

Velmans, Max (1998) Goodbye to Reductionism. In S. Hameroff, A. Kaszniac, A. Scott (eds.) *Toward a Science of Consciousness: The Second Tucson Discussions and Debates*, MIT Press, pp 45-52.

GOODBYE TO REDUCTIONISM¹

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KEYWORDS: consciousness, dualism, reductionism, phenomenology, identity theory, perception, reflexive, projection, pain, body-image, Searle, Place, Churchland.

To understand consciousness we must first describe what we experience *accurately*. But oddly, current dualist vs. reductionist debates characterise experience in ways *which do not correspond* to ordinary experience. Indeed, there is no other area of enquiry where the phenomenon to be studied has been so systematically misdescribed. Given this, it is hardly surprising that progress towards understanding the nature of consciousness has been limited.

Our current world view is dominantly materialist and reductionist, an ontology that has served us well in natural science. But for consciousness, materialist reductionism has not worked—for the simple reason, I will argue, that *it cannot be made to work*. While this limits the "range of convenience" of the materialist, reductionist programme, it matters little for science. The investigation of consciousness can take place, unimpeded, within a more inclusive, non-reductionist science.

Dualist and reductionist descriptions of consciousness

Within consciousness studies, the reductionist agenda has been set by what it opposes, the classical dualism of Plato and Descartes. For Descartes the universe is composed of two interacting substances, *res extensa*, the material stuff of the physical world, body and brain, which has extension in space, and *res cogitans*, nonmaterial stuff which "thinks", and which has no location or extension in space. The physical world affects consciousness through sensory perception, where motions in the external world are transduced by the eye and nerves into motions in the pineal gland which, in turn, produce conscious experiences (in the soul). That is, events located in space cause experiences of those events which have no spatial location or extension. Modern studies of the visual system have revealed a very different and far more complex physiology than envisaged by Descartes—and reductionists now claim that consciousness is nothing more than a state or function of the brain. But in one, crucial respect the causal sequence in perception, in modern accounts, remains the same. Events in the world still cause conscious experiences which are located in some quite different, "inner space"—albeit "in the brain" as opposed to some inner, nonmaterial soul.

¹ Based on a plenary paper given at "Towards a Science of Consciousness II", University of Arizona, Tucson, April 8-13th, 1996.

In short, both dualist and reductionists agree that there is a clear *separation* of the external physical world from the world of conscious experience.

Misdescriptions of experience

Given that we all have conscious experience, it is amazing that dualist and reductionist descriptions of it have persisted for so long. For Descartes, thoughts are the prime exemplar of conscious experience and it is true that, phenomenologically, they seem to be like *res cogitans*, without clear location and extension in space (although thoughts might loosely be said to be located "in the head or brain"). But conscious thoughts (phonemic imagery or "inner speech") form only a very small part of our conscious experience. While reading this page, for example, one might experience such thoughts, but at the same time one experiences print on paper, attached to a book, on a table or lap, surrounded by a physical world extended in a three-dimensional, phenomenal space. That is, the bulk of what one experiences has an extended, phenomenal nature very different to *res cogitans*.

Reductionism provides a description of what consciousness is "really like" that is even further removed from its actual phenomenology. Even reductionists *themselves* do not claim that we *experience* our phenomenal worlds to be nothing more than states or functions of the brain! By and large, phenomena as-experienced don't even seem to be in the brain! The stubborn fact is that we experience our phenomenal heads (and the thoughts within them) to exist within surrounding phenomenal worlds, not the other way around. Given this, it seems sensible to develop a model of the way consciousness relates to the brain that is consistent with science *and* with what we experience.

This is the aim of the *reflexive model of perception* (developed in Velmans 1990, 1993, 1996). This adopts a conventional scientific description of perceptual processing, which can only be determined by investigation of the brain, viewed from an external observer's "third-person perspective." Unconventionally, the reflexive model also assumes that one cannot understand consciousness without an accurate phenomenological description of it, and this can only be undertaken from the subject's "first-person perspective". If some conscious experiences are *not* like thoughts, so be it. If *no* conscious experiences seem to be like brain states, too bad for reductionism. The investigation of consciousness can proceed quite happily without reductionism, by finding out how events perceived from the subject's first-person perspective *actually* relate to the events perceived from the external observer's third-person perspective.

