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ABSTRACT

A research memorandum presents the results of an on-going study into the implications of a moral science. Adopting a moral stance in scientific investigation would entail the abandonment of analytic modes of inquiry for more holistic, open-ended ones. The basic premise of a moral science is that it is possible for men to reach agreement on what is healthy psychologically, just as agreement has been achieved on what makes for a nutritious diet. A second section of the report discusses the nature of scientific revolutions. Many social thinkers are quoted to explain what happens when one, all-inclusive paradigm for explaining natural reality is given up for another, less complete one which in the end provides more comprehensive and satifactory explanations. Evidence for an impending change of paradigm is put forth, using the background of research into extrasensory perception and communication. (RB)

IMPLICATIONS OF A MORAL SCIENCE

Memorandum Report
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ROBERT E. KANTOR

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CONTENTS

I INTRODUCTION

General Context of a New Paradigm

What is inexorably moral about social science is that its conduct is almost always concerned with the needs, values, and beliefs of human groups. In terms of social ends, the choices of which impinge on the quality of life, the data of social scientists have basic relevance. It is true as of now that relevance is small. But it seems to be growing. Some of the applications are already visible in the fields of public opinion surveys, in psychotherapy, in opinion-attitude measures, and in their changes through group methods.

The potential power of these applications and of others like them, such as control of the genetic pool, makes it all the more pressing to see that those values that are good for people are always present in the initial selection of a problem. Those social scientists who proclaim that, as scientists, they are not involved in what ought to be, generally tacitly assume that the established way of doing things is the proper way in which things ought to happen. Usually, this set of social values is not openly examined but instead is hidden behind premises about the "objectivity" of science.

It finally becomes clear that social science could remain "objective" as long as it didn't matter whether the knowledge it generated could have significant human consequences. Objectivity arises from the impersonal. It is analytic and dissecting. It selects a portion of an event and holds it up to the light of scrutiny in isolated loneness, apart from its effects on the other parts. Typically and basically, an analytic mode calls for an impersonal and amoral science; when the need is for a moral science, a holistic mode must enter. A holistic mode demands a larger frame of reference, a different focus, new discipline; finally, it redefines perception in favor of open-endedness (for open-endedness must be tolerated when the researcher is trying to see the whole picture rather than a part).

The chief implication of a moral science is that, by its overriding concern with what is good for man, it is forcing changes in the dominant paradigm of contemporary science. There is now an accumulating body of serious literature that has urged the reappraisal of regnant conceptions of human knowledge, looking at the processes of inquiry in all fields and also at the arbitrary boundaries current in these fields.

Most of the contributions to this re-examination have arisen among the physical scientists. Einstein[1] has credited Bohr, de Broglie, Heisenberg, and Schrodinger, among several others, with a basic shift in the premises of physics.

Michael Polanyi[2,3,4] is a name that comes to mind also, along with P. W. Bridgman (especially in The Way Things Are),[5,6] Harold G. Cassidy,[7] J. B. Conant,[8,9] Gerald Holton,[10,11] Robert Oppenheimer,[12,13] and Sir George Thompson.[14] But scientists from other areas have also shared in the new context: from mathematics there has been J. Bronowski;[15,16,17] from paleontology, Loren Eiseley;[18,19,20] and from microbiology, Rene Dubos.[21] Certainly Alexander Koyre[22] in history would be included in this company, as would N. R. Hanson[23] and Stephen Toulmin,[24,25,26] whose area has been the philosophy of science. Some historians of science who have been inclined, either manifestly or latently, to try to match the dominating premises of science against the process of research as it was actually conducted, belong here: Herbert Butterfield,[27] I. B. Cohen,[28] C. C. Gillespie,[29] and T. S. Kuhn.[30]

Psychological Context

Religious Overtones

In psychology the re-examination of the premises of current science has taken on some religious overtones. This is especially true in the human potential movement that includes such figures as J.F.T. Bugental, Sidney Jourard, Rollo May, Ira Progoff, Herbert Otto, Carl Rogers, and the late Abraham Maslow. They declare that even the healthy human uses only a fraction of his potential. Therapy, as they see it, should move away from the ideas of sickness and of healing. Instead, it should move toward drawing human consciousness beyond its normal bounds to a transcendent state. For Maslow, the "peak experience" was frankly religious; he called it "the sacred."

