Phil 397
The Mind/Body Problem

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Paul Churchland and Patricia Churchland:
Intertheoretic Reduction: A Neuroscientist's Field Guide
Lecture Outline

Different claims of intertheoretic reduction:

I. the complete reduction is in principle possible (there is no contradiction in its being carried out between two fields--e.g. it may not be in principle possible to reduce astrology to astronomy)
II. the complete reduction is in practice possible (we need an actual proof for this claim)
III. the reduction is possible to the degree of useful approximations to the desired ideal account (a more cautious claim that Churchland is making here)
IV. the reduction is not possible even to the degree of useful approximation, but mental phenomena are still just the macro-level descriptions of the neural phenomena. ==> Nonreductive materialism (e.g. Fodor)
V. the reduction is in principle impossible, because mental phenomena are fundamentally different from neural phenomena (e.g. Searle)

The question is whether it is reasonable to expect, and to work toward, a reduction of all psychological phenomena to neurobiological and neurocomputational phenomena.

STEPS:

1) provide a useful overview of the general nature of intertheoretic reduction, as it appears in the many examples to be found in the history of science.
2) identify the very real virtues that such cases display and the correlative vices to be avoided.
3) apply these historical lessons to cognitive neuroscience.

Q: Is such a process justified?

[Some Prototypical Cases of Intertheoretic Reduction]

[success]

1. astronomical motion ---> motions at the microscopic level
2. heat (temperature) --> mean molecular kinetic energy (Body's ability to do work by virtue of its motion.)
3. reduction of classical (valence) chemistry by atomic and sub-atomic (quantum) physics (quantum physics has indeed managed to grasp the underlying elements of chemical reality.)

[semi-success]

1. Newton's three laws of motion by Einstein's Special Theory of Relativity.

[failure]

1. the older phlogiston theory of combustion (How did wood turn into ashes, what happen to the rest of the wood?) by the oxygen theory of combustion (oxygen was being absorbed during combustion).

It is worth emphasizing that this reduction involved identifying familiar *phenomenal* property of common objects with a highly unfamiliar microphysical property.

Evidently, the fact that a property or state is at the prime focus of one of our native discriminatory faculties does not mean that it is exempt from possible reconception within the conceptual framework of some deeper explanatory theory.

**** Motivations:**

___ conceptual unification (simplification): reduction provides us with a simpler overall account of nature, since apparent diverse phenomena are brought under a single explanatory umbrella.

___ more explanatory power, deeper insight, more effective control over the phenomena within the old theory's domain: the newer theory also allows us to explain much that the old theory had been unable to explain

___ to find out whether what we thought to be two domains is actually one domain, though it may have been described in two (or more) different vocabularies.

___ the old theory can be vindicated, at least in its general outline

___ the old theory can be corrected in its important details, and this reflects the improvements in our knowledge

**** Intertheoretic reduction is at bottom a relation between two distinct conceptual framework for describing the phenomena, rather than a relation between two distinct domains of phenomena.**

**** the spectrum of reduction**

1. [cross-theoretic identity]

___ pairs of theories where the old is smoothly reduced by the new, and the ontology of the old theory survives, although redescribed, in a new and more penetrating vocabulary

2. [subsuming reduction]

___ pairs of theories where the old ontology is only poorly mirrored within the vision of the new, and it "survives" only in a significantly modified form.

3. [eliminative reduction]

___ pairs where the older theory and its old ontology with it, is eliminated entirely in favor of the more useful ontology and the more successful laws of the new.

___ It is instructive to note some cases where the older theory is neither subsumed under nor eliminated by the aspirant and allegedly more general theory. Rather, it successfully resists the takeover attempt, and proves not to be just a special case of the general theory at issue.

**** whether or not the resources are adequate is seldom clear beforehand, despite people's intuitive convictions. And even if reduction is impossible, this may reflect the old theory's radical falsity instead of its fundamental accuracy.**

[Objections to Reduction]:
[1]. the possibility of explaining the character of our subjective sensory qualia
Q: What are these phenomenal qualia? Are they ideas or concepts or just a "feeling"? Do they have any ontological status?