Consider how the differences between the dualist, reductionist and reflexive models work out in a simple case. Suppose I stamp on your foot, and you experience pain. Pain is universally assumed to be a "mental event" within philosophy of mind. But where is it? Is it nowhere, as dualists claim? Is it in the brain, as reductionists claim? Or is it in the foot? Readers in doubt on this issue may like to try this with a friend.

The reflexive model adopts the common-sense position that the pain is in the foot (in spite of it being a "mental event"). That is, a stimulus in the foot is transmitted to the brain and the resulting phenomenal experience (produced by mental modelling) is subjectively

"projected" back to the foot (where the mind/brain judges the initiating stimulus to be).² That is why the process is "reflexive". Similarly, events which originate in the external world are experienced to be out in the world, and events which originate in the mind/brain are experienced to be in the mind/brain. In short, the modelling process which subjectively "projects" experienced events to the judged locations of the initiating stimuli is, under most circumstances, reasonably accurate.³ Together, these experienced events (in the world, body, and mind/brain) form the content of our conscious, phenomenal worlds.

As noted above, such phenomenal worlds can be investigated from a "first-person perspective", or related to brain states viewed from a "third-person perspective", without any need to reduce their phenomenology to anything else. There are also many consequences of this *non-reductive* approach to consciousness science and for philosophy of mind which I do not have space to address (see Velmans 1990, 1993, 1996). Given the current dominance of reductionism, it will suffice to examine whether this, too, can cope with a more accurate description of everyday experience.

The appearance-reality distinction

Given the dissimilarities between conscious experiences and brain states, reductionism has a problem. How can things which seem to be so different be the same? This problem becomes acute once one accepts that conscious contents include not just ephemeral "thoughts", but entire phenomenal worlds. To bridge the gap, reductionist mostly rely on the appearance-reality distinction. They accept that conscious experiences *appear* to have phenomenal qualities, but argue that science will eventually show that these are *really* states or functions of the brain. For this to work, it must of course apply to all phenomenal qualities, including the apparent location and extension of perceived events (such as pains) in phenomenal space. John Searle (1992) for example, points out that:

"Common sense tells us that our pains are located in physical space within our bodies, that for example, a pain in the foot is literally in the physical space of the foot. But we now know that is false. The brain forms a body image, and pains like all bodily sensations, are parts of the body image. The pain in the foot is literally in the physical space in the brain." (Searle 1992, p63)

For reductionism to work, common-sense must be wrong. And if Searle is right, this demonstrates just how wrong common sense can be. So let us examine his assertion carefully. It is true that science has discovered representations of the body in the brain, for

² Note that "perceptual projection" is a *subjective, psychological effect* produced by unconscious cognitive processing. Nothing *physical* is projected from the brain. Extensive evidence for perceptual projection is given in Velmans (1990).

³ If the experienced world did not correspond reasonably well to the actual one our survival would be threatened. Nevertheless, mismatches occur, for example hallucinations, referred pains and so on. At great distances, our distance judgements, and consequent experiences, bear little resemblance to actual distances - how far away does the moon look, or a star?

example, a tactile mapping of the body surface distributed over the somatosensory cortex (SSC). The area of SSC devoted to different body regions is determined by the number of tactile receptors in those regions. In SSC, for example, the lips occupy more space than the torso. Furthermore, regions of the body which are adjacent in phenomenal space may not be adjacent in SSC. For example, we feel our face to be connected to our head and neck, but in SSC, the tactile map of the face is spatially separated from the map of the head and neck by maps of the fingers, arm and shoulder. That is, the topographical arrangement of the "body image" is very different to the body as-perceived.

