

One of the classical difficulties for the materialist position has been determinism. If all my behaviour is caused, then what am I to make of the statement 'I choose to go on with this sentence?'. O'Hara's slip about the gas laws enabled him to introduce indeterminacy into higher level descriptions but, as I have argued, this was a slip and no such facile move is really available. O'Hara seems to be making his discomfort with his own position clear in the last paragraph when the same problem resurfaces, in the shape of the relation of computer to minds. O'Hara here assumes that predictability is a necessary condition of rationality, and goes so far as to say that computers can be rational. Whilst I can see that this position is consistent with O'Hara's argument, it leads to conclusions that are so counter-intuitive that that argument is invalidated. Anyone who uses computers knows that they are, in between maintenance calls, predictable: but also that they are unutterably, stiffly stupid. Anyone who knows people knows that the effects of unreason may be quite predictable, but that the effects of reason are often gloriously unpredictable.

The problem here is that O'Hara seems to take account only of some of what I take to be knowledge. I do not take other people, or myself, to be wonderful machines. Nor have I found out about my mind by abstraction from lower level descriptions in terms of the brain and its constituents. I echo Wittgenstein in saying 'My attitude towards him is as towards a Soul: I am not of the opinion that he has a Soul' (Wittgenstein, p. 178e).⁴ My knowledge of mental phenomena is quite as basic and inviolate as my knowledge of the behaviour of billiard balls and inclined planes.

At this moment in the brain sciences there appears to be no means of making all my knowledge consistent (see Armstrong & Malcolm⁵ for a recent debate). I have been enjoined during my secondary education to suppose that 'scientific' meant correct and that the rest was something unreliable called 'intuition'. Moreover I have been taught that science was based on things that could be seen, touched, heard or smelt. Theories which could be instantiated in such things, or 'properties', 'fields', 'forces', etc. which affected such things constituted proper science. However the implication that knowledge is restricted to such things seems to me to be ill-founded. I can doubt the evidence of my senses just as readily as I can doubt my assumptions about other minds. Moreover any appeal to the efficacy of the brain sciences in understanding human behaviour could be countered by the greater usefulness of such mentalistic predicates as 'ambition', 'desire' and 'motive'.

O'Hara's article is a heartwarming attempt to incorporate something of the human in his biology, and not to accept the need, as many of us do, to put on our science when we arrive at work, and doff it when we leave. I do not regret his attempt to find a rational way of thinking about 'higher mental function' but only that it was not sufficiently radical. I wish that he had started from what he

knew and not what he thought it was acceptable to say that he knew.

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DEAR SIRS

I was very interested to read Dr O'Hara's article 'A Satisfactory Science of Mind and the Connection Between Mind Science and Brain Science'. The parallels drawn between computer operations and the brain are illuminating but there are some qualitative differences which could be further expanded and I wondered if, as a psychiatrist with a hobbyist interest in electronics since my youth, I might be permitted to make a few observations.

One is that computers at present are basically *serial* devices operating at a high speed of often several million operations a second on a relatively small number, typically between eight and 64, of bits of data at a time with the electronic elements functioning generally as binary switches. The brain on the other hand has a much larger number of more complex elements operating much more slowly with action potentials taking a millisecond or so and with a greater degree of parallel processing. In addition neurones are not simple binary switches but perform a much more complex process of analogue integration of excitatory and inhibitory impulses from hundreds of other cells and then frequency modulate the cell firing rate as the output. In addition, of course, they are subject to further modulatory processes through general neurotransmitter levels and doubtless other factors we don't yet know about and the functioning elements of the brain are thus orders of magnitude more complex than a theoretical binary switch.

I was, however, interested in the discussions of the definition of an epiphenomenon and the ideas that low level information may often have little simple connection with the higher level patterns of which it is a part. It seems unlikely that the brain generally stores information with a direct one to one correspondence between the physical elements and the bits of data as in a present day computer. It is possible, however, that the states of many individual elements together contribute towards the storage of a piece of information and there are certain physical and mathematical processes which suggest analogies as to how this

might be possible. These include the optical phenomenon of the hologram where it is possible to repeatedly subdivide the photographic plate yet retain the whole overall image though at a lower level of definition. Another example of this sort of one/many correspondence is provided by the mathematical procedure of the Fourier Transform and the transitions between the space or time and periodicity domains it permits and this latter technique has been used by, for example, visual physiologists looking for visual cortex cells responsive to particular spatial frequencies.

