ject-relations theorists have pursued exhaustive researches into early childhood in their attempts to reconstruct the early emotional traumas of adult *neurotics* and *psychotics*" (pp. 226–227, italics added). Is not the unique contribution of the object relations school (and its blending with ego psychology) the demarcation of a whole range of borderline personality disorders lying conceptually between neurosis and psychosis? And yet, these are all questions I pose to writers who have demonstrated that an argument with them would be both challenging and on "the cutting edge."

Unfortunately, this book includes some sexist language. Pribram and Robinson are most guilty in this regard. I can overlook such neologisms as "trialism" (for trinity or triadic, p. 356) and "parallelity" (for parallelism, p. 357), but a passage like the following is more offensive: "These writers and their *brethren* heralded the triumphs of a roguish, adolescent independence from *mother* philosophy, *aunt* education, and whatever family ties might still bind" (p. 366, italics added). Contrast the previous quote with the following: "it becomes easier to distinguish genuine fathers of our ideas from godfathers, grandfathers, and mere custodians" (p. 346). Fortunately, such passages are rare. And only in a book worth close scrutiny do they stand out so sharply.

One can hardly read this book without having one's understanding of psychology's history transformed. It will make an excellent textbook for graduate-level seminars and is "must" reading for every instructor in history and systems. And for people who are merely curious, it raises fascinating questions about psychology's future and offers an interesting reinterpretation of the present. Contemporary historiography of psychology is definitely not boring!

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Nobel Intentions

Sir John Eccles, Roger W. Sperry, Ilya Prigogine, and Brian Josephson
Nobel Prize Conversations
Dallas, TX: Saybrook, 1985.
220 pp. $14.95

Review by
Karl Pribram

Sir John Eccles, 1963 Nobel Laureate in Physiology/Medicine, is enjoying an active "retirement" that takes him all over the globe as a lecturer. He is coauthor, with K. Popper, of The Self and Its Brain. ■ *Roger W. Sperry, 1981 Nobel Laureate in Physiology/Medicine, is Trustee's Professor Emeritus at the California Institute of Technology (Pasadena) and author of* Science and Moral Priority. ■ *Ilya Prigogine, 1977 Nobel Laureate in Chemistry, is coauthor, with I. Stengers, of* Order Out of Chaos. ■ *Brian Josephson, professor of physics at the University of Cambridge (England) and 1973 Nobel Laureate in Physics, is researching relationships between the mind and physical reality. He is coeditor of* Consciousness and the Physical World. ■ *Karl Pribram is NIH Professor of Neuroscience and head of the neuropsychology laboratories in Stanford University. He is author of* Languages of the Brain *and other well-known books on cognition and Freud.*

Reading *Nobel Prize Conversations* has proved a fascinating exercise for me. I know the protagonists, Sperry, Eccles, Prigogine, Josephson, and the commentator-editor Cousins, personally and have discussed with each many of the views presented in this book. The volume served therefore as an update on a continuing dialogue. In general, I agree wholeheartedly with the purposes enunciated in the conversations. But I am not always in accord with the manner in which those purposes are articulated.

In the words of Cousins and Sperry, the purpose of the book is to herald a "mentalist revolution," a revolution that is to bridge C. P. Snow's two cultures: the mechanistic, materialistic world of science and the humanistic world of arts and letters. To some considerable extent the book succeeds, if for no other reason than that these brilliant men are all deeply committed to understanding the issues they are discussing and have spent their lives productively pursuing their commitment. Furthermore, they have been so successful in this pursuit that they have won the highest esteem from their colleagues and society at large.

What I find lacking is an acknowledgment of the existence of a science of psychology. It is this lack that makes the volume worth looking at by psychologists. Here are a group of astute scientists and the former editor of the *Saturday Review* discussing aspects of mentality (i.e., psychology) as if Freud, Wundt, Hull, Skinner, and Lashley had never addressed their problems in the laboratory and clinic. True, Sperry does initiate the *Conversations* with a historical bow to the cognitive revolution (although he places it a decade later than it occurred):

> The revisions in science I refer to have advanced farthest, and are most clearly manifest in the mind-brain and behavioral sciences, in what has come to be called the "consciousness" or "mentalist" revolution of the 1970s. A broad shift of conceptual framework or scientific paradigm is involved, a shift in psychology from objective behaviorism to a more subjective cognitivism, from the old reductive materialism to a new more holistic mentalism. (p. 42)

Sperry goes on to enunciate the view that psychological (mental) functions are emergent properties of the brain. Most scientists would find no quarrel with this view. But behavioral scientists might suggest, as has Popper, who collaborated with Eccles in 1978 to write *The Self and Its Brain*, that the emergent arises out of the interaction between an organism with its brain and the environment, physical and social, within which that organism moves.

On several occasions I have been asked to review manuscripts by authors who have interpreted Sperry's pronouncements on the relation between mind and brain as supporting a materialist position. I have had to point out that Sperry's own interpretation of his views is that he is a mentalist and monist: "In effect and without resorting to dualist views, the mental forces and properties of the conscious mind are restored to the brain of objective science from which they had long been excluded on materialist-behav-

ionist principles" (p. 45). I believe Sperry misreads behaviorism. Even Skinner, in his radical behaviorism, does not exclude mentality; he simply notes that it is extremely difficult if not impossible to construct a science of mind because such a science must depend on verbal reports of introspections, and verbal reports are notoriously ambiguous.

