An intriguing door

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The idea that the brain is the seat of the mind has been around for two-and-a-half millennia, but the phrase “neural correlates of consciousness” has appeared only in the past few years. Its popularity (Francis Crick recommends ‘neural correlate’ to his readers as a “useful term ... worth committing to memory”) is sometimes attributed to its neutrality — correlation between neural and mental events neither implies nor excludes a causal relationship between them.

So the phrase can be used happily by old-fashioned interactionist dualists (which is, of course, what most of us are most of the time) as well as by physicalists, functionalists, epiphenomenalists, identity theorists and what have you (each of which is what some of us are some of the time). Even behaviourists, who ignore consciousness, and eliminative materialists, who dismiss it as a misleading term in folk psychology, cannot deny that neural activity accompanies what they ignore or dismiss. But all this is much too

cynical. The neural correlates of consciousness are fashionable because they are important and almost accessible.

Ignoring tall stories, we know that consciousness is always associated with neural activity in a complex brain, and that altering that activity, whether by changes in sensory input, injury, disease, drugs, direct electrical stimulation or neurosurgery, can alter the contents of consciousness. So a reasonable hypothesis is that individual conscious states exist only in association with particular patterns of neural activity, and that the existence of these patterns is always associated with the corresponding conscious states. It is these patterns that are referred to as the neural correlates of consciousness.

Why such patterns should be associated with thoughts or feelings is among the most difficult of all problems. When Charles Darwin asked “why is thought being a secretion of the brain more wonderful than gravity a property of matter?” he was not minimizing the difficulty but rather arguing that failure to understand how the brain produces thoughts should not lead us to reject the idea that it does. Difficult though the problem is, determining what the neural correlates of consciousness are would seem to be a possible first step towards solving it. The trouble is that taking even this first step involves simultaneous monitoring of two elusive sets of events: the contents of consciousness and the relevant neural activity in a vast collection of neurons that are involved in many different processes.

During the past 12 years, ingenious experimenters in several laboratories have attempted this simultaneous monitoring. We now know a good deal about the earlier parts of the neural-event chains that link stimulation of sense organs to the resulting sensations or perceptions. Therefore, a general strategy is to follow the chain of events initiated by some sensation- or perception-causing stimulus in the hope that we will find a pattern of neural events that not only correlates well with the particular conscious experience but can also be shown to be both necessary and sufficient for it to occur.

That goal has not been reached, but in one of the most striking experiments so far, Nikos Logothetis and colleagues exposed a monkey to a visual stimulus that was ambiguous and could give rise to two different conscious perceptions. Having trained the monkey to indicate which perception it currently had and when the perception switched between alternatives, the researchers looked for (and found) neurons in the visual areas of the monkey’s brain that altered their behaviour when the

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Can we find patterns of neural events that are both necessary and sufficient for particular conscious experiences to occur?

perception changed. The logic of this procedure is that the monkey signals what it thinks it sees rather than what it is looking at. Because the stimulus remains constant, all of the early processing should remain constant, and the neurons that change their behaviour when the perception changes are therefore suspected of being specifically involved in conscious perception. This is still a long way from our goal but it is, as Ilya Farber and Patricia Churchland put it, “a substantial foot in a most intriguing door”.

If individual conscious states and processes are inseparable from particular patterns of neural activity, they can be effective in the physical world, and the evolution of consciousness through natural selection is plausible. But in 1879 William James pointed out a problem. There is a strong correlation between the pleasantness or unpleasantness of sensations and the survival value of the activities or situations that cause them. We enjoy eating, drinking and sex; we dislike hunger, injury and exhaustion. As long as we believe in old-fashioned, common-sense, interactive dualism, this correlation is predictable; our subjective mental states influence our behaviour, so, for our ancestors to have survived, their subjective preferences must have tended to favour their survival.

But once we give up this belief in interactive dualism (as most of us do when we think in ‘neuroscience mode’) and assume that it is only through their neural correlates that mental states can influence behaviour, the subjective character of mental states has no relevance. Why, then, is there an association between pleasure and survival-promoting situations, and between discomfort and survival-threatening situations? It seems that there is a stumbling block on the threshold of the intriguing door.

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FURTHER READING

Glynn, I. *An Anatomy of Thought: The Origin and Machinery of the Mind* (Weidenfeld & Nicolson, London; Oxford Univ. Press, New York, 1999).
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That thinking feeling: different conscious states are thought to have specific neural patterns.