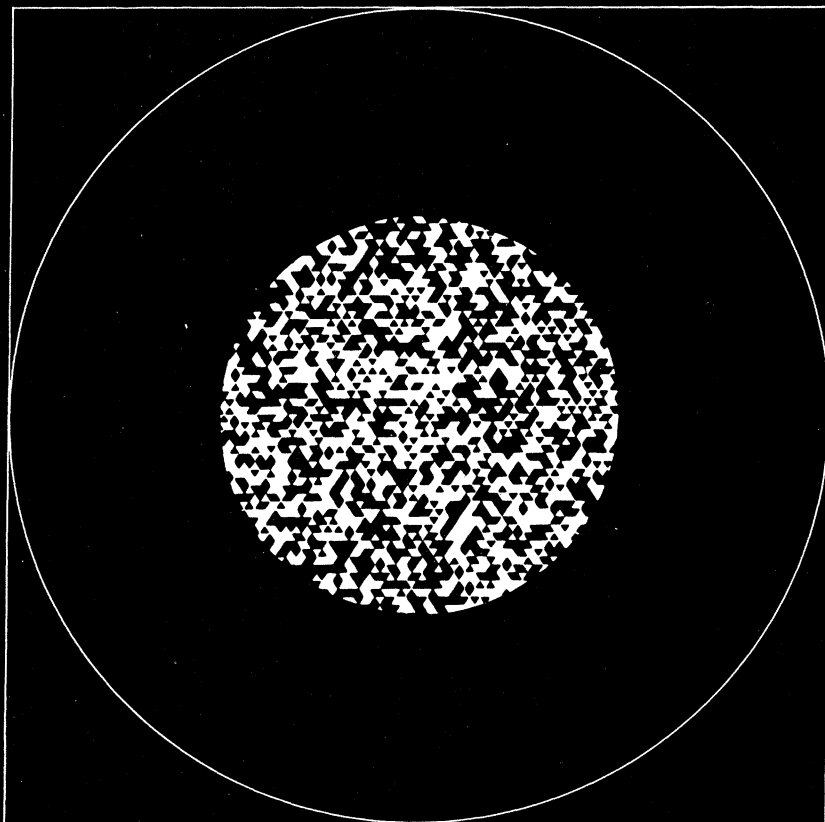


"The mythical cyclops looked out on the world through a single eye in the middle of his forehead. We, too, in a sense, perceive the world with a single eye in the middle of the head. But our cyclopean eye sits not in the forehead but rather some distance behind it in the areas of the brain that are devoted to visual perception."—from the Preface

Foundations of Cyclopean Perception



Bela Julesz, head of the sensory and perceptual processes department of the Bell Telephone Laboratories, presents, in a magnificently illustrated book, the insights into the "black box" of the visual system that have been gained by research of the past decade—research in which he has been a leading figure. He has established, by psychological methods alone, that human depth perception is a central process taking place at a precisely located site within the visual cortex, the "cyclopean retina."

Using computers to generate complex random-dot patterns, such as the one above, Julesz has created visual information which bypasses the outer, or anatomical, retina and directly stimulates the central cells within the brain which fuse monocular input from each eye to produce binocular depth perception.

This book presents the cyclopean methodology developed by Julesz and others, and his model of stereopsis is published here for the first time. Some of the findings in this work are relevant to cognition (localization of eidetic memory, perceptual learning, etc.). Others bear on purely "sensory" processes (localization of simultaneous contrasts and color phenomena).

Neurophysiologists, experimental psychologists, and ophthalmologists will find this book has rich implications for immediate use and for further research. Clinicians can use the Julesz patterns as test plates for locating and quantifying stereopsis deficiency. Julesz' work is already well-known to many artists interested in computer-generated art forms. The beauty of the reproduced plates and the excitement of perceiving the forms that float out from the seemingly meaningless patterns will delight the layman or student of the visual arts.

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LETTERS

Understanding Man's Behavior

Constance Holden reports (News and Comment, 17 Sept., p. 111) that psychologists are beset by feelings of futility and self-doubt. I don't wonder! As a biologically oriented scientist who has raised seven children over the past 40 years, I have also been beset by doubts and sheer disbelief of much of psychology for the last 20 of those years. A parent must finally throw up his hands and decide that grandma and grandpa know best after all. At least they have some unity and consistency in their ideas of family relations.

What a golden opportunity psychologists have had! The public has eagerly sought and read their latest pronouncements. People have tried to put psychology into practice, often with unfortunate results. Theories of child rearing have changed so fast that a whole generation (mostly confined to the educated classes) has been raised without fully consistent and secure parental guidance. What else can be expected from a science that has tended to de-emphasize and even disregard the biological contribution to human behavior and the vast biological diversity of humans? How can a science of "the mind" prosper when it sometimes forgets that the brain is a biochemical and biophysical organ that does not respond to environmental stimuli in the same way in different individuals, and furthermore often forgets that many of these differences are inherent?