Given this, how does the body image *relate* to the body as-perceived? According to Searle, science has discovered tactile sensations in the body to be, literally, in the brain. In truth, however, no scientist has discovered body sensations in the brain, and no scientist ever will—for the simple reason that, viewed from an external observer's perspective, the body as-experienced (by the subject) *cannot be perceived*. Science has nevertheless investigated the relationship of the body image (in SSC) to tactile experiences. Penfield & Rasmussen (1950), for example, exposed areas of cortex preparatory to surgical removal of cortical lesions responsible for focal epilepsy. To avoid surgical damage to areas essential to normal functioning, they explored the functions of these areas by lightly stimulating them with a microelectrode and noting the subject's consequent experiences. As expected, stimulation of the somatosensory cortex produced reports of tactile experiences. However, these feelings of numbness, tingling and so on were subjectively located *in different regions of the body, not in the brain*.

In sum, science has discovered that neural excitation of somatosensory cortex causes tactile sensations, which are subjectively located in different regions of the body. That is exactly what the reflexive model describes. But if tactile sensations cannot be found in the brain, viewed either from the experimenter's third-person perspective or from the subject's first-person perspective, how can one argue that they are nothing more than brain states?

Common reductionist arguments and fallacies

Reductionist arguments come in many forms. But they all claim the phenomenology of consciousness to be misleading, and trust in it to be naive. Commonly, they try to show that if one can find the neural *causes* or *correlates* of consciousness in the brain, then this would establish consciousness *itself* to be a brain state (see for example, Place 1956; Churchland 1988; Crick 1994). Let us call these the "causation argument" and the "correlation argument". I suggest that such arguments are based on a fairly obvious fallacy. For consciousness to be nothing more than a brain state, it must be *ontologically identical* to a brain state. However, *correlation* and *causation* are very different to *ontological identity*.

Ontological identity is *symmetrical*. If A is ontologically identical to B, then B is ontologically identical to A. Ontological identity also *obeys Leibniz's Law*—which states that if A is identical to B, then all the properties of A are also properties of B and vice-versa (A and B must exist at the same time, occupy the same location in space, and so on). A classical example of apparently different entities being shown by science to be one and the same are the "morning star" and the "evening star", which were just the planet Venus (viewed in the morning and evening).

Correlation is *symmetrical* but *does not obey Leibnitz's Law*. If A correlates with B, then B correlates with A, but all the properties of A are not properties of B. For example, height in humans correlates with weight and vice versa, but height and weight do not have the same properties.

Causation is *not symmetrical* and *does not obey Leibnitz's Law*. If A causes B, it does not follow that B causes A. Nor are the properties of A the same as those of B. If one throws a stone in a pond this will cause ripples in the water, but it does not follow that the ripples in the water cause the stone to be thrown in the pond. Nor are the properties of thrown stones and water ripples identical.

Once the obvious differences between causation, correlation and ontological identity are laid bare, the weakness of the "causation argument" and the "correlation argument" are clear. Under appropriate conditions, brain states may be shown to cause, or correlate with conscious experiences, but it does not follow that conscious experiences are nothing more than states (or, for that matter, functions) of the brain.⁴ To demonstrate that, one would have to establish ontological identity—in which all the properties of a conscious experience and its corresponding brain state were identical. Unfortunately for reductionism, few if any properties of experiences (accurately described) and brain states appear to be identical. In the case of pains in the foot, and other events as-perceived in the phenomenal world, the brain states (observed by the experimenter) and associated conscious phenomena (observed by the subject) do not even seem to be in the same place!

Faced with this difficulty, reductionists usually turn to analogies from other areas in science, where a reductive, causal account of a phenomenon led to an understanding of its ontology, very different to its phenomenology. Ullin Place (1956), for example, gives the example of lightning, which we now understand to be nothing more than the motion of electrical charges through the atmosphere. This reduction, he argues, is justified once we know that the motion of electrical charges through the atmosphere *causes* what we experience as lightning. Similarly, a conscious experience may be said to be a given state of the brain once we know that brain state to have caused the conscious experience.

