Proceedings of the British Academy, **83**, 89–95

COMMENTARY

Issues of Unity and Objectivity

MICHAEL LOCKWOOD
Green College, Oxford, OX2 6HG

LET ME BEGIN by summarizing Hurley's reasoning, as I understand it.

Suppose there is a thought that p and, simultaneously with that thought, a thought that q. If these thoughts are occurring within the same consciousness, then it may seem natural to infer that, simultaneously with the thought that p and the thought that q, and occurring within the same consciousness as these thoughts, there is a thought that p and q. This is the intuitive idea behind Hurley's *indexed agglomeration principle*:

> If it is thought that p in i at t and thought that q in i at t, then it is thought that p and q in i at t. (p. 57)

Hurley's neo-Kantian argument for objectivity is grounded in the claims

1 that it is an essential feature of conscious thoughts that they are parcelled out amongst separate 'thought worlds', corresponding to different indices, and

2 that these indices are not, in general, assignable solely on the basis of *subjectively available resources*. That is to say, nothing in the *contents* of p and of q can constitute sufficient grounds for assigning the same index to the thought that p and the thought that q. To be sure, where the conjunction of p and q is self-evidently contradictory, this will entitle us to assign *different* indices to the corresponding thoughts. That, indeed, is the basis of our postulating distinct streams of consciousness corresponding to the two hemispheres in some com-

Read at the British Academy 13 March 1993.

missurotomy subjects. We seem able to make sense of their behaviour, only on the assumption that there is a thought that *p* and a thought that *q*, where *p* and *q* are so transparently inconsistent that there could not possibly be a thought that *p* and *q*. So we are obliged by the indexed agglomeration principle to assign the thought that *p* a different index from the thought that *q*. But where there is no such transparent contradiction, we can make no inference, on the basis of subjective resources alone, as to whether these thoughts should be assigned the same or different indices. This can only be settled on some objective basis.

Hurley considers a *naive objection* to this argument. Why do we need a general principle, such as the agglomeration principle, to determine the unity of conscious states at a given time? Why shouldn't we appeal directly to the point of view of consciousness itself? For surely, in the case we have been considering, either there is, or there is not, an *awareness* of the conjoined content '*p* and *q*'. If there is, then the thought that *p* and the thought that *q* are united within in a single consciousness; if not, not. So purely subjective resources surely do, after all, suffice to determine the matter.

But even if we concede to the naive objector that the existence or non-existence of any given conjoined thought can be determined solely on the basis of subjective resources, there will remain, so Hurley argues, another matter which is not decidable from the standpoint of consciousness, and which can accordingly be made the basis of another neo-Kantian argument. How so? Well, let's now look at Hurley's hypothetical commissurotomy patients (based on Sergent's cases) who, by means of fixation, have a '*6*' projected into their left, and a '*7*' projected into their right hemispheres. The fact that neither side is able to report reliably whether the numbers are the same or different, implies that the perception of '*6*' is not co-conscious with the perception of '*7*'. But the fact that both sides are able to report that the number on the left is lower than that on the right, might be taken to imply that the awareness of the number on the left as lower, is co-conscious with the perception of '*6*', and also with awareness of the number on the right as higher, which in turn is co-conscious with the perception of the number '*7*'.

One way of making sense of all this is to suppose that *co-consciousness is a non-transitive relation*. This is not allowed for by indexed agglomeration, which presupposes that the thoughts, and other conscious states, which are associated with the same index, comprise a set,

all of whose members are pairwise co-conscious. The possibility of a failure of transitivity gives rise to a distinction for which Hurley uses the terms *weak* and *strong* unity. A strongly unified consciousness is one in which every token conscious state of a subject at a given time, is co-conscious with every other token conscious state of the subject at that time. In a weakly unified consciousness, by contrast, Hurley tells us that:

> Each token conscious state of that subject at that time will be co-conscious with *some* other token conscious state of that subject at that time, rather than with *every* other. (p. 68)

