Psychology of Consciousness: Theory, Research, and Practice

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The Unplanned Obsolescence of Psychological Science and an Argument for Its Revival

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I examine some of the key scientific precommitments of modern psychology, and argue that their adoption has the unintended consequence of rendering a purely psychological analysis of mind indistinguishable from a purely biological treatment. And, because these precommitments sanction an "authority of the biological," explanation of phenomena traditionally considered the purview of psychological analysis is fully subsumed under the biological. I next evaluate the epistemic warrant of these precommitments and suggest that there are good reasons to question their applicability to psychological science. I conclude that experiential aspects of reality (reflected in mental construct terms such as memory, belief, thought, and desire) give us reason to remain open to the need for psychological explanation in the treatment of mind.

Keywords: biophysical determinism, consciousness, metaphilosophy of science, mind, psychological science

In a letter to the *APS Observer*, Scott Lilienfeld notes a trend among Departments of Psychology to adopt a change of name. This departmental rebranding consists in adding "Brain" (or a cognate—e.g., Neuro) to "Psychological Science":

> Dartmouth's Department of Psychology has become the Department of Psychological and Brain Sciences; Indiana University's department is similarly termed the Department of Psychological and Brain Sciences; and Duke's department now calls itself the Department of Psychology and Neuroscience. These departments are hardly alone; the University of Colorado at Boulder's psychology department has recently become the Department of Psychology and Neuroscience, and the University of Louisville's department has become the Department of Psychological and Brain Sciences. (Lilienfeld, 2011)

We participated in a similar makeover at UCSB. Our program, since its inception, went by the name "Department of Psychology." However, motivated by a perceived change in circumstances (e.g., the President's initiative to map the human brain and funding agencies growing appetite for proposals with a neuroscience flavor), we decided a product rebranding might be in order (perhaps "repurposing" better captured our motivation for change). After much, occasionally heated, debate we opted for the name Department of Psychological and Brain Sciences.

My reason for relating this little episode of departmental history is not to argue—as did Lilienfield—that the titular conjunction (i.e., "psychological" *and* "brain" sciences) might be taken as a tacit endorsement of Cartesian duality. Departmental renaming, in my view, has implications beyond the problem of dualism—implications that call to question whether psychology still has anything of substance to offer to a science of the mind.

Goals of the Article

The currently popular view is that the mind can be conceptualized as "a naturally selected system of organs of computation" (Pinker, 2005, p. 22). Accompanying this are three corollaries – (a) a bio-physical reduction of mind is (or soon will be)

I thank Alba Papa-Grimaldi, Dan Robinson, and Galen Strawson for helping make this article better than it otherwise would have been. Any weak arguments and incoherencies that remain do so despite their best efforts to set me on the correct path.

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Fn1 within reach (e.g., Papineau, 2001),[1] (b) the appearance of conscious free will is a trick played by the mind (e.g., Wegner, 2003), and (c) "unconscious processes can carry out *every* [emphasis added] fundamental high–level function that conscious processes can perform" (Hassin, 2013, p. 195). Considered together, these propositions—which are more in the nature of scientific precommitments (clarification of this and other terms T1 used in the text is found in Table 1) than nomological necessities mandated by the data (see section "Questioning the Precommitments")—have considerable influence on how we approach research and theory in psychological science (e.g., AQ: 3 Piccinini, 2006).

I argue that these propositions, when taken as four premises of a deductive argument, lead to the conclusion that biological mechanism is both a necessary *and* sufficient explanation for human behavior. Put differently, it no longer is clear what work psychology has to offer current theories of mind: A commitment to unconscious neural computation and physical determinism sanctions a purely biological treatment of phenomena traditionally considered the concern of psychological analyses. In light of this, it would seem that the departmental renaming process should be taken a step further: The title should be simply "Brain Sciences"—a rebranding likely to please eliminative materialists, psycho-neural identity theorists, and administrators (who will welcome an opportunity to prune departmental letterhead in these cost-cutting times).

In the next section I discuss the role of physicalism (i.e., the mind is a biological computer instantiated by a physical brain) and the other precommitments coloring our understanding of mind. In section "The Question: Is There Still Room for Psychology in the Science of Mind?," I argue that these precommitments open the door to a "science of mind" in which phenomena customarily considered the concern of psychological science are fully subsumable under biological explanation (the "individuation problem"; section "Can We Individuate Psychological From the Biological Activities of the Brain?"). In the final two sections I take issue with the premises outlined in section "Precommitments: Physicalism, Determinism, the Unconscious," and contend that a science of mind that neuters the causal and explanatory efficacy of psychological explanation is misguided.

Precommitments: Physicalism, Determinism, the Unconscious

In this section I touch briefly on some of the key precommitments that underwrite most contemporary approaches to understanding the mind (even a moderately satisfying treatment of this very complex topic would require volumes). These precommitments, though functionally independent, when treated syllogistically endorse a reconceptualization of "Psychological and Brain Sciences" in which the first predicate (i.e., psychological) is left without a clear explanatory role. I refer to this as "the authority of the biological" (see section "The Question: Is There Still Room for Psychology in the Science of Mind?").

Physicalism and Neural Computation

The terms materialism and physicalism both are used to refer to the doctrine that everything that exists—whether molecule, mineral, or mind—exists wholly as matter. Materialism, whose roots trace to the atomists of Greek antiquity, is the doctrine that all reality is constituted of solid, inert substances (i.e., material) that interact energetically and deterministically via physical contact (e.g., Crane & Mellor, 1990).

Developments in modern physics pose serious difficulties for some of the properties attributed to "matter" by traditional materialist doctrine. Discoveries (primarily in the last century) suggest that matter need be neither inert nor solid (think "fields of force"), and that objects can interact instantaneously despite separation by space-like intervals (an interval is space-like if an object can be present at two events *only* if it travels faster than the speed of light).

In what follows, I therefore adopt the term "physicalism" when discussing the metaphysi-

[1] In my journal articles I typically cite a large number of supporting documents—ranging from the mid-100s to more than 300! In an effort to conserve journal space, I have been asked to forgo my proclivity toward encyclopedic referencing. Accordingly, in all but one (very important) case I cite only a single salient exemplar of the position under consideration. However, lest the reader worry that this paucity of documentation suggests an idealized review of the literature, I encourage those concerned (or simply interested) to contact me via e-mail (see the Author's Notes) and I will supply additional bibliographic material.

Table 1
Glossary of Key Terms Not Defined in the Text

1. *Consciousness*. Consciousness comes in many kinds (e.g., sentience, access consciousness, noetic consciousness, temporal consciousness, phenomenal consciousness; e.g., Klein, in press). My use of the term consists in the proposition that *X* is conscious if and only if there is "something it is like" for the organism to be in that state (e.g., Nagel, 1974). That is, consciousness consists in first-person *experience* (see below). This usage is what most philosophers have in mind when discussing phenomenal consciousness.
2. *Epiphenomenon*. *X* is an epiphenomenon if it occurs alongside or, in parallel to, a primary phenomenon, *Y*, but has no causal relevance for the enactment of *Y*. An example would be smoke issuing from the operation of a steam engine. Smoke (the epiphenomenon) occurs alongside the workings of the engine (the primary phenomenon), but has no effect on the engine's performance.
3. *Experience*. In my treatment, all experience is conscious: It is the qualitative aspect of the mental state (see below) you are having right now. Some who use the term have in mind sensation (e.g., pain) and perception (e.g., that tree over there). For me, experience also can be about internally generated content such as memories, thoughts and images.
   Throughout the text, I treat the term "experiential reality" as synonymous with terms qualitative, subjective, mental, and psychological reality (in distinction from non-qualitative aspects of reality). Although I realize that it is not technically precise to do so, it is an expositional convenience made necessary, in part, by the usage of quotes cited in the text. I acknowledge the duality of my position.
4. *Functional Independence*. As used in this article, two (or more) presuppositions (e.g., determinism, physicalism) are functionally independent if the positions endorsed by presupposition *X* are not entailed by the positions endorsed by presupposition *Y*. This does *not* imply that *X* has nothing to do with *Y*, or that they are disjunctive (e.g., they can be orthogonal); indeed, as argued in this article, functionally independent presuppositions can serve as the premises of a deductive argument. Rather, the idea is that although *X* and *Y* both can contribute to our understanding of a particular state of affairs, their contributions are unique.
5. *Mental States*. A mental state consists in content (i.e., its intentional objects; e.g., Brentano, 1995) *and* their conscious apprehension. Thus seen, a mental state is the *experienced* outcome of *sub-experiential* (see below) processes taking place (presumably) in the brain. Mental states give rise to the great variety of psychological experiences familiar to both academic discourse and personal phenomenology (e.g., attitudes, beliefs, memories, imagination, thoughts, inferences, and so forth).
6. *Mind*. Mind is the collection of sub-experiential processes required for having a mental state *and* the mental states they enable.
7. *Qualia*. Qualia are individual instances of conscious experience. They are specific instances of the "what it is like" character of mental states (i.e., the way it feels to have *this* pain, memory, desire, belief, perception, plan, image, thought, etc.).
8. *Scientific Precommitments*. A presupposition that helps determine the formative background of the questions we ask nature, rather than a fact or law we discover in virtue of the answers we receive. Precommitments are necessary for and facilitate the performance of scientific inquiry, though they are not formally part of science (e.g., Rescher, 1984).
9. *Sub-Experiential*. Learned or inherited processes (and the content on which they act) that take place unconsciously. Although subexperiential processes play a necessary role in enabling experience, they are not the experience itself. An analogy may help: Although a play consists in a great many behind the scenes activities (securing funding, finding a venue, casting calls, etc.), none of these activities is, strictly speaking, the play as experienced.

