuit. Given the powerful arguments from the philosophy of mind that consciousness does not itself reduce to physical processes in the brain[43], this result is not plausibly interpreted as one part of the brain gaining control of another, which could be explained as the result of materialistic, bottom-up processes. Rather, Schwartz's work is best explained by theorizing that consciousness has a downward causal influence on the brain, that attention can actually reconfigure the brain's structure.

Pursuing this idea, Schwartz developed a four-step program for OCD patients that requires conscious mental attention. First, following the Eastern idea of "mindfulness," patients must try to distance themselves from their OCD, so that they can see it as an abnormal condition afflicting them, rather than part of who they are. They are then able to "*Relabel* their obsessions and compulsions as false signals, symptoms of a disease."[44] Second, patients try to *Reattribute* these thoughts as deriving from bad brain circuitry, not an objective need. The third and hardest task, which requires the most conscious attention, is to *Refocus* the mind on more constructive behavior. Finally, patients try to *Revalue* their OCD thoughts, seeing them as without significance or power.

Each of the four steps, and especially the third, is actively initiated by the conscious mental effort of attention. They are clearly intentional acts, deliberately aimed at the goal of alleviating OCD. Yet, remarkably, using PET scans, Schwartz was able to show that after ten weeks of therapy, these

42. Ibid., 85.

43. See, e.g., David Chalmers, *The Conscious Mind* (New York: Oxford University Press, 1996).

44. Schwartz and Begley, *The Mind and the Brain*, 14.

mental acts resulted in observable changes to the OCD circuit in many of his patients' brains:

> PET scans after treatment showed significantly diminished metabolic activity in both the right and left caudate. . . . There was also a significant decrease in the abnormally high, and pathological, correlations among activities in the caudate, the orbital frontal cortex, and the thalamus in the right hemisphere. . . . [T]herapy had altered the metabolism of the OCD circuit. Our patient's brain lock had been broken.[45]

The obvious question is how such dramatic physical change to the brain is possible. Part of the answer is that adults have a much greater degree of neuroplasticity than previously believed. While the orthodox materialist view had held that the adult brain has a fixed map of sensory and motor homunculi in dedicated parts of the brain, neuroscientists Edward Taub, Michael Merzenich and Jon Kaas showed, by experiments on monkeys, that when nerves connecting the cortex to a hand are severed, the cortex rapidly responds to signals from other parts of the hand.[46] They also showed that an organism's use of its limbs dynamically changes its cortical map. If fingers are joined ("artificial syndactyly") the map is changed so that only a single digit is represented; if the fingers are separated, the map is redrawn to represent both digits separately. Applying these lessons to humans, it was shown conclusively that many stroke victims can regain use of their affected arm by exploiting cortical reorganization. One of the most effective therapies is constraint induced movement (CI) therapy, in which the good arm is restrained most of the time, and the patient is rewarded for any progress in moving the affected arm. Changes in the motor cortex were observed in as little as two weeks. While it is normal for an arm to be controlled by the motor cortex on the other side of the brain, cortical reorganization through CI therapy allowed these patients to move their arms with the motor cortex on the same side: "when the patients moved their affected arm, the motor cortex on the same side crackled with activity."[47]

An equally important part of the answer is that successful therapies for various neural deficits and disorders involve patient's conscious attention, mental effort and intentional action. Patients are not passively conditioned or merely medicated but must consciously try to perform a new behavior. In the case of OCD, the most important step is the conscious effort to refocus on a more constructive alternative behavior that enables them to resist the compulsion to respond to a baseless sense of unease. For stroke victims, therapy requires the patient to consciously and deliberately try to perform

45. Ibid., 89–90.

46. See the extended discussion in "The Mapmakers," chap. 5 of Schwartz, *The Mind and the Brain*.

47. Schwartz and Begley, *The Mind and the Brain*, 193.

basic, but now very difficult tasks, such as placing a peg in a hole.[48] The same approach is used to cure focal hand dystonia where a pianist loses the ability to move two fingers independently, through the reception of near simultaneous signals from both fingers when playing fast, complex pieces: therapy required "highly attended, repetitive, nonsimultaneous movements."[49] Another successful application is therapy for dyslexia, which is now known to derive from the inability to distinguish spoken phonemes. The therapy involves carefully attending to artificially elongated phonemes so that they are properly separated.[50] Other examples include treatment for Tourette's syndrome (manifested by stereotypical outbursts or behavioral tics) and depression, which is treated by helping patients to attend to thoughts that trigger a cascade of negative associations and to refocus on more positive alternatives.