I don't know whether this is intended to serve as a definition of 'weak unity'. If so, it is either far too weak, or implicitly circular. For consider: suppose we have a 'split-brain' patient in whom there are *no* relations of co-consciousness which bridge the two sides. Does the above characterization apply to this patient? If the patient counts as a subject, it clearly does apply, simply because each state associated with a given side of the brain, is bound to be co-conscious with some other simultaneous state which is also associated with that side. Yet this is patently not an instance of what Hurley means by 'weak unity'. On the other hand, we might plausibly say that the characterization does not apply to this patient, since what we have here is not a single subject, but two subjects inhabiting the same body. That, however, just raises the further question: What determines whether we have one subject or two? And the only plausible answer is that a single subject is one all of whose simultaneous conscious states are *at least* weakly unified. Hence the circularity.

The correct *definition* of a weakly unified consciousness is, of course, that it is one in which any two simultaneous token conscious states stand to each other in the ancestral of the relation, *is co-conscious and simultaneous with*. This means that, in a weakly unified consciousness, any two simultaneous conscious states are linked by a chain of simultaneous states, each of which is separately co-conscious with its two immediate neighbours in the chain. (I am assuming here that Hurley intends strong unity to entail weak unity. If one wanted weak unity to entail the *absence* of strong unity — as opposed merely to not entailing its presence — one could simply add to the above definition the further requirement that there are at least two, ancestrally linked, simultaneous states which are not co-conscious.)

The possibility that commissurotomy cases may involve a failure of

the transitivity of co-consciousness, is one that I discussed and defended in my *Mind, Brain and the Quantum* (Lockwood, 1989, pp. 87–94), unaware that the same suggestion had, in effect, already been advanced in the neurobiological literature — notably by Trevarthen.[1] I shall turn in a moment to the question as to how plausible this suggestion is. Hurley's answer to the naive objection turns on her claim that, wherever a failure of transitivity is a possibility, new questions will arise, concerning the unity of consciousness, which cannot be answered purely on the basis of consciousness itself. Suppose, for example, we want to know whether the thoughts that *p*, *q* and *r* are strongly unified. It may be determinable, from the standpoint of consciousness, that there is a thought that *p* and *q*, and determinable, likewise, from the standpoint of consciousness, that there is a thought, that *q* and *r*, and that there is a thought that *p* and *r*. So isn't this enough to establish strong unity? No, because it is not determinable, from the standpoint of consciousness, whether the mental representation of *r* which figures in the thought that *p* and *r*, is *numerically* identical, or merely identical in *content*, with the mental representation of *r* which figures in the thought that *q* and *r*. What this implies, in regard to Hurley's hypothetical patients, who are all at sixes and sevens, is that it cannot be determined, from the standpoint of consciousness, whether we have a single, merely weakly unified consciousness or, instead, two strongly unified ones — the thought that the left-hand number is lower than the right-hand number being *duplicated*, with one copy associated with each hemisphere. (Implicit, in Hurley's discussion, is a conception of thought, according to which the same mental representation can simultaneously figure in a multiplicity of distinct compound thoughts, somewhat as the same tile, in Scrabble, can simultaneously figure in more than one word. This picture seems reasonably apt, inasmuch as a person who, for example, simultaneously entertains the thought that *p*, and the thought that if *p* then *q*, wouldn't normally need to have the *additional* (meta)thought that the first thought has the same propositional content as the antecedent of the second, in order to infer that *q*.)