cal doctrine that nature is limited to facts about matter and its interactions. Physicalism holds that all substances are identical with the type of things studied by physicists (e.g., Spurrett & Papineau, 1999). This includes physical particulars (e.g., subatomic particles), physical properties (e.g., mass) and the laws that govern them (e.g., $F = MA$). A simpler way of putting the physicalist doctrine is that everything that exists either is an entity or is composed of entities studied by physical science.[2]

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Although physicalism encompasses all natural phenomena, my interests are more circumscribed—that is, the implications of physicalism for the science of psychology. Physics deals only in objective and quantifiable properties of physical objects (e.g., size, shape, mass, and motion). It has no place for qualitative aspects of nature reflected in mental construct terms such as belief, desire, pain, trust, happiness, anger, joy (e.g., Wilson, 2006). To close this metaphysical gap, physicalism stipulates that mental phenomena are reducible to, or identical with, physical phenomena: If physicalism is

[2] Physics, of course, is an ever-evolving discipline (compare present-day physical principles with those characterizing Newtonian mechanics). To avoid definitional slippage, let's stipulate that physicalism embraces not just our current understanding of nature, but future discoveries as well.

correct, all mental states are substances that have an entirely physical nature.

The most likely candidate for the physicality of the mental is the body in which they are presumed to reside. One part of the body—the brain—seems disproportionately relevant. The most popular physicalist approach to the mind is psycho-neural identity theory (e.g., Place, 1956)—the idea that the mind is identical with the physical-chemical states of the brain. As Crane (1995) notes "there is no well-motivated physicalist position which is not an identity theory" (p. 22).[3]

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But in what way does the brain effect an exclusively physical realization of events attributed to the workings of mind? Inspired by Turing's analysis of computation (Turing, 1936)—that is, the idea that a logical calculus can be implemented in digital computing machine—neuroscientists (e.g., Anderson & Rosenfeld, 1988), cognitive psychologists (e.g., Marr, 1982), and philosophers of mind (e.g., Putnam, 1960) have taken the position that the brain is an organic version of Turing's machine, fashioned by natural selection to solve problems by executing a series of logical operations. Although the mechanism of organic computation is thought to be the processing of trains of neuronal spikes, the exact manner in which this enables thought and behavior still is not well-understood (e.g., Piccinini & Scarantino, 2011). In this way, mental states are reduced to physical processes and the mind is seen as nothing above and beyond the computational states of the brain.

Although the popularity of computationalism has fluctuated over the years among philosophers of mind (e.g., Piccinini, 2006), the idea that neurons are the physical units that enable the brain to perform computations (i.e., the neuron doctrine) has remained a central tenet of neuroscience (e.g., Gold & Stoljar, 1999). By viewing mind as consisting wholly in neural computation, physicalism situates the mind securely within its purview.

Determinism and Free Will

If one accepts physicalism as an ontologically complete description of nature (as many do; e.g., Papineau, 2001), then all effects are physical effects and anything producing a physical effect must itself be physical. Accordingly, what we take to be mental causation (e.g., free will, intentions, decisions) is, in reality, nothing other than the physical workings of neurons. Qualitative, indeterministic notions of personal agency are taken to be illusions that blind us to the "fact" that every effect is a physical effect and therefore fully determined by a physical cause (e.g., Wegner, 2003).

In what may be the first systematic articulation of a physicalist conception of causality, Laplace (1825/2011) posed a thought experiment (often referred to as his "demon argument"). Specifically, he held that if there existed a magical being (the demon) who could know (a) all the initial conditions (e.g., the participating particles of matter, their location, state of motion and so forth), (b) all the physically relevant laws governing their behavior and interaction, and who (c) possessed an intellect sufficiently sophisticated to perform the proper analyses, then the demon (d) could predict with *absolute* certainty the future state of *any* system. That is, if conditions a through c can be met, and physicalism is true, nature is amenable to an exhaustively deterministic rendering. No additional considerations need be taken into account: Free will and other forms of mental agency are nothing more than tricks of the mind, misleading us into believing that our vo-

[3] Various well-known problems with identity theory (especially the multiple realizabitity of mental states; e.g., Kim, 1998) have opened the door to alternate conceptions of physicalism as well as competing theories of mind. For example, functionalism (e.g., Block, 1980)—which individuates mental states in terms of their overall *functional roles* and identifies token mental states in terms of whatever realizes those roles (e.g., neural computation, silicon chips or even rusty tin cans attached by string) in particular cases—doesn't require physicalism, but is compatible with it. If some version of functionalism is right, this might be thought to secure an important degree of autonomy for psychological science with respect to brain science. If minds are realized by but not reducible to brains, then psychology operates at a higher level of generality than neuroscience, and the findings of the latter can't give full answers to the questions posed by the former.

A detailed discussion of functionalism would move us far from the points I wish to make. However, it is important to note that although functionalism, if true, may be able to solve the individuation problem in *principle*, it cannot (easily) do so in *practice*. The problem centers on the attempt to individuate behaviors based on their *functional role*. As I argue in section "Individuation based on properties extrinsic to the enabling medium: A functional analysis," it is unclear how to identify which brain-based functions are high-level (and thus amenable to psychological rather than biological explanation) absent recourse to assertion, stipulation, and the threat of tautology.

litional concerns have traction in a world ruled entirely by physical contingency.[4]

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Subsequent developments in physics suggest that Laplace's demon argument, though still the conceptual bedrock of most formulations of physical determinism, is in need of fine-tuning (e.g., Balaguer, 2010). For example, the precise specification of the fate of any determinist process depends in a highly sensitive manner on exact knowledge of initial conditions of the relevant set of subatomic particles (i.e., the fundamental constituents of matter). However, because, by the principle of quantum indeterminacy (e.g., Heisenberg, 1958/1999), knowledge of these conditions never can be obtained with sufficient precision, the equations of motion cannot be solved in an unambiguous manner. Consequently, at the level of individual particle, premise 'a' cannot be realized without allowing margins of error in prediction. (Although calculating the fate of individual particles is, by the laws of physics, indeterminable, quantum mechanics does enable precise prediction about the distribution of large aggregates of particles; e.g., Thompson, 2008. In this way, human behavior, which transpires at a macrolevel of reality, might be seen capable of being accommodated by deterministic principles—but, see footnote 5).

Of course, the fact that one can explain a person's behavior in terms of nonmentalistic particulars and their properties does not preclude the possibility mentalistic explanation also can have causal relevance (this sometimes is referred to as the doctrine of compatibilism; e.g., Nichols, 2008). Indeed, some have argued that concerns about free will arising from modern neuroscience (which embraces the physicalist doctrine) are largely unwarranted (e.g., Roskies, 2006).

Compatibilism (of which there are several versions), however, faces serious challenges. For example, any attempt to endow mental states with causal potency appears to violate a fundamental tenet of science—the conservation of energy (see section "Energy conservation and free will"). According to this critique (sometimes referred to as the "argument from causal closure under the physical"), for a physical entity with purely physical properties to act on other physical entities to alter their physical properties, these entities must exchange energy. But, because energy is a property of physical entities (e.g., $E = MC^2$), any exchange between a nonphysical aspect of reality (e.g., an unreduced mental state) and the physical world (e.g., the brain) would result in a net increase in energy in the universe, thus contravening the principle of energy conservation (physicalists do not face this problem in virtue of their identification of mental properties with physical properties).

Physical determinism thus rules out any causal relations between nonphysical and physical aspects of reality. Because unreduced, agency-relevant mental states (e.g., volition, free will, intention, decision) are seen as incapable of interacting with physical reality, they either are (a) dismissed as socially sanctioned verbal conventions, recruited to help us cling to our belief in free will (e.g., the illusion argument), or (b) if they exist apart from physical substance (in some unknown manner), they do so absent any causal potency (the epiphenomenon argument).