In conclusion I would just like to say how pleased I was to see an essay addressing such basic and broad ranging scientific and philosophical questions in your pages and would wish to congratulate the author on a most thought-provoking piece.

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DEAR SIRS

I found Peter O'Hara's article on the mind science very interesting. As a model of the relationship between neuronal activity and mental function, it does offer food for thought and may well reappear in some form in future research into the relationship of mind and brain. Dr O'Hara applies his understanding of the working of electronic computers in arriving at this model, and it may well be that we have built computers to reflect the way our brains work—impelled by intuition.

However, in the concluding paragraphs of his article, Dr O'Hara expresses a disquieting conviction, not only that his viewpoint constitutes a *science*, but also that it is *satisfactory* and above all *true*.

It may in the long run prove to be the case, but at this point in time it is only an opinion, an analogy drawn from another field of knowledge. Some day, perhaps, a way may be found to subject this hypothesis to experimental testing.

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DEAR SIRS

Writing as one who has only a limited understanding of the mind and the brain and no understanding at all of computers, I found Peter O'Hara's article fascinating and incomprehensible. If I am right in thinking that the gist of his argument is that there is a connection between mind and the brain which we do not yet understand then, for what it is worth, I agree with him.

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Dr O'Hara replies

DEAR SIRS

I am gratified to see so many responses to my article, and glad of the chance to reply to them. I had never seen such matters discussed in psychiatric journals and felt impelled to bring them to psychiatrists' attention after reading J. R. King¹ say 'at one end of the scale physical scientists scratch patiently away at the chemistry of receptor sites on cell membranes, at the other clinicians make brilliant deductions by sheer intuition, and in between is a hazy land'. Unsure of its reception, I kept my article clear of references to philosophical schools of thought, much as I would avoid giving myself a party political label if publicly arguing for a new social proposal. However, Dr Tantam has referred to most of these philosophical terms, in some cases misunderstanding my position, and so I must address them.

With regard to philosophical behaviourism (readers can see from my second and third paragraphs that I am not a psychological behaviourist), Flew² defines it as the idea that 'psychological concepts can be analysed in exclusively behavioural terms, and this is what such words mean'. Bullock & Stallybrass³ rather emphasise behaviourists as viewing mental states as dispositions or tendencies to certain behaviours. In contrast, I have emphasised the possibility of an internal mental state description.

I was also surprised to be seen as rejecting reductionism and so, perhaps believing in holism. Here Flew² and Bullock & Stallybrass³ see reductionism as *reducing* mental events to physical and chemical events. Both define holism as the idea that some wholes are more than the sum of their parts. Bullock & Stallybrass³ add that the wholes have characteristics that cannot be explained in terms of the properties and inter-relations of the parts. Hofstadter⁴ defines holism similarly but sees reductionism as 'a whole can be understood completely if you understand its parts and the nature of their "sum"'. The reductionism of Flew² and of Bullock & Stallybrass³ is obscure because they don't define *reducing*. The extreme view of reducing, of an *identity* or one-to-one correspondence between events and predicates of the reduced science (e.g. psychology) and those of the basic science (e.g. physics), is given by Fodor.⁵ By this standard I agree with Fodor in rejecting reductionism. However his reductionism is so extreme that it appears false at first sight, and indeed he states that he defines it thus in order to prove it false. I suspect that Fodor is in a minority in defining reductionism so extremely. It also cedes the middle ground to holism which I have always seen as the idea that 'something else' (spirit, perhaps) must be added to the parts (neurons and brain structure) in order to explain the whole (mental function). My many examples were designed to show that properties of neurons could cause them to relate to each other in such a complex fashion as to underlie (or be a satisfactory substrate for) mental function. In my fifth paragraph I also criticised holism's 'something else' for being amorphous and so not open to further investigation and analysis. So I