

## Why biological neuroscience cannot replace psychology

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**Abstract:** Gold & Stoljar argue persuasively that there is presently not a good case for the "radical neuron doctrine." There are strong reasons to believe that this doctrine is false. An analogy between psychology and economics strongly throws the radical neuron doctrine into doubt.

Gold & Stoljar (G&S) have provided an excellent case for believing that current arguments for the "radical" version of the neuron doctrine – that a successful theory of the mind will consist purely of biological neuroscience – are not persuasive. In this commentary, I take the next step and argue directly that the radical neuron doctrine is false.

In cognitive science it is standard to view the mind as a computational device. An analogy with conventional digital computers then immediately suggests that an equivalent of the radical neuron doctrine – what one might term the "radical transistor doctrine" – is patently absurd. The entire subject matter of computer science testifies that a successful theory of digital computation is not couched in terms of transistors or, indeed, in terms of electrical engineering at all. Instead, there is discussion of programming languages, computer programs, data structures, and so on, none of which has any interpretation at the level of transistors. However, this argument is not likely to persuade advocates of versions of the radical neuron doctrine, because they simply reject the analogy between the brain and digital computation.

Let us therefore consider instead a different domain: economics. Economists talk about notions such as "money," "price," "inflation," and so on. The laws of economics are defined over these and similar notions. Let us call the "radical physics doctrine" the view that economic phenomena should really be explained purely in terms of physical properties of the world. The deep problem with this doctrine is that economic notions do not have any physicalistic specification. Crudely, there is nothing *physical* about the note in my pocket that makes it worth five pounds sterling. After all, an atom-by-atom replica of the note created by some devious forger will be worth nothing, though it will pass successfully into circulation unless its origins are revealed. Moreover, if the Bank of England decides to mint a five pound coin, and remove the note from circulation, my note becomes worthless, even though its physical properties are unchanged. Similarly, and perhaps more strikingly, consider that the only physical correlate of my bank balance may be a complex distributed physical pattern on the hard disk of my bank's computer. The economic properties of my bank balance are (I hope) unchanged if my bank changes its computer system, or switches to a different kind of storage medium, but the physical correlate of my bank balance changes radically. Quite generally, economic concepts and laws can simply not be expressed at all in the language of physics; it would therefore seem to be a great mistake to attempt to explain economic phenomena in purely physical terms. The radical physics doctrine would appear doomed.

What is the upshot of the analogy? It places advocates of the radical neuron doctrine on the horns of the dilemma: They must either accept the analogy between the two doctrines and somehow find a way to accept the radical physics doctrine with respect to economics or find a disanalogy between this doctrine and the radical neuron doctrine, which shows the latter to be more acceptable.

The first option seems extremely unappealing. By staying with physical descriptions we are simply unable to talk about "money," "price," and so on, yet these notions appear to be central not just to present theoretical accounts of economics but to the very subject matter of the discipline. To put the point simply, we have no way of conceiving how we might predict and explain phenomena

in terms of, say, elementary particles that we currently predict and explain in terms of supply and demand.

However, the second option is also difficult to defend. There seems to be no more reason to suppose that psychological notions, such as "memory," "attention," and so on will one day be replaced by rigorous talk about neurons than there is to suppose that economic notions, such as "money," will be replaced by talk about physics.

One attempt to make the overthrow of psychology by neuroscience seem plausible points to the provisional, partial, and generally unsatisfactory state of psychological theory, but the very same criticism can be levelled at economics. In both cases, what seems to be required is more and better theory at the same level of analysis; it seems patently self-defeating to attempt a radical shift to a different and more basic level of analysis.

Another attempt to make the overthrow of psychology by neuroscience seem plausible points to the fact that neuroscientists are gradually clarifying how psychological notions such as "memory" have a neural basis (in terms, for example, of long-term potentiation; Bliss & Lømo 1973). This is of no help, however, because this kind of knowledge is already in place in the economic case – we already know that the "physical basis" of my being able to buy a newspaper consists of the possession of coins or notes with particular physical properties. The problem is that in neither the psychological nor the economic context are the physical properties appropriate for couching relevant generalizations: The physical properties of a note do not make it worth five pounds, and the physical properties of a memory do not make it a memory of visiting London or buying a filing cabinet. In sum, the radical physics and the radical neuron doctrine seem equally unattractive as guiding principles for scientific research; in both cases, accepting the doctrines immediately undercuts the theorist's ability even to talk about the phenomena of interest, let alone to explain them.

G&S end their target article with a plea for further work in what they see as the underdeveloped field of the philosophy of neuroscience, to be concerned with the "presuppositions and philosophical problems of neuroscience itself" (sect. 6.2, para. 2). I suspect that the philosophy of neuroscience appears underdeveloped because there simply is nothing to develop. Once the confusions and ambiguities concerning the relationship between neuroscience and other perspectives on the mind are clarified and are cleared away, as G&S have so ably done, the link between neuroscience and philosophically interesting issues is broken. Perhaps a putative philosophy of neuroscience would be no more substantial than a putative philosophy of cellular processes in the lung or the heart.

## How trivial is the "trivial neuron doctrine"?

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**Abstract:** I argue that Gold & Stoljar's "trivial neuron doctrine" is not in fact trivial. Many familiar positions in the philosophy of mind run afoul of it, and it is unclear that even those whom Gold & Stoljar identify as adherents of the trivial neuron doctrine can be comfortably described as such.

Gold & Stoljar (G&S) distinguish between a radical and a trivial version of the "neuron doctrine" and argue that the former is implausible. This, I think, is right. At the same time, I wonder whether even the trivial neuron doctrine is all that trivial.

According to G&S, the trivial neuron doctrine holds that the correct theory of the mind "will turn out to involve any one of a very large number of possible combinations of scientific concepts" (sect. 2.2.1, para. 1). This seems straightforward, yet, although the scientific concepts in question can come from any one of a num-