The Unconscious Mind

If all is physical, then causality cannot be explained by appeal to mental state constructs. Terms such as judgment and free will are, at best, epiphenomena (it is worth mention that there is a sense in which the treatment of mental construct *terms* as epiphenomena runs counter to physicalist doctrine. This is because, if, say, a "judgment" *really* occurs—even as a meager epiphenomenon—it either is real, and physicalism fails, or it is a word that refers to what is entirely physical, and then it isn't causally inert). This neutering of qualitative aspects of mind fits comfortably with the modern view of the brain as a neuro-computational device (see section "Physicalism and Neural Computation"): Computers—whether consisting in silicon chips or neural networks—are physical devices that manipulate symbols in the service of some outcome which, of doctrinal necessity (see section "Determinism and Free Will"), is fully deterministic. Given these assumptions, there is no need to consider even the possibility of a role for mental aspects of reality in an account of the mind and its operations.

[4] Interestingly, it never is made clear by proponents of physical determinism how the qualitative experience of an illusion fits into a nonqualitative universe.

Consistent with this perspective, psychological scientists have taken an increasingly deflationary view of the role of consciousness in human behavior. Demonstrations that functions traditionally assumed to be underwritten by conscious mentation (e.g., memory, attitudes, thinking, calculation, reading) can be performed unconsciously have become commonplace. We thus have unconscious memories, attitudes, beliefs, thoughts and so forth (for recent reviews see Dijksterhuis & Aarts, 2010; Hassin, 2013). The conclusion drawn is that much of what formerly was attributed to the experiential aspects of mind can be fully accommodated by subexperiential processes. Taken in conjunction with the principles of physicalism, biological determinism and causal closure (sections "Physicalism and Neural Computation" and "Determinism and Free Will"), unconscious mentation calls into question what (if any) causal role remains for consciousness in the achievement of cognitive and behavioral outcomes.

Another reason to question the casual efficacy of consciousness comes from work by Libet and his colleagues on volitional behavior (for review see Libet, 1993). In a typical study, a participant has EEG electrodes attached to his or her scalp. S/he then is asked to perform some simple motor activity (e.g., raise a finger) within a particular time frame. The choice of exactly when (within the time allotted) to initiate the act is left to the participant's discretion. S/he further is instructed to disclose the moment s/he first becomes conscious of a desire to act (e.g., by noting the position of a moving dot on an oscilloscope timer). By comparing the participant's conscious decision to initiate a behavior (as indicated by the dot's location on the timer) with changes in his or her EEG signals, Libet discovered that cortical activity commenced (on average) several hundred milliseconds *before* participants indicated awareness of their intention to act. In other words, a conscious decision appeared to be reliably preceded by an unconscious change in neural activity. Libet termed this subexperiential change in cortical conductivity the "readiness potential" (Note: Although this term most often is associated with Libet, it actually antedates his writings by a few decades).

These findings have numerous implications for theories of mind. For present purposes, the take-away message is that if subexperiential processes (as identified by the readiness potential) are the true initiators of volitional mentation (i.e., if the processes that eventuate in an act commence prior to the conscious intention to act), serious questions are raised about the role of consciousness in volitional accounts of behavior (a domain of inquiry traditionally considered a safe haven for advocates of the causal potency of consciousness).

Contemporary psychological literature contains numerous demonstrations of the alleged sufficiency of unconscious mentation for control of thought and behavior. Because no synopsis can do the topic justice, one more (albeit highly influential) example will have to suffice. Blindsight—the ability of people suffering *cortical* blindness (resulting from lesions in the striate cortex) to respond appropriately to visual stimuli they cannot consciously "see" (e.g., Weiskrantz, 1997)—seems a clear case of a function unequivocally psychological in nature (perception) that is capable of being performed in the absence of conscious mentation. For example, in one study a patient was asked to locate a visual stimulus presented on a screen. Because s/he could not consciously detect the presence of the stimulus, s/he was instructed to "guess" its location. Research showed that blindsight patients were able discern properties (e.g., location, shape) of visually presented stimuli at levels of accuracy (often substantially) higher than would be expected from chance alone.

The Question: Is There Still Room for Psychology in the Science of Mind?

Mental construct terms are pervasive in psychology: They are "part and parcel of the interpretation of data whenever and wherever everyday psychological phenomena are under investigation" (e.g., Hutto, 2013, p. 30). However, if (a) physicalism is true, and (b) determinism (instantiated by subexperiential neural computation), accounts for all human acts, then (c) an analysis of mind in terms of psychological constructs is in danger of being superseded by a purely biological rendering.

Anticipating (and perhaps fostering) the sentiments of contemporary cognitive and neuroscientists, Minsky (1986) maintained that minds simply are what brains do. But brains do lots of

things, many of which (e.g., digestion, balance, respiration, hormonal regulation) do not fall within the purview of psychological science. Accordingly, the question arises "Is there a principled way to individuate brain-based phenomena that do and do not require psychological explanation?"

In what follows, I attempt to show that such individuation is more a matter of social convention and interdisciplinary turf wars than the principled outcome taxonomic analysis or nomothetic necessity. I conclude that if one ascribes to the precommitments discussed in Section 2, a biological level of explanation is both necessary and sufficient to explain *all* brain-based behaviors—even those traditionally considered the province of psychological analysis. And if explanation in terms of psychological mechanisms and processes is left with no work to do, there is no need for a science of psychology.

Can We Individuate Psychological From the Biological Activities of the Brain?

Before we can determine whether phenomena assumed to require psychological explanation can be individuated from phenomena for which biological explanation is mandated we first must have a clear idea of which phenomena traditionally fall within the purview of psychological analysis. The American Psychological Association (APA)—which can be taken as authoritative on this topic—defines psychology as "the scientific study of the behavior of individuals and their mental processes" (adapted from Gerrig & Zimbardo, 2002). Thus seen, psychology is the study of the mind and its "presumptive" effects on behavior (Note: The APA does not draw a distinction between "mental" and "mind"; see Table 1. Although the definition above refers to "mental processes," in other definitions these processes are attributed to "mind"). I use the word "presumptive" because the APA does not explicitly draw a causal link between mind and behavior. However, I think it reasonable to infer that the behaviors referred to in their definition are those whose actualization is in the interests of the mind, not those charged with sustaining the biological integrity of the organism (e.g., neural maintenance of hormonal balance). Unfortunately, as the reader likely has noted, the "line of demarcation" is not sharp. For example, are eating behaviors (e.g., food preferences, regulation of caloric intake) mediated by the mind or do they serve the purposes of homeostatic maintenance? There is, of course, no reason why such behaviors cannot be viewed as occupying that intersection on a Venn diagram where the possibilities overlap. But this simply adds to the problems facing attempts to individuate the purely psychological from the purely biological.

By definition, then, psychology is concerned with behaviors that fall under the aegis of mind. But the mind—which is nothing over and above what the brain does (e.g., Minsky, 1986)—consists in both experiential and subexperiential processes (see Table 1). And if, as argued in section "Precommitments: Physicalism, Determinism, the Unconscious", experiential reality exists solely as an epiphenomenon, it has no causal potency. Thus, all behavior attributable to the mind (e.g., recollection, volition, beliefs, plans) must result from computations performed by subexperiential neural activity (the neuron doctrine). But, because every brain-based behavior—whether in the service of mind (e.g., attempting to remember one's past) or bodily integrity (e.g., regulating glucose levels)—is neurally enacted, what makes the former "psychological" and the latter "biological"?

Individuation based on properties intrinsic to the enabling medium: A neuro-computational analysis. Short of finding some individuating signature in the neural substrate, the apportioning of behavior-to-discipline seems based largely on stipulation (rather than principled argument) in the service of justifying interdisciplinary boundaries. Consider, as one example, a brain function taken by most to fall clearly within the purview of psychological science—intelligence. As Bechtel and Wright's (2009) note, psychological explanation applies to "*any* [emphasis added] attempt to understand phenomena related to intelligent behavior" (p. 113). Although the concept of "intelligence" is difficult to define (e.g., Neisser et al., 1996), most agree that intelligent behaviors are cognitively complex, goal-directed acts that enable an individual to adapt effectively to environmental contingencies (e.g., Sternberg & Salter, 1982).

But, these criteria are too broad to enable unambiguous classification. A purely homeostatic behavior can be complex, goal-directed, and facilitate adaptive responses to circum-

stance (see below). What sanctions the identification of any particular behavior as intelligent (and thus within the compass of psychological science)? The (often unstated) assumption is that intelligent acts are "high-level" functions of the brain, and that psychology is concerned with explaining high-level brain function (e.g., Vygotsky, 1980). But now the circularity is in full view: Behavior *X* is psychological in virtue of being underwritten by high-level neural activity. But, behavior *X* is a high-level activity of the brain in virtue of its psychological nature. This approach to the assignment of behavior-to-discipline thus begs the question by assuming (i.e., high-level brain activity are psychological phenomena) what it is trying to prove (i.e., psychological explanation targets high-level activity of the brain).