It is important to see that none of these therapies can be explained by the model of passive behavioral reconditioning. Conscious attention is vital because it actively changes how the brain processes information. Normally, we are bombarded by a large number of parallel stimuli, competing for attention, which has the effect that the stimuli mutually suppress each other. While some stimuli are naturally stronger than others, fMRI shows that the observer's interests make a large difference to subsequent processing. When we look for a specific target, such as a particular profile in a crowd, or one voice in the babble of a cocktail party, "neurons that respond to [the] target (the image attracting your attention) fire more strongly than neurons that respond to a distraction."[51] Attention biases the brain so that the suppression of target stimuli by competing distracters is reduced. While the information impinging our cortex is not under our control, the brain's response to that information is selective and depends on conscious attention. "An activity usually determined to be a property of the mind—paying attention—determines the activity of the brain."[52]

If it is a fact that conscious attention changes how the brain processes information, and deliberate, conscious focusing of the mind on therapeutic behaviors can cause cortical reorganization, it is reasonable to conclude that the intentional activity of the mind has a downward causal influence on the brain. Schwartz's conclusion from his work with OCD is that the mind is not an impotent shadow thrown up by the brain. While the mind is obviously strongly influenced by brain events in a bottom-up fashion, as is evident from the mental effects of brain deficits, medication and behavioral conditioning, the scientific evidence shows that the mind also has the power to reconfigure the brain.

48. Ibid., 190.
49. Ibid., 219.
50. Ibid., 226–36.
51. Ibid., 328.
52. Ibid., 329.

> [W]illful, mindful effort can alter brain function, and . . . such self-directed brain changes—neuroplasticity—are a genuine reality. . . . In other words, the arrow of causation relating brain and mind must be bidirectional.[53]

Some materialists will object that Schwartz's account of the causal efficacy of conscious attention, especially in the critical role of the subject's refocusing onto a more constructive behavior, presupposes free will, and argues that recent neuroscientific work establishes that conscious free will is an illusion. By closely monitoring the pattern of electrical activity in the cerebral cortex, Benjamin Libet was able to show that a "readiness potential" (meaning that the brain is ready to initiate a movement) occurs roughly 550 milliseconds before the action, but the conscious intention to perform the action occurs 350 milliseconds later.[54] Some have taken this to show that conscious choice is an illusory shadow thrown up by a "decision" that has already been made. As Schwartz points out, however, the full experimental data do *not* show there is no conscious free will, and Libet himself has not claimed that they do. Interestingly, the readiness potential associated with an intentional action is not always followed by the action: the readiness potential does prepare the body to act, but it does not produce the action deterministically. Since a conscious intention to perform or refrain from performing the action appears later, conscious will appears to have the power to approve or veto the action. If conscious will is compared to the presidential review of new legislation, the readiness potential is analogous to the presentation of a bill which may be rubberstamped or vetoed: "In this view, although the physical sensation of an urge to move is initiated unconsciously, will can still control the outcome by vetoing the action. . . . Libet's findings suggest that free will operates not to initiate a voluntary act but to allow or suppress it."[55] This would clearly explain how an OCD patient, seized with the urge to perform a ritualized compulsive behavior, can succeed in refocusing on, and performing, an alternative behavior instead.

Mario Beauregard has offered additional support to Schwartz's claim. In an important article surveying the use of cognitive (mind-based) therapies to alter brain function, Beauregard summarizes his conclusions as follows:

> the results of these [neuroimaging] studies strongly supports the view that the subjective nature and intentional content . . . of mental processes (e.g. thoughts, feelings, beliefs, volition) significantly influence the functioning and plasticity of the brain . . . mentalistic variables

53. Ibid., 94–5.

54. Benjamin Libet, "Do We Have Free Will?" in *The Volitional Brain: Towards a Neuroscience of Free Will*, ed. Anthony Freeman, Keith Sutherland, and Ben Libet (Exeter: Imprint Academic, 2000), 47–57.

55. Schwartz and Begley, *The Mind and the Brain*, 307.

> have to be seriously taken into account to reach a correct understanding of the neurophysiological bases of behavior in humans.[56]

In addition to the examples of cognitive therapies cited by Schwartz, Beauregard lists the examples of downward suppression of sexual arousal and negative emotions (such as fear and sadness); treatments for panic disorder, unipolar major depressive disorder, social phobia, spider phobia; and the placebo effect.