Let me say at once that I have no major quarrel with this line of argument, and that I admire the ingenuity with which Hurley deploys the findings of neuroscience in defence of a Kantian conception of consciousness as not metaphysically self-sufficient, but demanding

[1] For references, see p. 54, n. 4 of Hurley's paper.

some objective underpinning. I do, however, have a difficulty with Hurley's statement of the indexed agglomeration principle, inasmuch as it seems to me implausibly strong. If it is really true that the co-consciousness of the thought that *p* and the thought that *q* implies the existence of the conjoined content '*p* and *q*', then what is to prevent us iterating the principle for, say, *q* and '*p* and *q*', so as to yield the conclusion that it implies the existence of the conjoined content, '*q* and (*p* and *q*)', and '*q* and (*q* and (*p* and *q*))', and so on *ad infinitum*?

A more substantial question is where it might be appropriate to look, in search of the objectivity which Hurley's neo-Kantian arguments tell us we require. Elsewhere (in the larger work of which her contribution to this symposium forms a part),[2] Hurley is critical of the reasoning I employ in my own discussion of commissurotomy cases (Lockwood, 1989, chapter 6). Let me explain. There is a well-known experiment in which a mildly pornographic picture is tachistoscopically projected into the right hemisphere of a commissurotomy patient. Both sides then show evidence of embarrassment and arousal; but the left-hand side, which controls speech, is unable to say why. My suggestion was that, in Hurley's terms, what we may have here is a weakly unified subject, in whom the emotions aroused by the picture are largely subcortical, and are separately co-conscious with cognitive states in the two cerebral hemispheres which are not, however, co-conscious with each other (Lockwood, 1989, pp. 89–90).

Here, Hurley argues, I am committing the sin, recently inveighed against by Dennett (1991, pp. 131–2, 143–66 *passim*), amongst others, of 'conflating properties of vehicles of content with properties of contents'. For, given the behavioural evidence, am I not then, in effect, arguing for a partially unified and partially disunified consciousness (i.e. a weak unity) on the strength of a partially unified and partially disunified brain? Hurley's criticism of this way of arguing has two parts. First, unity of contents does not follow from unity of (physiological) vehicle, since there may be a duplication of contents within a physiologically unified, or connected, region of the brain. Secondly, though, there may, so she argues, be unity of contents even in the absence of physiological unity or connectedness. In defence of the latter claim, Hurley appeals to a thought experiment involving a hypothetical congenitally acallosal subject. She bids us imagine that this subject (unlike real callosal agenesis subjects, who appear to rely mainly on alternative

[2] *The Reappearing Self*, chapter 3, work in progress.

internal pathways) has relied, from birth, on external channels of communication, to link the two hemispheres, and that the resulting degree of functional and behavioural integration, under ordinary circumstances, is comparable to that of a normal subject. For a subject such as this, in whom the use of external methods of information transfer is completely second nature — or perhaps I mean *first* nature — why, Hurley asks, should we think that these methods, by contrast with the use of neural pathways, are incapable of effecting a genuine integration of consciousness? After all, in someone who had never possessed a functional corpus callosum, these external information channels might, as she points out, be just as 'hard-wired' as our own internal ones. And putting such a subject in a situation where he or she was unable to employ these external channels, might be regarded as analogous to, say, anaesthetizing the corpus callosum in a normal subject. In thinking that there is something uniquely efficacious, in this regard, about connections that are neurophysiological in character, are we not in the grip of a form of superstition? Haven't we fallen into the trap of thinking that, by contrast with the unity which the nervous system accomplishes without external aid, there would be something 'magical' about externally effected unity of consciousness?

Well, maybe so. But on the whole, I am inclined to reject this criticism. In the first place, if one rejects functionalism as a theory of mind — and it does (as I have argued in Lockwood, 1989, chapter 3) seem to me to be vulnerable to decisive objections — then I don't think one should give too much weight to the mere functional integration which is displayed by Hurley's hypothetical callosal agenesis subjects. More generally, it seems to me that the physical basis of the *unity* of consciousness should be sought in whatever we have reason to identify as the physical *substratum* of consciousness itself. To the extent that we have good reason to think that the latter lies exclusively *inside* the head, in the workings of our brain, then it seems to me rational to conclude that so does the basis of its unity. Indeed, if external lines of communication, exploited from birth, could suffice, in subjects congenitally lacking a corpus callosum, to produce genuine integration of conscious states, then I see no reason why a pair of Siamese twins, joined very close to the head, should not likewise achieve at least a weakly unified shared consciousness. This seems to me to be a *reductio ad absurdum* of the view in question. But of course, one should be ever mindful of the fact that one person's *modus tollens* is another person's *modus ponens*!