I have dealt with the "causation argument" above. But the lightning analogy is seductive because it is half true. That is, *for the purposes of physics* it is true that lightning can be described as nothing more than the motion of electrical charges. But psychology is interested in how this physical stimulus interacts with a visual system to produce lightning as-perceived—in the form of a jagged flash of light out in the phenomenal world. This experienced lightning may be said to represent an event out in the world which physics describes as a motion of electrical charges. But the *phenomenology itself* cannot be said to be nothing more than the motion of electrical charges! Prior to the emergence of life forms

⁴ It is worth keeping in mind that many *non-reductionist* positions also assume there to be neural causes and correlates of given conscious experiences, including the reflexive model, dualism, epiphenomenalism, emergent interactionism, and so on. That is, the causes and correlates of conscious experience should not be confused with their ontology

with visual systems on this planet, there presumably was no such phenomenology, although the electrical charges which now give rise to this experience did exist.

Patricia Churchland (1988) tries to achieve phenomenological reduction through theory reduction. She argues that psychological theory and neurophysiological theory will continue to co-evolve, until in some distant future, the higher level, psychological theory is reduced to a more fundamental, neurophysiological theory. When this happens, she claims, consciousness will have been shown to be nothing more than a state of the brain. Whether a complete, inter-level theoretical reduction is possible, is open to debate. But even if this were possible, fundamental problems remain. Theories *about* phenomena do not make the phenomena go away! Furthermore, neurophysiological theories of consciousness deal with its neural causes and correlates rather than its ontology, for the simple reason that causes and correlates are all one can observe in the brain. And, as shown above, even a complete understanding of neural causes and correlates would not suffice to *reduce* conscious phenomena to states of the brain.

John Searle (1987) agrees that causality should not be confused with ontology, and his case for physicalism appears to be one of the few to have addressed this distinction head-on. The gap between what *causes* consciousness and what conscious *is* can be bridged, he suggests, by an understanding of how micro properties relate to macro properties. Liquidity of water is caused by the way H₂O molecules slide over each other, but is nothing more than (an emergent property of) the combined effect of these molecular movements. Likewise, solidity is caused by the way molecules in crystal lattices bind to each other, but is nothing more than the higher order (emergent) effect of such bindings. In similar fashion, consciousness is caused by neuronal activity in the brain and is nothing more than the higher order, emergent effect of such activity. That is, consciousness is just a *physical macro property* of the brain.

This argument too, is seductive, but needs to be examined with care. The brain undoubtedly has physical macro properties of many kinds. The one closest to liquidity and solidity would be "sponginess". But there are also more interesting, psychologically relevant macro properties. For example, the mass action of large neuronal populations and the EEG. Some of these properties, no doubt, cause or correlate with conscious experiences. Unfortunately for physicalism, however, there is no reason to suppose that consciousness is ontologically identical to these, or any other known physical properties of the brain. As shown above, even simple experiences such as a pain in the foot pose a problem for reductionist theory. Searle would dispute this. But he accepts that *subjectivity* and *intentionality* are defining characteristics of consciousness. Unlike physical phenomena, its phenomenology cannot be observed from the outside; unlike physical phenomena, it is always *of* or *about* something. So, even one accepts that consciousness is, in some sense, caused by or emergent from the brain, why call it "physical" as opposed to "mental" or "psychological"? Merely *relabeling* consciousness won't solve the mind/body problem!

I have had space only to sample from, and briefly analyze a few reductionist arguments, but I have selected from those that are most persuasive. The absence of any completely persuasive reductionist case, in spite of the eloquence of its protagonists, suggests that reductionist accounts of consciousness *attempt to do something that cannot be done*.

Examination of the brain from the outside can *only* reveal the physical causes and correlates of consciousness. It can *never* reveal consciousness itself. Many phenomenal properties of conscious experience appear very different to those of brain states. Consequently, it is difficult to imagine what science *could* discover to demonstrate that experiences are *ontologically identical* to states of the brain.

To put matters another way, once one abandons the atrophied descriptions of consciousness implicit in dualism and reductionism, any realistic hope of reducing its phenomenology to brain states disappears. As John Searle notes

"...consciousness consists in the appearances themselves. Where appearance is concerned we cannot make the appearance-reality distinction because the appearance is the reality." (Searle 1992, p121).

If so, reductionism is dead within philosophy of mind. Let us wave it goodbye without tears. And hello to a non-reductionist science of consciousness, which takes phenomenology seriously, and does not ignore common-sense.

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