It is ironic that Skinner and Clark, the men Holden cites as believing they have some answers, should take such completely different approaches. Skinner "believes that all of man's behavior is determined by his environment." He would condition each and every one of us to be good boys and girls. Clark, on the other hand, assumes some biological basis for behavior when he advocates the use of mind-affecting drugs to make our leaders behave.

These prescriptions sound like nonsense to this nonpsychologist and will plunge psychology even deeper into futility and self-doubt. Psychologists need a "comprehensive theoretical model" that includes the fact that the human brain is a highly diversified biochemical and biophysical organ, developed over a million years of human evolution. Man's behavior will not really be understood until the nature and ramifications

of the biological-spiritual brain (human nature?) are better understood. In the meantime let's keep in mind that all men are *not* created equal. This will save much time and effort and many tears.

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In the account of the annual meetings of the American Psychological Association, Holden states that operant conditioning refers to the stimulus response techniques first developed by Pavlov. It should be pointed out that operant conditioning refers to the stimulus-response-reinforcement techniques first described by B. F. Skinner in 1938 (1).

The distinction between Pavlovian (respondent) conditioning and Skinner's operant conditioning is an important one. Skinner contends, and his contentions are supported by a wealth of experimental data from the field of behavior analysis, that behavior is controlled by the consequences it produces in the environment. Pavlov was the first to demonstrate that certain behaviors (primarily reflexes) are elicited by specific antecedent stimuli. Skinner, on the other hand, was the first to explain systematically how most behaviors (primarily social and verbal) are controlled by their consequences.

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Reference

B. F. Skinner, *The Behavior of Organisms* (Appleton-Century-Crofts, New York, 1938).

Pavlov's stimulus-response techniques involve the pairing of a neutral stimulus with a stimulus that regularly elicits a response, such as food (which elicits salivation) or shock (which elicits diffuse "emotional" responses). The food or shock is presented without regard for the organism's behavior.

Operant conditioning procedures differ from Pavlov's in that the organism's behavior determines whether a stimulus such as food or shock will be presented. In a standard operant conditioning experiment, the rate at which a rat will press a bar depends on whether bar-pressing is followed by food or shock, and, conversely, the occurrence of food or shock depends on bar-pressing. Thus, the organism affects its environment, as well as being affected by it. This aspect

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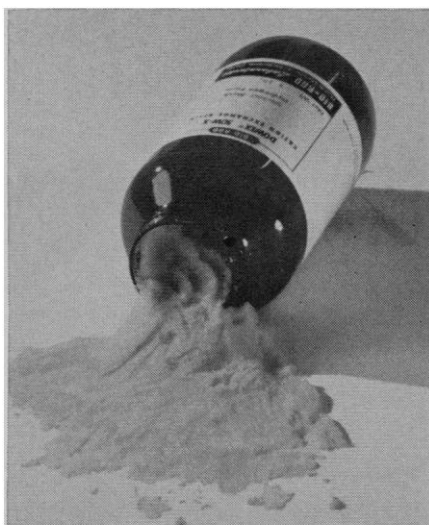
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of operant conditioning is especially important when the environment includes other organisms—each affects the other and is affected by the other, so that they enter into the reciprocal controlling relations which are the essence of social interaction. Operant conditioning provides a way of understanding these interactions; Pavlovian conditioning, although important in the analysis of behavior, cannot incorporate reciprocal organism-environment interactions.

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Research Grant Evaluation at NIH

Gross (Letters, 9 July, p. 106) expresses sincere but misguided concern for the viability of the National Institutes of Health (NIH) system of research grant evaluation. He considers that "the growth of NIH center grants and contracts . . . not now reviewed by study sections" (but by special committees instead) is an effort to bypass the present system of quality control and provide safe, easy cover for individual investigators. Others, on the contrary, have privately voiced fears that worthy center and program-project grant applications may not be approved if they include less meritorious projects. Both views underestimate the strength and wisdom of the peer review system. Indeed, experience with one special committee, the Pharmacology-Toxicology Program Committee, has been reassuring.

Each institution applying for program-project, center, or contract funds is first rigorously inspected by a site-visit team of experts from the committee, suitably reinforced as needed by outside ad hoc consultants to ensure coverage in depth of all aspects of the proposal. The question recurs, "Is this truly a program (or a center), or is it merely an umbrella to cover the research of the department?" The component research projects are minutely scrutinized for both scientific merit and relevance to the aims of the program or center; projects lacking in either criterion are pruned from both the application and the budget in a consensus report prepared by the site visitors.

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