This religious ideology is, in an unexpected way, also political. Maslow, in his last work,[31] argued that good people and a good society can only emerge together. Herbert Marcuse, in his essay "On Liberation," wrote:[32]

> The new sensibility . . . emerges in the struggle against violation and exploitation where this struggle is waged for essentially new ways and forms of life; negation of the entire. Establishment (and) affirmation of the right to build

> a society in which the abolition of poverty and toil terminates in a universe where the sensuous, the playful, the calm, and the beautiful become forms of existence and thereby the form of society itself. . . . The new society will be one where the hatred of the young bursts into laughter and song, mixing the barricade and the dance floor, love play and heroism.

Marcuse sounds more biblical than political; the vision fits Revelation, not revolution. But Marcuse's notion is that the two work together. In the revolution that he and many others of his outlook are talking about, our very definitions of reality will sharply alter. A common thread in almost all religious beliefs--one that transcends their differences--is that our usual ideas of reality are illusory. Our goods, even our bodies, are not our real selves. To "see" we must first become "blind" to worldly possessions and restraints.

That is the revelation Marcuse seeks. For, as he sets it forth, we are limited by an image of reality that is a mistaken one, it merely stems from the demands of the present economic structure--deprived of commitment by an economy where planned obsolescence takes the point away from our work and by an ethos that excludes play from work, deprived even of our psyches by a premise about mind that artificially opposes rationality to imagination and in the alleged service of scientific objectivity suppresses the fact that it is in our subjectivity that our humanity lies.

For decades sociologists have called attention to this alienation. The call grows louder now. Students speak commonly of "getting it all together." Paul Goodman believes that these students are foreshadowing a religious revival that will reform a society that now violates its citizen's needs for privacy, for communality, for redemptive values widely shared.[33] Theodore Roszak[34] says that:

> This . . . is the primary object of our counterculture; to proclaim a new heaven and earth so vast, so marvelous that the inordinate claims of technical expertise must of necessity withdraw in the presence of such splendor to a subordinate and marginal status in the lives of men. . . . We must be prepared to entertain the astonishing claim men like Blake lay before us that there are eyes which see the world not as commonplace sight or scientific scrutiny sees it, but see it transformed, made lustrous beyond measure, and in seeing the world so, see it as it really is. . . .

It begins to become clear that there is more to the protest movement than stopping war or ending the economic and social sins of the country, for those ends are mostly political ones. A far deeper change is what these revolutionaries are about. The liberation is theological/political. It proposes that we rejoin what we feel with what we declare, unconsciousness with consciousness, fantasy with rationality, mind with body, our inner selves with the outer, all of us in real community.

Psychotherapy

As noted before, the redemptive note has been struck in psychotherapy also. One of the facts of our time is that people seeking help for their problems have turned to psychotherapy rather than religion. For this reason alone psychotherapy could be regarded as a moral psychology. It is moral in the sense that it teaches the client to interpret the cares of his life with some enlightenment and therefore with some freedom.

For this freedom to come about, man must be unfettered from his bonds, both the inward and outward ones. Karen Horney[35] has put the heart of the matter succinctly. She speaks of the "real self as that central inner force, common to all human beings and yet unique to each, which is the deep source of growth."

The goal for humans of this sort of an approach is the ever-growing awareness and comprehension of the self. But self-knowledge is not an end in itself, only a means of freeing the forces of self-unfolding.

Although such an end might at first seem selfish, it is really morally enlightened because, to the extent that men take their growth seriously, they grow better able to feel love and concern for others. The prescription for society inherent in the unfolding psychologies such as Dr. Horney's is that of practicing brotherhood. It could be said that the real self of each individual joins all the real selves of all others in a constructive communal way.

All this may sound somewhat romantic and unscientific, yet it sums up the experience of many level-headed clinicians. Why then, one might ask, do not psychologists extend such inferences to the social ills of the day? Probably the answer lies in that these ills, neurotic in origin though they may be, do not yield directly to political remedies. At the social level these ills are encased in obdurate organizational forms that are hard to get through. Social changers, then, need to get around the obstacle through the educated growth of an increasing number of individuals who could learn to tell themselves the truth without defense, who

are productive and energetic, who give to one another, and who can assume mature responsibilities for their choices in life. Education to such ends might better be day-to-day practice for each person rather than institutionalized process.

This notion that the individual's path to self-discovery can serve to save society as well finds an echo in many contemporary psychological systems such as Goldstein's self-actualizing drive or as Jung's individuation ways. The basic general idea is that the human, given a chance, tends to maximize his own potentialities. This is not a matter of teaching, any more than sown seeds need to be taught to grow into their own particular types of plants.