There are, of course, ways to avoid this tautology, but these solutions have their own problems. For example, designating a behavior as intelligent often falls victim to species-prejudices. Take, for example, the ability to follow directions on a map. Most would classify this as an obvious example of high-level psychological behavior (indeed, a branch of psychological science is devoted, in part, to its investigation; e.g., Montello, 2005). In contrast, navigation by sense of smell ranks rather low on the human intelligence scale. But for other species (e.g., canines), olfactory navigation requires substantial neural complexity and adaptive sophistication (while viewing a map has no obvious adaptive significance). Thus, for one species, navigation by sense of smell would seem an exemplar of high-level intelligence while for another it is a primitive and inefficient method to find one's way. The level (and hence intelligence) ascribed to olfactory navigation varies by species.

If nominal designation (e.g., olfactory navigation) cannot unequivocally position a behavior on a "levels" hierarchy, perhaps assignment might be accomplished by considering the neuro-computational complexity required for an act's achievement. The ability to effectively navigate potentially unfamiliar surroundings—whether by smell or printed instruction—would seem to involve a considerable degree of complex computational resources. On this view, map reading in humans and olfactory navigation in canines both would qualify as high-level, intelligent behavior.

There are at least two problems with this proposal. First, what is the metric that maps complexity-of-computation to intelligence-of-behavior? Compare a largely motoric behavior (e.g., keeping one's balance in a blizzard) with a behavior clearly cognitive in nature (e.g., planning to cope with the effects of the storm). Although the latter intuitively seems intelligent (and thus computationally demanding—requiring involvement of such things as imagination, reasoning, planning and executing the acts they encourage), the former also appears to make considerable computational demands (e.g., vestibular and kinesthetic feedback need to be constantly monitored and updated; muscle groups have to be activated, coordinated and responsive to a largely unpredictable environment). An index based solely on computational complexity seems too general to allow specification of behaviors attributable to intelligence.

Perhaps we can avoid this problem by focusing not on computational complexity per se, but rather on the particular *kind* of computational complexity associated with brain structures that enable intelligent acts. But herein lays a second problem. To assess the computational complexity (or any other intelligence-relevant property) of a neural structure we need to know what identifies that structure as an intelligent structure. And this is notoriously difficult (e.g., Jerison, 1973). A number of proposals—for example, volume of gray matter, cortical thickness, neural efficiency, structural interconnectivity—have been advanced, but each has sustained serious criticism (for a *partial* review see Luders, Narr, Thompson, & Toga, 2009). Absent scientific consensus on the neural bases of intelligence, it is difficult to assign behaviors a place on a "level-of-function" scale based on consideration of their enabling properties.

Another way to individuate intelligent (high-level) from nonintelligent (low-level) behavior might be to consider the range of problems to which the behavior can be applied (e.g., Rozin, 1976). Viewed in terms of its phylogenetic history, any behavior initially is an adaptive specialization. Adaptive specialization refers to evolution's specific solution to a specific problem—that is, a behavior designed to deal with a narrowly circumscribed range of contingencies. For example, while certain species of honey bees have evolved the ability to communicate the location of a food source to members of the

hive, this navigational competence cannot be used for other purposes (e.g., von Frisch, 1967). Rozin proposes that intelligence is the extent to which a specialization initially developed for a specific response to a specific set of circumstances has become accessible to other neural systems, thereby increasing the scope and flexibility of the organism's ability to respond effectively to its environment.

Unfortunately, system-accessibility is not unambiguously indicative of intelligence. Continuing with the example of olfaction, consider the number of neural systems that have access to the adaptive specialization that initially enabled dogs to identify an object by its smell—for example, navigation, fertility awareness, assessment of nutritional value. Yet, despite availability to these and other systems, most would argue that such olfactory-based behaviors seem more like basic biological competencies than cognitively complex manifestations of intelligence.

In summary, attempts to distinguish psychological from biological activity of the brain in virtue of some neuro-structural property (e.g., computational complexity) are easily subject to counterexample. In addition, many fall victim to charges of tautology and post hoc stipulation.

Individuation based on properties extrinsic to the enabling medium: A functional analysis. One problem with attempts to individuate behavior on the basis of underlying mechanism is that all brain-based behavior (whether regulative, motoric, or cognitive) is assumed to depend on the same mechanism—computation. And the way in which computation is realized in its neural medium still is too poorly understood (e.g., Piccinini & Scarantino, 2011) to allow for unambiguous ascription of behavior-to-discipline.

But many things can be individuated without consideration of property or mechanism. For example, although taxis and a hearses share properties (doors, tires, chassis, mirrors) and mechanism (internal combustion engine), no one would confuse the former for the latter. What makes one an acceptable mode of transporting one's date to the senior prom, and the other morbidly inappropriate, is the *function* they serve. That is, despite many intrinsic similarities they have clear differences attributable to external purpose.

Perhaps examination of a neural structure in light of its purpose might help identify activities of the brain that require psychological analysis. For example, behaviors designed to facilitate social function seem prime candidates for psychological treatment (psychology is, after all, a *social* science). Indeed, some have argued that the major driving force in the evolution of psychological mechanisms was the advantage such neural sophistication afforded in meeting the demands of the social environment (e.g., Humphrey, 1976). Identifying behaviors possessing clear social relevance and examining their neural enablers might provide a way of individuating systems of the brain tasked with psychological functions from those with a purely biological mission.

Although at first glance a functional analysis seems promising, problems quickly arise. For example, how does one classify a behavior as social? Communicative acts such as speech, grooming, and facial expressions seem clear exemplars (e.g., Dunbar, 1998). But what about behaviors designed to maintain physical coordination? Incorrectly timed or awkward movements can have a significant impact on the quality of a social exchange (imagine trying to convey a positive first impression while you are listing from side to side). Thus, while communicative and motoric acts both can have social relevance, the former seem obvious candidates for psychological explanation while for the latter a purely biological treatment seems more fitting. Considerations of function seem to offer no reliable route to individuation.

Summing Up

Regardless of whether investigative efforts are trained on internal or external criteria, there appears to be no clear-cut way to identify which neural activities are best seen as psychological and which are better classified as biological (i.e., "the individuation problem"). And, given the "authority of the biological" (section "Precommitments: Physicalism, Determinism, the Unconscious"), when faced with taxonomic uncertainty the latter would seem the default position. The case can thus be made that the precommitments of modern psychology have the unintended consequence of calling into question whether psychological explanation is necessary to understand the workings of the mind.

Questioning the Precommitments

The fact that attempts at individuation failed to find a place for psychological explanation in the treatment of mind does not mean that individuation is impossible. A strictly biological treatment mind is sanctioned in large part by the precommitments discussed in sections "Physicalism and Neural Computation," "Determinism and Free Will," and "The Unconscious Mind". But, precommitments are not inviolable laws: They are postulates that color how we think about nature, rather than how nature itself is constituted. As Rescher (1984) observes, they are "a matter of the particular systematization of knowledge we find it *convenient* [emphasis added] to adopt." (p. 11).

Although not formally part of science, precommitments are necessary for its conduct. Because phenomena do not speak for themselves, it is difficult, if not impossible, to study *any* subject without some precommitments to give direction to how we think about and conceive of the topics under consideration (e.g., Hanson, 1958). However, it is important to distinguish the precommitments to which we *ascribe* from those that are *available*. Precommitments that guide scientific inquiry reflect "our conceptual choices and interests, but [their] truth or falsity is not simply determined by our conceptual choices and our interests." (Putnam, 1992, p. 59). The job of metascientific analysis is to assess the legitimacy of our precommitments, and, when indicated, emend or replace those found to have less-than-solid footing.

In what follows, I undertake such an analysis. A science of mind that embraces the doctrines of causal closure and completeness of physicalism must assume that mind, being a physical entity, obeys only the laws of physics. This has the consequence of reducing the mental aspects of mind to causally inert epiphenomena, opening the door to a science of the mind in which psychological explanation is superseded by a wholly biological account.

In this section I argue that neither conceptual nor empirical analyses offer clear support for the precommitments that inform modern conceptions of mind. In section "The Need to Make Room for Mental Happenings in Our Inventory of "What Is Real" and to Accord Them Causal Potency," I propose that attributing causal potency to mental phenomena is (a) necessary to understand human behavior and (b) offers a basis for legitimizing psychological treatment of the mind. I conclude that *both* psychological and biological explanation are needed to understand the mind.

Physicalism Revisited

Physicalism is a metaphysical position, not a scientific fact. It is a *presumption* that helps determine the formative background of the questions we ask nature, rather than a *fact* we discover in virtue of the answers we receive. Its utility is thus stipulated, not demonstrated.