On the other hand, I entirely agree with Hurley that there may be duplication of contents even in the presence of physiological connectedness. As regards the case considered earlier, of the commissurotomy subject who had the pornographic picture projected into the right hemisphere, I concede that the behavioural *and* physiological evidence is consistent both with duplication (of the affective component, that is) and with a failure of transitivity. And indeed, I would now count myself agnostic as to which characterization is the correct one, though I still think that interpreting the case in terms of weak unity is the more attractive option, assuming it to be a philosophically coherent one. I was less interested (in *Mind, Brain and the Quantum*) in arguing for a failure of transitivity in this specific experiment, than in using it to illustrate a possibility for which I felt that there was a strong independent argument. What mainly led me to speculate about failures of transitivity were my efforts to imagine what it would be like to be conscious, while my corpus callosum was being very gradually severed, one fibre at a time. Assuming that at the beginning, there was a fully unified consciousness and, at the end, two entirely separate ones (which I now suspect may not be the true result, given the alternative possibility of subcortically sustained weak unity), we needed, it seemed to me, some way of understanding what could constitute a *gradual transition* from the one situation to the other. And the idea of a successive 'snipping' of relations of co-consciousness between mental states, with its implication of a failure of transitivity, accordingly came to mind. It occurred to me that, in these terms, one could make sense of Nagel's suggestion — which I had previously been inclined to dismiss as philosophically confused — that the unity of consciousness is not an all-or-nothing affair (Nagel, 1979, pp. 162–4).

I must confess, however, that, in spite of having defended it in print, I am still by no means wholly persuaded that the concept of a merely weakly unified consciousness really does make sense. Like Nagel (1979, pp. 160, 163), I am still unable to project myself into the position of a subject with a partially unified and partially disunified consciousness. So, as for what it is like to *be* such a weakly unified subject, I don't really have a clear conception — unless, as is entirely possible, it is essentially like being my own absent-minded self, only more so!

Bibliography

Allison, H. E. 1983: *Kant's Transcendental Idealism.* New Haven: Yale University Press.

Baron-Cohen, S., Leslie, A. M. and Frith, U. 1985: Does the autistic child have a 'theory of mind'? *Cognition*, 21: 37–46.

Bennett, J. 1966: *Kant's Analytic.* Cambridge: Cambridge University Press.

Bisiach, E., Berti, A. and Vallar, G. 1985: Analogical and logical disorders underlying unilateral neglect of space. In M. Posner and O. Marin (eds), *Attention and Performance*, vol. 11. Hillsdale, New Jersey: Erlbaum.

Bisiach, E., Geminiani, G., Berti, A. and Rusconi, M. L. 1990: Perceptual and premotor factors of unilateral neglect. *Neurology*, 40: 1278–1281.

Bisiach, E. and Luzzatti, C. 1978: Unilateral neglect of representational space. *Cortex* 14: 129–133.

Bisiach, E. and Vallar, G. 1988: Hemineglect in humans. In P. Boller and J. Grafman (eds), *Handbook of Neuropsychology*, vol. 1. Amsterdam: Elsevier.

Boden, M. 1990: *The Philosophy of Artificial Intelligence.* Oxford: Oxford University Press.

Brewer, B. 1992: Unilateral neglect and the objectivity of spatial representation. *Mind and Language*, 7: 222–239.

Cassam, Q. 1987: Transcendental arguments, transcendental synthesis, and transcendental idealism. *Philosophical Quarterly*, 37: 355–378.