The placebo effect provides particularly powerful evidence of downward mental causation. By definition, a placebo is "any treatment—including drugs, surgery, psychotherapy and quack therapy—used for its ameliorative effect on a symptom or disease but that is actually [physically] ineffective or not specifically effective for the condition being treated."[57] The placebo therefore has no physical power to heal the patient, and yet patients who trust in the placebo have a statistically greater chance of improvement. Doctors have been aware of the power of the placebo effect for some time:

> The placebo effect depends on a patient's trust in the physician. I've become convinced that this relationship is more important, in the long run, than any medicine or procedure. Psychiatrist Jerome Frank of Johns Hopkins University found evidence for this belief in a study of ninety-eight patients who had surgery for detached retinas. Frank assessed the subjects' independence, optimism, and faith in their doctors before the operations, and found that those with a high level of trust healed faster than the others.[58]

The power of the placebo evidently derives not from its physical properties, but from the patient's mental attitudes of trust and hope. Initially, this could only be supported indirectly by surveying patient outcomes. For example, Norman Cousins cites the work of Drs. Sheldon Greenfield and Sherrie Kaplan of the UCLA School of Public Health on ulcer diseases, hypertension, diabetes and breast cancer:

> Drs. Greenfield and Kaplan found that increased patient control, more expression of affect by doctor and patient, and greater information provided by the doctor in response to patient questions, were related to better patient health status as measured by audiotapes of office visits, questionnaires, and physiological measurements.[59]

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56. Beauregard, "Mind Does Really Matter," 219.

57. A. K. Shapiro and E. Shapiro, *The Powerful Placebo: From Ancient Priest to Modern Physician* (Baltimore: MD: Johns Hopkins University Press, 1997), quoted in Beauregard, "Mind Does Really Matter," 227.

58. Bernie S. Siegel, *Love, Medicine and Miracles: Lessons Learned about Self-Healing from a Surgeon's Experience with Exceptional Patients* (New York: Harper & Row Publishers, 1986), 37.

59. Norman Cousins, *Head First: The Biology of Hope* (New York: E. P. Dutton, 1989), 234.

More recently, however, improved brain scanning techniques have allowed a more direct scientific study of the effects of psychological attitudes on health. Most remarkably of all, there is evidence to show that the placebo effect was at least as effective as the drug apomorphine in treating the chronic underproduction of dopamine in patients with Parkinson's Disease:

> the magnitude of the placebo response was comparable to that of the apomorphine. . . . These results constitute . . . evidence for considerable release of endogenous dopamine in the striatum of PD patients in response to placebo. . . . Garris et al. . . . have provided evidence that it is the expectation of reward that elicits dopamine release.[60]

More generally, there is an emerging field of psychoneuroimmunology, which studies how mental attitudes affect the immune system via the brain.[61] For example, it has long been known that psychological stress is correlated with negative effects on physical health. One successful therapy for stress related to chronic illness uses an approach called "Mindfulness Based Stress Reduction" (MBSR) derived from Eastern meditation. A 2004 study explored the effect of MBSR on cancer patients who are hospitalized for a long time with stem cell or autologous bone marrow transplants, and found "a statistically significant decrease in pain . . . and increases in the levels of relaxation . . . happiness . . . comfort . . . reduced heart rate . . . and respiratory rate." Other studies have shown benefits from MBSR in "decreasing anxiety, depression, anger, demoralization, and symptoms of somatic fatigue in male and female cancer patients."[62]

In light of these results, one might argue that the materialist insistence that downward mental causation is impossible, not only conflicts with the most reasonable interpretation of a wide class of empirical facts, but is also a threat to public health. The widespread acceptance by scientists of methodological materialism, which denies the possibility of goal-directed mental causes in nature, encourages medical scientists and therapists to remain "locked into the view that the *psychological* treatment of ailments *caused by neurobiological impairments* is not a realistic goal."[63]

60. Beauregard, "Mind Does Really Matter," 227–8.

61. I do find it odd that so many philosophers of mind, who are sure that downward causation is excluded "on empirical grounds," are not keen to explore those areas of science, such as psychoneuroimmunology, where such grounds might be found.

62. Mary Jane Ott, Rebecca L. Norris, and Susan M. Bauer-Wu, "Mindfulness Meditation for Oncology Patients: A Discussion and Critical Review," *Integrative Cancer Therapies* 5, no. 2 (2006): 106.

63. Schwartz, Stapp, and Beauregard, "Quantum Physics in Neuroscience and Psychology," 1311.