Modern science simultaneously is inclusive and restrictive. It is inclusive in its belief that everything falls within its theoretical jurisdiction, but it restricts what it allows to qualify as "everything." Put another way, modern science trades heavily on the assumptions that (a) those aspects of reality, as we currently understand them, are exhaustive of the whole and (b) the laws and constants of physics are universal in their domain of applicability (e.g., Papa-Grimadli, 1998).

However, as Earle (1955) cautions, "We have no way of surveying the whole of reality; we have only a formal idea of it on one hand, and an infinitesimally small assortment of unclear objects on the other . . . we must in other words hold our theory in precisely that tension which represents our honest position; we don't know what the entire character of reality is, and we should not attempt to close our ignorance through impatience with the infinity of the absolute itself." (p. 89). As discussed below, Earle's cautionary message receives strong support from an ironic source—the laws and principles of modern science.

Although scientists assume that their laws and constants remain unchanged at all times and in all places, contact with reality is, in fact, limited to what we can observe locally (e.g., Wilczek, 1999). "To extend that knowledge requires both an act of faith in the uniformity of nature and a compromise with truth, for knowledge has an inbuilt uncertainty to it [e.g., Heisenberg's principle of indeterminacy]" (Shallis, 1983, p. 32). To maintain that physicalism (or any other monistic metaphysic) exhausts the nature of reality is to substitute dogma for demonstrable fact. Such a stance forecloses what we allow to stand as reality by

presuming we have license to assert that reality, in its fullness, can be captured by our current concepts, methods and instruments of measurement. To declare that the mind cannot exist (except in a physicalist incarnation) is a metaphysical conceit lying outside what can be epistemologically or operationally justified.

Physicalism asserts that mental events are reducible to the activities of a material brain. This view is endorsed by a majority of psychologists, neuroscientists, as well as (primarily Western) philosophers of mind (for review and discussion see Batthyany & Elitzur, 2006). However, limits to our ability to measure—and thus to what we can know (in the sense of true, justified belief) about—reality constitute a serious drawback for advocates of the universal applicability of a physicalist agenda.

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Consider, for example, the "light cone" of astrophysics—that is, the surface describing the temporal evolution of a flash of light in space-time. Events outside the boundaries of the cone cannot (because of the finite speed of light) send a signal that would have time to reach an observer (living or mechanical) and influence it in any way. A galaxy at a given distance from earth is defined to lie within the observable universe if the signals it emits can reach us at some time in the future. However, because of the universe's continued expansion following the Big Bang, there are galaxies whose signals will never reach us. Because the galaxies within the light cone likely represent only a tiny fraction of the galaxies in the universe (e.g., Guth, 1997), there is a substantial portion of reality permanently beyond our powers to know. It therefore remains a live possibility that aspects of the universe are forever barred from incorporation into our catalog of what is real. In short, our understanding of the physical parameters of the universe is, by the laws of science, potentially incomplete.

Turning from large-scale indeterminacies to uncertainty occasioned by the very small, Heisenberg's indeterminacy principle decrees that nothing can be known about the properties or behavior of entities that occupy minute (i.e., 10^{-13} cm) regions of space (e.g., Heisenberg, 1958/1999). For example, the Planck length is the spatial interval within which the properties of entities cannot be measured simultaneously to an accuracy of greater than $h/4\pi$ (i.e., $\Delta p\ \Delta q \leq h/4\pi$), where h is the Planck constant, and Δp and Δq are the measurement uncertainties associated with the location and momentum of an entity (Planck, 1925/1993).[5] Fn5

These restrictions on our ability to "know reality" follow from the basic structure of relativity and quantum theory. Regardless of whether they ultimately are shown to reflect epistemological limitations on the scope of our understanding, or ontological limitations stemming from the nature of reality, they warrant the conclusion that (at least at present) we have no way to detect what transpires at great distances from our earth-bound reference points or within certain minute regions of space. This being the case, it is logically impossible to know whether phsysicalist doctrine has universal applicability. In short, while they do not offer direct support for the reality of the mental (but see sections "An argument from the sensation," "An argument from knowledge," "An argument from evolution," and "An argument from meaning"), these constraints on our ability to know impose boundary conditions on *all* scientific inquiry.

There are other reasons to question the completeness of physicalist doctrine. First, the scope of our ability to comprehend reality is circumscribed by the limitations of our sensory capacities and cognitive abilities (e.g., McGinn, 1991). Thus, there not only are limits on what can be known imposed from without (i.e., theoretical constraints on what can be measured); there also are limits from within (i.e., constraints on our powers to perceive and conceptualize). Second, our inability to situate a phenomenon within a physicalist scheme does not license its debarment from membership in "reality." Thousands of years ago, humans learned to extract energy from matter (e.g., the discovery of fire) despite lacking any plausible physicalist account of how such a transformation was accomplished. If a credible physical explanation is a prerequisite for bestowing existence on a phenomenon, the designation of fire as part

[5] Although issues of quantum indeterminacy seem far afield from human-scale events (but see section "Energy conservation and free will"), quantum-level happenings can have serious consequences at the macro-level. For example, the activities the subatomic particles might, via a feed forward sequence of causation, eventuate in feelings of hatred which, in turn, result in a fist fight (or even a war between nations). The message is that all phenomena, regardless of physical dimension, are subject, in varying degrees, to the effects of quantum uncertainty.

of reality would have had to await developments in chemical and physical theory taking place in the 19th century.

In summary, theoretical, perceptual, and logical considerations suggest that we cannot observe, much less know about, the behaviors, dispositions and properties of reality falling within (or, in the case of the light cone, outside) the borders of these epistemological "black-boxes." In light of these considerations, it seems that the ontological status of the mind is held hostage to an unverifiable physicalist precommitment. The assertion that mental phenomena are subsumed by purely physical events cannot, at present, either be proved *or* disproved.

This is not to say that physicalism is false, or that mental aspects of reality always will remain beyond its reach. A fully matured physics (see Footnote 2) may be capable of explaining *all* there is to explain (however, there are considerations—such as the Gödelian incompleteness of any formal system [see below]—that suggest such an expectation is, in principle, unrealizable; e.g., Strawson, 2006). But the important caveat here is "fully matured." Historical induction strongly suggests that adjustments to our understanding of physical reality cannot be predicted with certainty—that is, we cannot know the extent to which the future will resemble the past, the unknown the known (e.g., the orderly physics of Newtonian mechanics could not anticipate, much less accommodate, the chaotic behavior of quantum reality). Perhaps a "finished" physicalism will be capable of explaining the mind without having to treat its subjective aspects as epiphenomenal detritus (e.g., Russell, 1921/1949). But we do not at present know what a fully matured physics might consist in. And, for a number of reasons (e.g., Spencer Brown, 1957) we never may. Accordingly, tethering our understanding of mind to a future version of physicalism requires we accept a promissory note with no way of envisaging the conditions of the note.

Of course, one might argue that although metaphysical positions, such as physicalism, cannot be directly confirmed or disconfirmed, such positions receive indirect support from the success of the kinds of inquiry with which they are associated. The extraordinary achievements of physics therefore might be taken as providing sufficient reason to endorse a physicalist view of mind.

But the authority of physicalism reaches only as far as those aspects of reality for which it has been fitted. And, as we have seen, inductions and prognostications about experiential reality based on the precommitments of modern psychology are more a matter of stipulation than the principled importation of discovered facts or theoretical prescriptions (e.g., Klein, 2014a). Accordingly, rejection of attempts to uncritically extend scientific methodology to the domain of experiential reality should not be taken as a revolt against science. Rather, it should be seen as a challenge to the assertion that knowledge obtained by scientific methodology is "the only kind of knowledge that existed or ever could exist." (Collingwood, 1946/2005, p. 134).

More, physicalist treatment renders the study of experiential reality largely without a subject matter—that is, mental phenomena are treated either as epiphenomena or folk psychological linguistic convention (a fate not befalling aspects of reality for which physicalism appears canonical; for discussion see Footnote 8). In short, despite its undeniable achievements, the authority of physicalism *must* be questioned when its applicability is extended to domains significantly different from those to which its accomplishments pertain.

Let me be very clear. I am *not* arguing we therefore should endorse spiritualism, immaterialism or other nonphysicalist approaches to mental phenomena. It may very well be the case that a fully matured physicalism will fully accommodate phenomena that, under its current rendition, are seen as the epiphenomenal residue of nature (but see Strawson, 2006). But we have no way of knowing what such a reenvisioning might consist in. And until we do, it is unwise to tether our understanding of experiential reality to a metaphysics that has the effect of assigning the single most undeniable aspect of our existence to a lower grade of being (e.g., Klein, 2015).

Determinism Revisited

The logic of physical determinism. As noted in section "Determinism and Free Will," Laplace's demon argument underpins most versions of physical determinism. In this section I hope to show that one of the premises of the demon argument—that is, "we can know all the

physically relevant laws"—is, by Gödel's incompleteness theorem, demonstrably false.