Cassam, Q. 1989: Kant and reductionism. *Review of Metaphysics*, 43: 72–106.

Cassam, Q. forthcoming: Transcendental self-consciousness. In P. K. Sen and R. Verma (eds), *The Philosophy of P. F. Strawson.*

Chisholm, R. 1981: *The First Person.* Brighton: Harvester Press.

Collingwood, R. G. 1946: *The Idea of History.* Oxford: Oxford UniversityPress.

Coltheart, M. 1980: Deep dyslexia: a right-hemisphere hypothesis. In M. Coltheart, K. Patterson and J. C. Marshall (eds), *Deep Dyslexia*, pp. 326–380. London: Routledge and Kegan Paul.

Davidson, D. 1984: What metaphors mean. In *Inquiries into Truth and Interpretation*, 245–264. Oxford: Oxford University Press.

Davies, M. 1986: Tacit knowledge, and the structure of thought and language. In C. Travis (ed.), *Meaning and Interpretation*, 127–158. Oxford: Blackwell.

Davies, M. 1987: Tacit knowledge and semantic theory: Can a five per cent difference matter? *Mind*, 96: 441–462.

Davies, M. 1989: Tacit knowledge and subdoxastic states. In A. George (ed.), *Reflections on Chomsky*, 131–152. Oxford: Blackwell.

Dennett, D. 1984: Cognitive wheels: the frame problem of AI. In C. Hookway (ed.), *Minds, Machines and Evolution*, 129–151. Cambridge: Cambridge University Press.

Dennett, D. C. 1991: *Consciousness Explained.* Boston: Little, Brown.

Diamond, S. 1972: *The Double Brain.* London: Churchill Livingstone.

Evans, G. 1973: The causal theory of names. *Proceedings of the Aristotelian Society*, supp. vol. 47: 187–208.

Evans, G. 1981: Semantic theory and tacit knowledge. In S. Holtzman and C. Leich (eds), *Wittgenstein: To Follow a Rule*, 118–137. London: Routledge and Kegan Paul. (Reprinted 1985 in *Collected Papers*, 322–342. Oxford: Oxford University Press.)

Evans, G. 1982: *The Varieties of Reference*, ed. J. McDowell. Oxford: Oxford University Press.

Fogelin, R. 1985: *Hume's Skepticism in the* Treatise of Human Nature. London: Routledge & Kegan Paul.

Gallistel, C. R. 1980: *The Organization of Action: A New Synthesis.* Hillsdale, New Jersey: Erlbaum.

Gallistel, C. R. 1990: *The Organization of Learning.* Cambridge, Mass.: MIT Press.

Gazzaniga, M. 1988: In A. J. Marcel and E. Bisiach (eds), *Consciousness in Contemporary Science*, 226ff. Oxford: Oxford University Press.

Gibson, J. J. 1979: *The Ecological Approach to Visual Perception.* Boston: Houghton Mifflin.

Goldman, A. I. 1989: Interpretation psychologized. *Mind and Language*, 4: 161–185.

Goldman, A. I. 1992: In defense of the simulation theory. *Mind and Language*, 7: 104–119.

Goldman, A. I. 1993: The psychology of folk psychology. *Behavioral and Brain Sciences*, 16: 15–28.

Gopnik, A. and Wellman, H. 1992: Why the child's theory of mind really *is* a theory. *Mind and Language*, 7: 145–171.

Gordon, R. M. 1986: Folk psychology as simulation. *Mind and Language*, 1: 158–171.

Gordon, R. M. 1992a: The simulation theory: objections and misconceptions. *Mind and Language*, 7: 11–34.

Gordon, R. M. 1992b: Reply to Stich and Nichols. *Mind and Language* 7: 87–97.

Gordon, R. M. 1992c: Reply to Perner and Howes. *Mind and Language*, 7: 98–103.