More important, Sperry, in agreement with Eccles, points out that mental organizations control the operations of the brain. This downward causation poses little difficulty within the scope of biology. As Paul Weiss, Sperry's mentor, clearly stated, hierarchical biological systems are so constituted that control is reciprocal: for example, homeostatic systems control and are controlled by the substances they regulate. So why does Sperry feel that basic revisions in the concept of causality are involved here? Is it because to him mind and brain are really still two separate and different categories and because he feels that there is some sort of category error that must be expunged from current thinking before scientists can fully accept his mental monism? Eccles does not have this problem: He sticks to dualism and simply has mind operating on brain, period:

> In a fashion which is not yet fully understood, mental intentions are able to activate across the mind-brain frontier those particular SMA [supplementary motor area] neurons that are coded for initiating the specialized motor programs that cause voluntary movements. . . . The fact remains, and is demonstrated by research, that nonmaterial mind acts on material brain. (pp. 65–66)

What is of interest to a cognitive psychologist is that neither Sperry nor Eccles tells how he conceives of this downward causation. It is, of course, the metaphor of program and computer, which has energized the cognitive enterprise since the mid-1950s, that allows a plausible explanation to be developed (Pribram, 1986). In this metaphor the invariances that inform the coding operations that connect the computer's hardware (or the brain's wetware) with various levels of programming languages are the key. My formulation suggests there is good evidence to neutralize such invariants as "in-formation" with respect to the mind–brain dichotomy, but this is not the essential point. Statements such as those of Sperry and Eccles, which proclaim their views without providing some sort of an answer to the question of *how* such a process might proceed are neither philosophically sound nor scientific.

Equally difficult, from a scientific viewpoint, are the pronouncements on "intelligence" made by Josephson. I remember several occasions on which Josephson and I argued the fact that he does not deal with intelligence as it is studied in psychology. In fact, until now, Josephson had failed to provide some sort of definition of what he was talking about. In *Conversations* this deficit has been remedied, and Josephson gives an original definition: "The presence of an intelligence manifests itself via the presence of or the creation of states which are a priori extremely unlikely" (p. 98). But there is a flaw in this definition—the reification of what is observed to be a process. And so Josephson goes on to examine the theological question of the existence of God. There is no question that people observe in nature, in the cosmos, all sorts of states (such as water, chlorophyll, bicycles, and marital pairings) that a priori appear to be highly unlikely. In Josephson's sense, the universe thus exhibits intelligence and, proceeding to reify, an Intelligence. I like the definition but cannot go along with its reification whether by IQ tests or by Josephson. I would, however, like to see whether IQ tests might not incorporate some of Josephson's insight as to what people intuitively recognize as intelligent behavior. And I would like to see Josephson incorporate some testable hypotheses in his scheme.

A more congenial approach to the evolution of unlikely states is presented in the second "Interlude," which consists of a paper by Prigogine. He appears not to have attended the meeting. There are therefore no conversations in his contribution. Prigogine's paper is a straightforward scientific-theoretical presentation regarding the unavoidable "conflict between fundamental dynamic theories, be it classical dynamics, quantum mechanics or relativity and the second law of thermodynamics. . . . In all these fundamental theories entropy is strictly conserved as a result of a general mathematical property which is the unitary character of the time evolution. Therefore it seems that indeed at the fundamental level of description, there exists for classical theoretical physics no place for history, for meaningful changes from order to disorder or vice versa" (pp. 126–127).

Prigogine handles this problem of "the enigma of time" in a unique fashion—by introducing the concept of unstable systems and showing that they obey the second law of thermodynamics: "We have taken a quite different approach to the problem of irreversibility. We have taken the law of entropy and therefore the existence of an arrow of time as a fundamental fact" (pp. 127–128). In short, he introduces time into the system as an operator and breaks the symmetry of time as it exists in classical and quantum physical theories.

What interests me in this brief description of Prigogine's steps "from being to becoming," the title of one of his books, is that he derives the time arrow from the nonlocal aspects of quantum theory:

> The dynamics of unstable systems equipped with internal time corresponds to an algebra of noncommuting observables. Once we use internal time and partitions we have lost the local point of view of classical mechanics. *Instability leads to non-locality.* In this way the main obstacle for the transition between dynamic theories and probabilistic description is eliminated. (p. 136)

This procedure parallels Heisenberg's application of Hilbert's mathematics in quantum theory and Gabor's use of the same mathematics in psychophysics. What is new for me here is that whenever a system manifests (in space–time) its potential (as measured in energy–momentum terms), instabilities are introduced, and these instabilities account for the uncertainty relation.

I am sure that there are other provocative bits and pieces to be found in this volume. Cousins was inspired to find corresponding statements in the literary arts. Depending on your background and interest, you also should be provoked, on occasion perhaps even to amusement or anger, by certain of the thoughtful statements. But whatever your reactions, you will not regret perusing these thoughtful *Nobel Prize Conversations*.

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