First, from a practical standpoint we (currently) cannot formulate laws that enable precise prediction of future contingencies. Although the equations of physics can calculate the exact (or, more accurately, correct to many decimal places) causal history of two interacting objects, prediction becomes progressively more approximate as the number of interacting objects increases (this is referred to as the "n-body problem"). Whether dealing in classical or quantum mechanics, the equations used to predict the interactions of more than two bodies yield only approximate solutions (such prediction often is based on analysis of a power series that converges so slowly that getting its value to any useful precision is impractical; for review see Valtonen & Karttunen, 2006).

Although this might seem a temporary setback—one we can expect to be remedied by the development of more computationally sophisticated physical laws—there is a more fundamental concern that cannot be resolved by mathematical refinement. According to Gödel's incompleteness theorem, one cannot supply proofs for *all* the laws that capture *all* the truths about any formal system from *within* that system. In other words, for any given set of axioms, there are true mathematical statements that cannot be derived from the set itself. There always will be statements about the system that cannot be proved within the system—hence the name "incompleteness theorem."

Mathematical statements that are assumed true, but cannot be proved within their system of origin, can, according to Gödel's logic, be proved within larger systems which can be shown to be valid forms of reasoning. Thus, one always can seek a metaformalization to capture all of the "truths" of any closed system. However, these larger systems also are subject to the incompleteness theorem. Thus, the incompleteness is iterated infinitely: Because of infinite regress, certain laws assumed true within a system of axioms cannot be proven within any finite time. So, neither you, nor I, nor Laplace's demon can know with mathematical certainty "all the laws." And if that is the case, then the deductive argument for determinism falls victim to the falsity of one of its premises: "If we know *all* the physically relevant laws."

These considerations create serious problems for determinism by making it impossible to empirically verify its tenets. For example, to demonstrate that a person's actions are wholly deterministic, one needs to show that *precise* knowledge of the relevant initial conditions and laws *guarantees* that a sufficiently sophisticated being could predict *exactly* how she will behave. But such knowledge—in virtue of epistemological and mathematical limitations discussed above—is forever beyond our reach. Although this does not necessarily entail that determinism is false (or that free will is true), it does mean that we have no way to validate determinist accounts of human agency. Epistemologically, human behavior will always contain an element of unpredictability. Whether this uncertainty results from limitations in our understanding or is intrinsic property of nature is, and always will be, indeterminable. The upshot is that the possibility of free will remains a live option (for a critique of Wegner's arguments against free will see Nahmias, 2002).

Energy conservation and free will. An oft cited objection to free will is that its implementation would violate the law of energy conservation (e.g., Ney, 2012). The physicalist version of this critique begins with the assertion that a physically existing entity with physical properties acts on other physical entities to alter their physical properties. For one entity to influence another, they must be capable of exchanging energy. Because energy is a property of the physical world, any exchange between a purely mental event (e.g., an unreduced belief) and a purely physical entity (e.g., raising one's arm) would result in a net increase in energy in the universe, thereby disobeying a fundamental laws of physics.

Objections based on energy conservation are grounded in the assumption that all causal interactions result in and from the exchange of energy. This assumption, however, does not enjoy universal agreement. For example, some recent models of causality trade on the assumption that what is exchanged between things in interaction is not energy, but information (e.g., Fields, 2012). Accordingly, intentions, memories, perceptions, beliefs, and other mental states can be granted causal potency if their effects result in *information* rather *energy* being exchanged between interacting participants

(there is, to my knowledge, no generally accepted law of information conservation).

Imagine, for example, that a person decides to write a letter to a friend. In this scenario, a great deal more than energy is exchanged between cause (the writer) and effect (the target of the missive)—for example, *interpreting* the *meaning* the words are *intended* to convey. Mental state concepts such as interpretation, meaning, and intention refer to aspects of nature that have causal potencies, albeit potencies that are informational rather than energetic (for a more analytic treatment, see section "An argument from meaning").

Other problems with the energy conservation position are worth brief mention. A number of neuroscientists have proposed that interactions between mind (construed in terms of its mental properties) and the brain are localized in activity taking place in regions falling below the microlimits of epistemological resolution (e.g., events occurring within the paracrystalline structure of the presynaptic vesicular grid; for review see Smith, 2003). If these ideas have merit, the law of energy conservation no longer has uncontested applicability in the realm of things mental, because, by the principle of quantum indeterminacy, activities taking place in the microstructure would be unknowable. As Meixner (2005) points out, there is little, if any, empirical evidence for the applicability of conservation laws to the mind. Accordingly, the universal applicability of such laws is an *assumption* of the physical sciences—not, as often presented, an empirically defensible *result*.

Recent years have seen a number of challenges to the principle of causal closure (the interested reader is referred to Baker & Goetz, 2011). These critiques—taken in conjunction with epistemological limits on our ability to know about events occurring in very distant or very small regions of space (see Section 4.1.2)—suggest that, as currently configured, arguments from closure do not sanction any strong position with respect to the mind's causal potencies. Free will remains a viable possibility (the question of whether mental states are epiphenomena is treated more fully in section "The Need to Make Room for Mental Happenings in Our Inventory of "What Is Real" and to Accord Them Causal Potency").

The unconscious mind. Even die-hard supporters of conscious causality recognize that the mind consists in both mental states *and* their subexperiential enablers (see Table 1). Accordingly, demonstrating that an unconscious processes can eventuate in a behavioral outcome does preclude a role for consciousness in the realization of that behavior. To think otherwise is to engage in the fallacy of assuming that because process *X* is necessary for function *Y*, it also is sufficient. Although the performance of any particular behavior is made possible (in part) by unconscious aspects of the mind (e.g., neural computation), this does not, by itself, rule out a role for conscious processes in the behavior's realization (e.g., Newell & Shanks, 2014).

Consider, for example, the phenomena of unconscious social priming (e.g., Bargh, Chen, & Burrows, 1996). Unconscious social priming (a favorite "proving ground" for those who champion the explanatory sufficiency of subexperiential processes) refers to a participant's performance on tasks in which a stimulus—presented in a manner falling outside the participant's awareness—subsequently is found to affect his or her behavior in a manner that rationally can be tied to information embodied in the stimulus. Although such findings, if reliable (and there currently are big questions in this regard; e.g., Klein, 2014b), suggest a role for subexperiential process in performance of behavior, they do not sanction the conclusion that consciousness plays no part in its enactment (e.g., the claim that "unconscious processes can carry out every fundamental high–level function that conscious processes can perform"; Hassin, 2013, p. 195). I respectfully suggest that an insentient individual would face insurmountable difficulties either in acquiring information presented in a social priming study or displaying its effects on his or her behavior.

In short, the most one can say about social priming demonstrations of subexperiential factors in causation is that they are a necessary condition for the performance of behavior. Whether they are sufficient (as is implied by the Hassin quote) is not presently determinable—because an unconscious participant will be minimally responsive (at best) to his or her milieu (for a recent critique of claims made by proponents of the sufficiency of unconscious mentation, see Hesselmann & Moors, 2015).

Other challenges to the presumed irrelevance of consciousness in performance of behavior

traditionally considered to require conscious mediation target case findings such as those reported by Libet. Here too, careful conceptual analysis has shown that the implications of these studies for conscious mentation are far from clear (e.g., Banks & Isham, 2009). For example, the claim that Libet studied spontaneously generated acts appears at odds with the fact that participants were explicitly told to perform the "spontaneous" acts! And, although we know that a readiness potential appears before a participant's avowed awareness of "intent to behave," what this potential is in readiness of is based more on assertion than demonstration. Perhaps, for example, it is in the service of preparing the mind for a subsequent, consciously mediated, decision on whether to act (for discussion about the implications of Libet's findings for a volitionalist account of behavior, see Robinson, 2012).

As noted in section "The Unconscious Mind," the phenomenon of blindsight has led many in psychology and the neurosciences to question whether our intuitions about the role of consciousness in visually based behavior need to be revisited. This concern, I believe, is premature. Although discussion of conceptual issues attending interpretation of the findings generated by blindsight patients would take us far afield, I refer the reader to Holt (2003) for an excellent treatment of what, if anything, would require revision *even if* it could be shown that performance of behaviorally relevant visual function can occur absent conscious experience.

Summing Up

In this section I questioned the advisability of a largely uncritical acceptance of the precommitments of modern psychological science. I concluded that (a) our precommitments are not unequivocally sanctioned, and (b) by the laws of physics, they are barred from attaining such standing. Although they *may* eventually be shown to be the best path to understanding how the mind works, at *present* their applicability is more a matter of assertion than nomothetic necessity. Accordingly, the epistemological door is left ajar for the explanatory relevance of a psychological treatment of mind.