Gordon, R. M. in press: Simulation without introspection or inference from me to you. In M. Davies and T. Stone (eds), *Mental Simulation: Philosophical and Psychological Essays.* Oxford: Blackwell.

Harris, P. L. 1989: *Children and Emotion: The Development of Psychological Understanding.* Oxford: Blackwell.

Harris, P. L. 1991a: The work of the imagination. In A. Whiten (ed.), *Natural Theories of Mind: The Evolution, Development and Simulation of Everyday Mindreading*, 283–304. Oxford: Blackwell.

Harris, P. L. 1991b: Letter to Josef Perner, 30 May 1991.

Harris, P. L. 1992: From simulation to folk psychology: the case for development. *Mind and Language*, 7: 120–144.

Heal, J. 1986: Replication and functionalism. In J. Butterfield (ed.), *Language, Mind and Logic*, 135–150. Cambridge: Cambridge University Press.

Heal, J. in press: How to think about thinking. In M. Davies and T. Stone (eds), *Mental Simulation: Philosophical and Psychological Essays*. Oxford: Blackwell.

Hurley, S. L. in preparation: *The Reappearing Self*.

Jeeves, M. A. 1965: Agenesis of the corpus callosum — physio-pathological and clinical aspects. *Proceedings of the Australian Association of Neurologists*, 3: 41–48.

Johnson-Laird, P. N. 1983: *Mental Models*. Cambridge: Cambridge University Press.

Kant, I. 1933: *The Critique of Pure Reason*. Tr. Kemp Smith, N. London: Macmillan.

Lockwood, M. 1989: *Mind, Brain and the Quantum: The Compound 'I'*. Oxford: Blackwell.

Marcel, A. J. 1993: Slippage in the unity of consciousness. In Ciba Foundation Symposium No. 174, *Experimental and Theoretical Studies of Consciousness*. Chichester: John Wiley.

Marks, C. E. 1981: *Commissurotomy, Consciousness and the Unity of Mind*. Cambridge, Mass.: MIT Press.

Milner, A. D. and Jeeves, M. A. 1979: A review of behavioural studies of agenesis of the corpus callosum. In I. S. Russell, M. W. Van Hof and G. Berlucchi (eds), *Structure and Function of Cerebral Commissures* 428–483. London: Macmillan.

Nagel, T. 1979: Brain bisection and the unity of consciousness. reprinted in T. Nagel, *Mortal Questions*. Cambridge: Cambridge University Press. (First published in 1971 in *Synthese*, 20.)

O'Keefe, J. 1985: Is consciousness the gateway to the hippocampal cognitive map? A speculative essay on the neural basis of mind. In D. A. Oakley (ed.), *Brain and Mind*, 59–98. London: Methuen.

O'Keefe, J. 1990: A computational theory of the hippocampal cognitive map. In J. Storm-Mathisen, J. Zimmer and O. P. Ottersen (eds), *Progress in Brain Research*, 83: 301–312. Amsterdam: Elsevier.

O'Keefe, J. 1991: The hippocampal cognitive map and navigational strategies. In J. Paillard (ed.), *Brain and Space*, 273–295. Oxford: Oxford University Press.

O'Keefe, J. 1993: Kant and the sea-horse. In N. Eilan, B. Brewer and R. McCarthy (eds), *Spatial Representation: Problems in Philosophy and Psychology*, 43–64. Oxford: Blackwell.

O'Keefe, J. and Nadel, L. 1978: *The Hippocampus as a Cognitive Map*. Oxford: Oxford University Press.

Parfit, D. 1984: *Reasons and Persons*. Oxford: Oxford University Press.

Peacocke, C. 1986: Explanation in computational psychology: language, perception and level 1.5. *Mind and Language*, 1: 101–123.

Peacocke, C. 1989: When is a grammar psychologically real? In A. George (ed.), *Reflections on Chomsky*, 111–130. Oxford: Blackwell.

