
The

An International Journal of Current Research
and Theory with Open Peer Commentary

Behavioral and Brain Sciences

VOLUME 8
NUMBER 4
DECEMBER 1985

Appearing in this issue, with Commentary . . .

Unconscious cerebral initiative and the role of conscious will in voluntary action Benjamin Libet

Supplementary motor area structure and function: Review and hypotheses Gary Goldberg

Nineteenth-century ideas on hemisphere differences and "duality of mind" Anne Harrington

Matrilineal inheritance: New theory and analysis John Hartung

Are there independent lexical and nonlexical routes in word processing? An evaluation of the dual-route theory of reading

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Continuing Commentary on "Minds, brains, and programs" (Searle),
"Journal review process" (Peters & Ceci), "Rational belief" (Kyburg),
"Blindsight" (Campion, Latt & Smith),
and "Intentional systems in cognitive ethology" (Dennett)

Among the articles to appear in forthcoming issues of BBS:

Multiple book review of A Grünbaum, *The foundations of psychoanalysis*

MB Berkinblit, AG Feldman, & OI Fukson, "Adaptability of innate motor patterns and motor control mechanisms"

BT Engel, "An essay on the circulation as behavior"

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P Soubrié, "Reconciling the role of central serotonin neurons in human and animal behavior"

NP Spanos, "Hypnotic behavior: A social psychological interpretation of amnesia, analgesia and 'trance logic'"

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This publication was supported in part by NIH Grant LM 03539 from the National Library of Medicine.

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Subscriptions *The Behavioral and Brain Sciences* (ISSN 0140-525X) is published quarterly in March, June, September and December. Four parts form a volume. The subscription price, which includes postage, of Volume 8 (1985) is US \$128.00 net in the U.S.A. and Canada (£72.00 in the U.K. and rest of the world) for institutions; US \$57.00 net (£35.00) for individuals; US \$32.00 net (£20.00) for BBS Associates; and US \$32.00 net for students (in the U.S.A. and Canada only) who provide proof of eligibility with order. Single parts cost US \$35.00 net (£20.00) plus postage. Institutional orders may be sent to a bookseller or, in the U.S.A. and Canada direct to: Cambridge University Press, 32 East 57 Street, New York, N.Y. 10022; in the U.K. and rest of the world to: Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, England. Individuals must order direct from the Press. Second class postage paid at New York, N.Y. and at additional mailing offices. Postmaster: send address changes in the U.S.A. and Canada to *The Brain and Behavioral Sciences*, Cambridge University Press, 32 East 57 Street, New York, N.Y. 10022.

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D. O. HEBB

Father of Cognitive Psychology

1904–1985

When one is not equipped to write an objective biographical tribute on the occasion of a great man's passing, all one can offer is one's own personal recollection and appreciation.

When I enrolled in Psychology 21 at McGill University twenty-one years ago, it was with the usual undergraduate expectation that Freudian psychology was psychology, and that it would help you understand your own mind and everyone else's. The instructor for this enormous introductory course looked anything but Freudian. This gaunt mariner called Hebb, with his stern spectacles and portentous limp, who pronounced "calm" "cam," looked more qualified to teach us about practical seamanship than about the mysteries of the psyche (although his tone was incongruously gentle, sometimes even dreamy). He warned us from the outset that he was going to ween us of our preconceptions about psychology. And so he did. Not all at once, but gradually—with his emphasis on the role of our biological heritage (through those unforgettable anecdotes about "Booie" and the other chimps Hebb had worked with at Yerkes' primate center) as well as our early experience (and experience in general) in shaping those thought processes that we had all been so ready to interpret symbolically in terms of old Greek myths recirculated in late Victorian Vienna—he succeeded in distancing us at least from the inclination to change courses in favor of something more like what we had been expecting.

For me, however, the transformation was unforgettable and very specific. I can remember that when I was a child and people spoke of the "brain," I had always assumed that it was just a figure of speech. It seemed obvious that my mind was not a material substance, so people couldn't really mean it when they said that we had a physical organ that was responsible for our minds in the same way that a heart was responsible for circulation and a stomach for digestion. When I had learned that there really was a brain, I just filed it away as a kind of oddity, never even tying it together with my only other early contact with the mind-body problem (one solipsistic summer).