Reply:
___ There are already success with the reconstruction of light, sound, heat. We need only to carry such a reconstruction through, as in the historical precedents of the objective phenomenal properties noted earlier. Some things may indeed be inarticulately phenomenal in character, because they are the target of one of our basic discriminatory modalities. But that in no way makes them immune to an illuminating intertheoretic reduction.

[2]. we are unable to imagine how meaning could be just a matter of how signals interact or how inert symbols are processes. (the objection from the understanding of meaning or from intentionality)

(Searle's Chinese Room Experiment)
Q: When you encounter emergencies, you would react without thinking about it. Isn't this because you have some internal "homunculi" inside you? Who is operating inside you when "you" are not there?

Q: Churchland says that Searle's argument is actually argument from ignorance, do you agree?

Reply:
___ current theory of neural network function address the issue of how the brain represents the external work and the regularities it displays: real-time information about the world is coded in high-dimensional activation vectors, and general information about the world is coded in the background configuration of the network's synaptic weights. Activation vectors are processed by the weight configuration through which they pass, and learning consists in the adjustment of one's global weight configuration.

___ We are still too ignorant to insist that hypotheses of this sort will prove inadequate to explain all of the representational capacities.
___ It is an empirical question, and the jury is still out.

Q: If the question is settled empirically, what conclusion *must* we draw?

[3]. the socialistic account:
___ what constitutes a human consciousness is not just the intrinsic character of the creature itself, but also the rich matrix of relations it bears to the other humans, practices, and institutions of its embedding culture.
(e.g. Burge's *arthritis* case)
___ What this means is that any adequate neuro-computational account of human consciousness must take into account the manner in which a brain comes to represent, not just the gross features of the physical world, but also the character of the other cognitive creatures with which it interacts, and the detail of the social, moral, and political world in which they all live.

Reply:
___ We already know that artificial neural networks... can come to recognize and respond to the most astonishingly subtle patterns and similarities in nature. If physical patterns, why not social patterns?
___ It may indeed be unrealistic to expect an exhaustive global account of the neural and behavioral trajectory of a specific person over any period of time. The complexity of the neural system we are dealing with may forever preclude anything more than useful approximations to the desired ideal account. The case of chemistry and its relation to quantum physics comes to mind... This means that our reduction will never be truly complete, but we rightly remain confident that chemical phenomena are nothing but the macro-level reflection of the underlying quantum physical phenomena even so. As with chemical phenomena, so with psychological phenomena.

[Argument]
1. Even if the reduction of chemical phenomena to quantum physical phenomena will never be truly completed, we can still remain confident that chemical phenomena are nothing but the macro-level reflection of the underlying quantum physical phenomena.
2. Psychological phenomena to neural phenomena is just like chemical phenomena to quantum physical phenomena.
3. Therefore, even if the reduction of complex psychological phenomena (esp. in the context of social interaction) to neural phenomena can never be completed, we can still remain confident that psychological phenomena are nothing but the macro-level reflection of the underlying neural phenomena.

[4]. reduction takes away human freedom

Reply:
___ 1. Whether and in what sense there is any human freedom is an entirely empirical question.
___ 2. We should just let scientific investigation teach us in what ways and to what degrees human creatures are free.

Q: Do you think the notion of human freedom is compatible with the project of intertheoretic reduction? (Viz. if we are operating on the neurobiological level, do we still have freedom or are we determined?)

[5]. multiple instantiation:
___ How can we reduce psychological phenomena to neurobiology, if other physical substrates might serve as well?

Reply:
[Argument]

1. **Multiple instantiation: human psychological phenomena can be instantiated onto different physical substrates.**
2. **But reduction can be domain specific; that neurobiology should prove capable of explaining all psychological phenomena in humans is *not in conflict with* the possibility that some other theory should serve to explain psychological phenomena in *robots*.**
3. **Therefore, multiple instantiation does not pose a problem for Reductionism.**

[Conclusion]: not *eliminative materialism*
___ Each of the higher-level sciences has helped to shape profoundly the development and articulation of its underlying science. It will surely be the same with psychology and neuroscience. At this level of complexity, intertheoretic reduction does not appear as the sudden takeover of one discipline by another; it more closely resembles a long and slowly maturing marriage.