Peacocke, C. 1992: *A Study of Concepts*. Cambridge, Mass.: MIT Press.

Peacocke, C. 1993: Externalist explanation. *Proceedings of the Aristotelian Society*, 93: 203–230.

Perner, J. 1991: *Understanding the Representational Mind.* Cambridge, Mass.: MIT Press.

Perner, J. and Howes, D. 1992: 'He thinks he knows': and more developmental evidence against the simulation (role taking) theory. *Mind and Language*, 7: 72–86.

Piaget, J. and Inhelder, B. 1951/1975: *The Origin of the Idea of Chance in Children.* New York: Norton.

Powell, C. T. 1990: *Kant's Theory of Self-Consciousness.* Oxford: Oxford University Press.

Quine, W. V. O. 1960: *Word and Object.* Cambridge, Mass.: MIT Press.

Rorty, R. 1970: Strawson's objectivity argument. *The Review of Metaphysics*, 24: 207–244.

Schwyzer, H. 1990: *The Unity of Understanding.* Oxford: Oxford University Press.

Sergent, J. 1990: Furtive incursions into bicameral minds. *Brain*, 113: 537–568.

Seymour, S., Reuter-Lorenz, P. and Gazzaniga, M. 1994: The disconnection syndrome: basic findings reaffirmed. Abstracted in The Society of Neuroscience, 1993.

Shebilske, W. L. 1984: Context effects and efferent factors in perception and cognition. In W. Prinz and A. F. Sanders (eds), *Cognition and Motor Processes.* Berlin: Springer-Verlag.

Shoemaker, S. 1984: Causality and properties. In S. Shoemaker, *Identity, Cause and Mind.* Cambridge: Cambridge University Press.

Sperry, R. W. 1990: Forebrain commissurotomy and conscious awareness. In C. Trevarthen (ed.), *Brain Circuits and Functions of the Mind.* Cambridge: Cambridge University Press.

Stich, S. and Nichols, S. 1992: Folk psychology: simulation or tacit theory? *Mind and Language*, 7: 35–71.

Stich, S. and Nichols, S. in press: Second thoughts on simulation. In M. Davies and T. Stone (eds), *Mental Simulation: Philosophical and Psychological Essays.* Oxford: Blackwell.

Strawson, P. F. 1959: *Individuals.* London: Methuen.

Strawson, P. F. 1966: *The Bounds of Sense.* London: Methuen.

Tegnèr, R. and Levander, M. 1991: Through a looking glass. *Brain*, 114: 1943–1951.

Trevarthen, C. 1974: Analysis of cerebral activities that generate and regulate consciousness in commissurotomy patients. In S. Dimond and J. G. Beaumont (eds), *Hemisphere Function in the Human Brain.* London: Elek Science.

Trevarthen, C. 1984: Biodynamic structures. In W. Prinz and A. F. Sanders (eds), *Cognition and Motor Processes.* Berlin: Springer-Verlag.

Walker, R. 1978: *Kant.* London: Routledge.

Wiggins, D. 1980: What would be a substantial theory of truth? In Z. van Straaten (ed.), *Philosophical Subjects: Essays Presented to P. F. Strawson*, 189–221. Oxford: Oxford University Press.

Wilkie, D. M. and Palfrey, R. 1987: A computer simulation model of rats' place navigation in the Morris water maze. *Behavioural Research Methods, Instruments and Computers*, 19: 400–403.

Williams, B. 1978: *Descartes: The Project of Pure Inquiry.* Harmondsworth: Penguin.

Wilson, M. D. 1987: *Descartes.* London: Routledge & Kegan Paul.

Wimmer, H. and Perner, J. 1983: Beliefs about beliefs: representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition*, 13: 103–128.

Wimmer, H., Hogrefe, G.-J. and Perner, J. 1988: Children's understanding of informational access as a source of knowledge. *Child Development*, 59: 386–396.