The Need to Make Room for Mental Happenings in Our Inventory of "What Is Real" and to Accord Them Causal Potency

Thus far my approach has been largely negative—I presented evidence and argument *against* the idea that mental states can be unambiguously fitted to the physical-determinist agenda and, in so doing, reduced to epiphenomena. In this section, I take a positive approach—arguing *for* inclusion of mental happenings in our catalogue of causally efficacious aspects of the mind.

According to the precommitments of modern psychology, mental properties, if they exist, do so as epiphenomena. Because, by stipulation, a nonmaterial aspect of reality can have no causal relations with the material world (the principle of causal closure under the physical), mental events are, by definitional fiat, stripped of any capacity to interact with the world of physical reality. In what follows, I argue that it makes sense to accord ontological status and causal potency to what is considered by many to be the single most ubiquitous aspect of our existence—our subjective experience (e.g., Strawson, 2009).

General Considerations: Saving the Phenomena

> In moving to a sub-personal level of explanation we are changing the subject matter, the target of explanation. (Wong, 2014, p. 96)

Reality, in its most general sense, is taken to mean everything that has being; that is, everything that exists. Although subject to considerable discussion and emendation over the centuries, Western science currently holds the view that there is only one reality—physical reality. But arguments for the inclusion of another reality (mental reality) in addition to the physical are beginning to undermine the existential hegemony of physicalist doctrine. For example, Tulving and Szpunar (2012) maintain that "Despite doubts that some thinkers, through the ages, have suffered privately or expressed publically, mental reality is as 'real' as physical reality" (p. 257). The constituents of mental or psychological reality include such things as sights, sounds, thoughts, love, hate, jealousy, images, memories, ambition, suffering, happiness, beauty, ugliness, dreams, hopes, feelings,

beliefs, doubts, wisdom, stupidity, the pull of the past, the anticipation of the future—that is, the processes and states that populate things "mental."

The relation between physical reality and mental reality, as Tulving and Szpunar see it, is complicated. "Although mental reality is utterly dependent on physical reality, in the sense that it could not exist in the absence of physical reality, it also is independent of physical reality in the sense that what exists in mental reality does not exist in physical reality. . . . There are no thoughts, images, memories . . . experiences, dreams, feelings, hopes, fears . . . in physical reality . . . there is neither personal past nor personal future . . . there is no self." They continue, "The converse also is true, there is not a single thing that exists in physical reality that also exists in mental reality. There are no rivers or mountains, tress or flowers, no brain, no blood, no neurons or synapses, no molecules of atoms in mental reality" (p. 258).

Although this may sound like substance dualism, the authors take strong objection to such categorization. "Like all other cognitive neuroscientists we accept as axiomatic that mental reality is fully dependent on the brain, is continuous with the brain the rest of physical reality. The brain and the mind are made of the 'same stuff.' We do not yet know what that 'stuff' is but we have reason to believe that eventually it will be discovered. Contrary to what some people like to declare, we know that the brain and mind are not identical. The brain and the mind are different entities constituted of the same basic 'stuff'" (Tulving & Szpunar, 2012, p. 258). (This position could still be characterized as a form of dualism, albeit a dualism of property rather than substance). I fully endorse these sentiments—that is, that mental phenomena, though dependent (in some way) on properties of the physical, are neither reducible to, nor fully explicable in terms of, purely physicalist considerations.

In light of its assignment by scientific precommitment to the realm of epiphenomena, it is ironic that subjective experience is what makes the pursuit of scientific knowledge possible. Telescopes, microscopes, timing devices, nuclear accelerators, neuroimaging technology, and the host of modern means of obtaining objective knowledge about reality are useless absent an experiencing subject to manipulate these instruments, record their output, and interpret its meaning (e.g., Dewey, 1958). As Gallagher and Zahavi (2008) point out, "Science is performed by somebody; it is a specific theoretical stance towards the world . . . scientific objectivity is something we strive for but it rests on the observations of individuals" (p. 41). To believe otherwise has the absurd consequence of rendering our knowledge of reality dependent, in its entirety, on the provisions of an experiential conduit stipulated to be causally impotent or nonexistent.

As I hope to show, we must, of both practical and theoretical necessity, make a place for psychological reality in our inventory of "what is." We also need to accord it participatory status. Our mental states are not passive, causally ineffectual observers; they are active agents. Below, I present several arguments for the treatment of mental happenings as causally relevant members of reality.

An argument from the sensation. Discussing the limitations of a reductive analysis designed to connect the level of neurobiological events with events at the level of mental experience, Antoietti (2008) observes the following:

> While in the scientific study of physical realities it makes sense to move from appearance [e.g., water] to a "deeper" reality [e.g., the molecular structure of water—H_2O], where the mind is concerned it is not a question of going to a deeper reality, because the subjective appearance is the essence of the mind. . . . Painfulness is not a contingent property of pain, painfulness is the essence of pain; there is no appearance beyond the pain itself; I feel pain, the sensation of the pain is all I feel; it is a non-sense to say the [experience of] pain is actually a neural process. (p. 52).

It is "a non-sense" because although we understand how the properties of water can be connected to, and understood in terms of, the properties and relations of their molecular constituents, we cannot understand how the experience of pain can be derived from, or conceived in terms, of the physical activity of neurons (e.g., Robinson, 2008).

In fact, the experience of pain and our response to that experience makes a case for the causal potency of experiential reality. A person placed under general anesthesia does not experience pain (else anesthesiologists would be out of work), despite having his or her c-fibers fully functional in the presence of pain inducing stim-

uli (e.g., the physician's scalpel). While the effects of general anesthesia on central nervous system (CNS) activity result in both unconsciousness and lack of sensation, it is believed that the unconscious state, rather than a deactivation of CNS mechanisms devoted to processing sensory stimuli, accounts for the absence of pain during surgery. If this is the case (admittedly, there is some uncertainty concerning how general anesthesia achieves its analgesic effect; e.g., Miller, Eriksson, Fleisher, Wiener-Kronish, & Young, 2010), then conscious experience must play a causal role in pain-based behaviors. No consciousness, no pain, and no pain, no pain-relevant behavior (e.g., avoidance, grimaces, screams).

An argument from knowledge. Another argument for the need to accord mental states a causal role comes from Jackson's (1986) famous thought experiment about Mary, who is forced from birth to live in a black and white room. To ease any feelings of isolation, Mary is allowed to investigate the world via a black and white monitor. Over time she becomes a brilliant scientist who has learned *all* the physical information there is to know about vision—for example, exactly which wavelength combinations from a red tomato reach the eye, how retinal information is transferred via the optic nerve to the occipital cortex, and so forth.

The question Jackson poses is "if Mary was released from her black and white room would there be anything left for her to know that she had not already acquired via her *exhaustive* knowledge of the physical science of vision?" For Jackson the answer is "yes": On release Mary acquires knowledge that she did not previously possess—that is, knowledge of the qualia associated with color (e.g., the redness of a ripe tomato).[6] These qualia previously had been inaccessible to her because she had never *experienced* color herself.

Fn6

But, if this is the case, then her previous knowledge of color was incomplete. A person who knows everything there is to know about the science of color, but has never experienced color, can describe the color experience in complete, analytic detail. But she cannot know what the subjective, qualitative experience of seeing color feels like (e.g., Nagel, 1974) until she actually sees color. And if Mary has learned something new about the world (via her color experience), then physicalist claims about completeness are subject to counterexample. If there is more to reality than what can be captured by the principles of physical science, physicalism necessarily is false.

More, if Mary responds to her *experience* of color (e.g., "Oh wow, so that's what red looks like!"), than her experience is having a causal influence on her behavior. If that is the case, than the epiphenomenal status attributed to subjective experience also must be false (after all, prior to her exposure to the ripe tomato she already possessed every physical fact about the color red). So, not only has a new, qualitative fact entered her world, but that fact enables a *response* unavailable to her from her preexposure, purely descriptive knowledge of color.

An argument from evolution. Physicalist arguments in support of the epiphenomenal status of "things mental" also are contraindicated by principles from within the physical sciences themselves. As many have noted, mental experience is the thing of which we can be most certain (e.g., Klein, 2015). But how can a constituent of mind attain the status of existential certainty if its presence, by definition, is invisible to natural selection (i.e., they are epiphenomena)? Evolutionary processes cannot engage with aspects of reality that have no behavioral signature: There simply is nothing on which natural selection can work.

The only scientifically sanctioned explanation available to a proponent of epiphenomenal-

[6] It is worth noting that Jackson subsequently rejected the implications he initially drew from his "Mary" thought experiment (e.g., Jackson, 2003). His concern was that to know that Mary has a new experience, she must comment on her experience. However, this means that Mary's qualia have caused her to comment. And because this contradicts the attribution of epiphenomenal status to her mental states (i.e., it involves a quale causing speech behavior), Mary's thought experiment presents a contradiction. Jackson concludes, therefore, that there must be something wrong with his thought experiment.