But then Hebb reminded us of the problem anew, first through suggestive accounts of his work with Penfield on the localization of memories in the brain, and then from the viewpoint of his own specific hypothesis that thoughts could actually be the activity of reverberating circuits of neurons called "cell-assemblies." I don't think his idea had its full impact on me at the moment he described it. Rather, it was after the lecture, as I thought about it, and thought that my thoughts may well consist of those physical things I was thinking about, that I realized what a radically different world view such a theory represented, and that it all had a ring of reality to it that made the Freudian notions I had been flirting with sound like silly fairy tales. Here were the real unconscious processes underlying our thinking, instead of the anthropomorphic machinations of some Freudian "unconscious mind," which now began to look rather like a supernumerary and supererogatory alter homunculus: *One* mind-body problem was enough!

Then, almost before the revelation his hypothesis represented had had a chance to take effect, Hebb took it back, informing us that his theory was almost certainly wrong. What followed was his second revelation: That a theory need not be right in order to be informative and to guide us in the right direction. And the cell assembly theory (together with other ideas in Hebb's epochal 1949 monograph, *The Organization of Behaviour*) had indeed inspired an enormous wealth of research findings, from the effects of sensory enrichment and deprivation to electrical and chemical pleasure centers in the brain to theoretical modeling of neural networks, as we went on to learn panoramically from the rest of Psychology 21 (based, as it was, on Hebb's *Textbook of Psychology*, which was itself based largely on research inspired and organized by his ideas).

Hebb himself was not only altogether unpretentious but also ever sceptical about his ideas. He saw them as pointing the way toward answers, rather than representing the answers themselves. In this I

believe he had had a veridical insight into the state of contemporary psychology: he did not see much that was lapidary in it. A student of Karl Lashley, whose own contribution had been mainly critical and heuristic, Hebb always stated with complete conviction that he regarded B. F. Skinner as the greatest psychologist of the century. This, despite the fact that (in my opinion) Hebb's own work and the research it provoked (rather than Chomsky's celebrated review of Skinner's *Verbal Learning*) may well turn out to be seen historically as having provided the real empirical alternative to behaviorism.

Contemporary cognitive science lays claim to a variety of roots (linguistic, philosophical, computational), but it also takes a lot for granted. Without any particular brief for symbolic representation, Hebb had been arguing for four decades that thoughts are processes represented in the head, and that behaviorism, in an over-reaction against introspectionism, was begging the important questions in psychology. For Hebb, the business of scientific psychology was to make inferences about the unobservable physical substrates of behavior, thinking, personality and emotion. Such inferences were risky (unlike behaviorism's reinforcement schedules), in that they might be very wrong; but as long as they suggested testable predictions and successfully guided research, they were leading toward the truth about the mind.

Another negative lesson Hebb had learned from behaviorism was that it is unwise scientific practice to ignore anything, be it our brain, our biological heritage, our cognition or our conscious experience. There is the room—indeed the need—in Hebb's cognitive psychology for studying all of these. And just as he avoided arbitrary dismissiveness and question-begging, Hebb resisted any sense of premature closure, of already having found the answers. (Contemporary cognitive science might do well to introspect somewhat as to whether, in its own animistic interpretations of symbolic processes, it has not inadvertently rejoined the hermeneutic road to Vienna.)

Hebb may well have been taking the proper measure of his subject when he declined the honor of having been its greatest contributor to date. In my view, his tribute to Skinner expressed his conviction that whereas theoretical ideas will come and go for some time to come in scientific psychology, its methodological commitment to ultimate behavioral testability (which is to say, *empirical* testability) is here to stay.

I went on to do honors psychology at McGill, and to write my honors thesis under Hebb (the last thesis he supervised, to my knowledge), and I continue to regard everything I do in psychology as Hebb-inspired. Many people feel this way about their own personal intellectual debt to Hebb (although "debt" is not really the right word—it's much more like "credit"), especially McGill people. There is also a related tendency on the part of the students of "D. O." (as Hebb was affectionately known locally) to see all good things in psychology as having issued from him. Perhaps this is a weakness of the students of all great teachers, and D. O. would certainly have been the first to pooh-pooh it. But before I set it down to mere discipial bias, I shall await the judgment of objective historians.

Historians have been relatively silent about D.O. so far, partly, no doubt, out of deference for the fact that he was still alive. For his part, D.O. had, in his wisdom, been electing to keep his own counsel in his last years, declining the many invitations to pronounce on the past, present and future of psychology that inevitably accrue to the grand old men of a field. He abstained in part because he remained ever the shrewd and dispassionate observer of life-cycle effects in his cognitive capacities (and those of others). And in part it was out of the perennial modesty and scepticism of this down-to-earth and very humane man.

But now that the old mariner's body has completed its last voyage, it is time we evaluated in earnest the treasures left us by his mind.

Stevan Harnad
1985