However, this "contradiction" follows only if one is committed, a priori, to the position that mental states are epiphenomenal. And, as I hope to have shown in section "The Need to Make Room for Mental Happenings in Our Inventory of "What Is Real" and to Accord Them Causal Potency," this is a highly questionable stance. Accordingly, the contradiction may be due to Jackson's pre-commitment to epiphenomenalism rather than the internal logic of his argument.

ism of mental states is to argue that they are an evolutionary by-product. But we know from personal experience that mental states can be complex (e.g., rational thought) as well as phenomenologically preeminent. And because, as Williams (1966) notes, complexity of mechanism is a hallmark of adaptive specialization, the by-product explanation is highly improbable. Either we reject evolution, find another explanation for how we have come to possess complex mental states that are undetectable by, and thus not subject to, the workings of natural selection, or grant causal status to mental events. I contend the third option makes the most sense (particularly in light of previous arguments offered in its support).

An argument from meaning. In an influential paper on determinism, Sloman (1974) noted that mental causality cannot be simply treated as a two-termed relation ($X \rightarrow Y$) between a physical antecedent (X) and its physical consequence (Y). This is because *meaning* also is a constituent of the relation between X and Y. The argument goes as follows (see also Dewey, 1958).

If the physical acts of our bodies are fully determined by physical causes, then there is no place within the physical-determinist agenda for such things as beliefs, intentions and meanings. But, if this the case, then how does one know how to respond when, for example, upon meeting your friend John, he raises his arm and forms a fist? The answer is that you know how to respond by giving meaning to the physical event (John's clenched fist). That is, you use your *beliefs* about John's personality, *memories* of his past behavior, *knowledge* of the present context, and so forth, to determine your response. Because you know that John is a kind person and remember that he just got accepted into the college of his choice, you *understand* that his raised his fist as an act of celebration rather than aggression, and respond appropriately (e.g., you give him a pat on the back rather than punch him in the face).

In short, mental phenomena supply meaning to what, in purely physical terms, is ambiguous behavior. On this view, mental causality is actually a three-termed relation in which one's "mode of interpretation" (M) provides meaning to the physical antecedent (X) as well as direction to the action taken (Y). As Sloman notes, the relation between mental and physical phenomena "is not a two-termed one, but involves a third term, a mode of interpretation . . . [and] since different modes of interpretation may be appropriate in different circumstances, there need be no reliable inductive correlations between physical phenomena and [mental states]" (Sloman, 1974, p. 293).

The key here, of course, is the introduction of *meaning* into the causal equation. Absent interpretation of what an antecedent event "is about," no informed or proportionate response can be offered in consequence. But meaning is not something easily identified solely in reference to states or properties of physical entities; for example, Wittgenstein, 1953/2009). It is part of the qualitative character of experience (e.g., Strawson, 2009). In this way, mental states make a difference to how we interact with the physical world.

Summing Up

Although each of the arguments presented has its share of critics (there is a reason the mind/body problem has been subject to intense debate for thousands of years), taken together I believe they make a solid case for according causal potency to the mental aspects of the mind. And if that is so, then mental construct terms cannot legitimately be consigned to an epiphenomenal existence.

Conclusion

In his discussion of the Enlightenment, Collingwood (1946/2005) observes that philosophers based their treatment of mental reality on an analogy with established physical sciences. Unfortunately, Enlightenment philosophers failed to notice an important difference between physical and mental aspects of nature—one that calls into question the extent to which the analogy holds. As we learn about a physical objects (via chemistry, physics, biology, etc.), we can use these discoveries to better understand the object' nature and realize its potential (e.g., as a raw material for manufactured goods, as a source of energy, etc.). But growth in our knowledge does not alter the object: "Nature stays put, and is the same whether we under-

stand it or not" (Collingwood, 1946/2005, p. 84).[7] Fn7

However, growth in our understanding of mental reality changes the object of inquiry: As the mind comes to better appreciate itself, this knowledge transforms its way of being in the world and its mode of operation (compare the workings of the superstitious mind of antiquity with those of the rational mind of the Enlightenment). Mental states are not merely knowable—the mind is capable of reflecting on that which it knows, thereby enriching the conscious mind and creating new things for it to know.

Consequently, by accepting a false analogy between knowledge of nature and knowledge of mind, 18th century philosophers viewed the mental happenings as though they were just another part of physical nature, when in reality they are importantly different (for additional discussion see Klein, 2015). This disanalogy, I have argued, characterizes much of contemporary approaches to experiential reality.

The questionable commitment to a parallelism between physical and mental aspects of reality is underscored by the problem of subjectivity. Within the limits of current understanding, there exists no viable, or even moderately convincing, explanation of how nonconscious physical matter gives rise to subjective experience (e.g., Klein, 2014a; McGinn, 2004; Robinson, 2008; Strawson, 2009). And, so long as concepts of neural function have no explanatorily transparent links with mental constructs, there will be no conceptual bridge capable of spanning the conceptual gap in our understanding of mind/brain interaction. Accordingly, we must, of both practical and theoretical necessity, remain open to the possibility that experiential reality merits inclusion in our inventory of "what is" and "what works." And if this is the case, then the mental construct terms will have an explanatory relevance not fully subsumable under a bio-physical level of explanation.[8,9] Fn8,9

The alternative, fostered by the precommitments of contemporary psychological science, is to force reality—"all there is"—into a (currently) unverifiable physicalist metaphysics. If psychologists adopt this approach, we expose psychological phenomena to a complete makeover in terms of biological process and mechanism: There simply will be no room for a science of psychology. Although my proposal (that mental states need to be accorded explanatory relevance in our treatment of mind) is not problem-free, it does offer a logical, phenomenological, and empirically defensible way to approach some of the problems entailed by strictly physical-deterministic approach to the mind.

Indeed, understanding nature *requires* we accord subjectivity a causally efficacious role

[7] The "stasis of the real" here refers to ontological simples (i.e., the basic constituents of nature). However, science draws a distinction between ontological simples and the processes in which they participate. Whereas at the level of simples "nature stays put," at the level of interaction between simples change is inevitable (though even here stasis is pursued—the laws of science being attempts to freeze the natural order into changeless formulae; e.g., Spencer Brown, 1957).

[8] This conclusion obviously runs counter to the position taken by advocates of eliminative materialism (e.g., Churchland, 1981). According to this metaphysical position, a fully matured neuroscience will have no need for mental state constructs: Just as modern science has eliminated many posits once considered real entities (e.g., aether, vital forces, phlogiston), mental states will be discarded as wholly lacking any correspondence to objective phenomena.

A problem with this analogy, however, is that unlike phlogiston and aether, with which we have no direct acquaintance (they exist only as linguistic devices), subjective experience is phenomenologically undeniable. Although our beliefs about our mental states, and the terms we use to label them, can (and have been) subject to intense debate (e.g., Uttal, 2001), these beliefs (unlike those directed toward, say, the aether) take as their object irrefutable, introspectively-given states whose characteristics are made visible by the experience itself. More, the content of a mental state need not be arbitrary, ambiguous or inexpressible: Intra-subjective experience can be subjected to empirical analysis, providing descriptions and conclusions that attain inter-subjective consensus.

[9] It might be objected that a great deal of psychological science proceeds quite independently of any consideration or effect of the scientific pre-commitments discussed herein. However, much of this work is demonstration- rather than theory-driven (e.g., Klein, 2014b). Unless this facet of psychological inquiry wishes to be subsumed under social anthropology (e.g., people do *Y* in presence of condition *Z*), increased effort is needed to relate observed effects to well-specified theories capable of enabling parametrically precise predictions (not simply the binary outcome of "effect present/effect absent"). Accordingly, as demonstration-driven psychological empiricism becomes a mature science it inevitably will come into contact with the scientific pre-commitments described herein (or their replacements).

in our ontology (e.g., Klein, 2015). As Dewey (1958, p. 13) observes, "recognition of subjective minds having a special equipment of psychological abilities is a necessary factor in subjecting the energies of nature to use as instrumentalities for ends." Rather than saddling experiential aspects of reality with epiphenomenal impotency, we are better served by bestowing on subjectivity a full-fledged participatory status in the natural order (e.g., Valera, Thompson, & Rosch, 1993). Training our investigative efforts on the role played by subjective processes in the workings of mind enriches our understanding of reality in the fullness with which it is given to experience.

I close with a quote from Dan Robinson (2002) who, with his characteristic combination of precision, clarity, and insight, summarizes in a three sentences what I have struggled for pages to communicate: "What makes it [the brain] interesting is its non-accidental association with those events, states and processes we refer to as psychological. Reduce these, eliminate them, trivialize them, and, in just that proportion, the brain sciences become reduced. Psychologists have an important service to perform *vis a vis* the Brain Sciences; viz., supplying them with a *psychology worth having*" (p. 11).

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