But where psychotherapy becomes education is in the area where the blocks to individual growth need to be removed. For growth can be blocked by an unfavorable world. Much of learning amounts to a liberation from these obstacles. Furthermore, the learning process begins to aim farther than mere healing. The psychotherapist/educator sees that men are empty and dissatisfied because they are estranged from direct knowledge of their being.

The modes of help vary here. Maslow declares that the peak experiences people have felt indicate the workability of a pleasanter life when it is not opposed by security or esteem needs, Frankl formulates mens' efforts to fill their void as a "search for meaning," and Jung described the fuller contact with reality as part of the individuation.

The process of discovering the real self may involve the risk of temporary psychosis. This was particularly noted by Jung as a possible part of individuation. It seems like the kind of recoil necessary for a better spring. Maslow spoke of the same risk in B-cognition. Kantor cited anthropological data on Shamanism to the effect that the development of charismatic tribal leadership fell on those men who could retreat into lengthy psychosis and emerge self-healed.[36]

Laing has been particularly articulate in proposing psychosis as a stage in the road to self-realization and deep unification.[37] His ideas about schizophrenia are that it is a creative solution for the psychosis-producing double-bind in which the schizophrenic found himself. Since a double-bind is effective only because the person placed in helpless conflict is also prohibited from commenting on that conflict, Laing saw that the schizophrenic withdrawal was helpful. For the conflicted person used his period of withdrawal to sort out and clear up the deceptions involved in the communications to which he was subject. Reaching the real self during his withdrawal time also widened the self-analytic capacity for

the person alienated from himself during the double-bind process. The definition of schizophrenia as a solution rather than as a problem is a dramatic reversal to the usual perspectives of abnormal psychology. It opens up a promising new way to look at one of the oldest puzzles in psychology by taking a radically different stance. Instead of seeking better technological solutions by examining new chemical, surgical, or confinement means, the solution leaps into an innovative realm. This realm takes its start from a new assumption: schizophrenia is not the illness but the cure. The true illness lies in man's enforced estrangement from his real self and schizophrenia is his means of getting back to that needed real self. Such a reversal of orthodox perspective often heralds new advances for it corrects inadequacies in the dominant perspectives. T. S. Kuhn has made much of this idea.

II NATURE OF SCIENTIFIC REVOLUTIONS

Paradigms, Dominant and Aging

Kuhn[38] made the point that science does not progress, as the philosophers of science said it did, by steadily accreting knowledge. Rather than steady growth, there are instead series of sudden jumps. In the intervals between these jumps there is a buildup of basic upheavals that Kuhn called scientific revolution. First, however, there is a reigning picture of the field, called by Kuhn a paradigm. It is a set of insights and percepts, backed up by an abstract theory and communicated through exemplars. As this paradigm extends over time, it becomes articulate and elegant and eventually constitutes the bulk of what most eminent scientists believe. Imperceptibly, with its growth the paradigm is regarded as the unique bearer of scientific truth; problems (and facts) that do not square with it are pushed out of sight.

Gradually, and usually within the paradigm itself, trouble visibly turns up. Persistent data, which do not square with the paradigm, appear in widely separated studies or problems remain that are insusceptible to the techniques based on the accepted theory. These sorts of troublesome signs are anomalies, so called by Kuhn. Anomalies unmask those places where the dominant theory is overextended, or where its predictions go awry, or where inconsistencies between hypotheses and outcomes become apparent.

The followers of the paradigm do not yield easily to the difficulties; they propose ingenious extensions of the paradigm, they vary it, and they may revamp its structure. And, of course, sometimes they succeed in their restructuring efforts. When they do not, the anomaly sinks into a crisis. Now, the faults and shortcomings of the paradigm come under increasing scrutiny; many of the disregarded facts and awkward problems are again remembered. Conflicting schools of thought with differing fundamentals grow around the issues.

In time, a small group rises above the confrontations with a new image or philosophy or metaphor, building their postulates to untangle the knots that had hobbled the old paradigm. The new paradigm looks rough compared with the older one, and part of the struggle between the followers of each concept entails the efforts on the part of the adherents of the new to include into their own development as much as possible

of the detail and finish of the data garnered by the old paradigm. If this last is successful, the scientific revolution has occurred. The new paradigm composes the framework of contemporary science and the processes of "normal" science may start once more.

Character of a New Paradigm

There have not been many new paradigms in the history of the western thought, but they share some common aspects: (1) expansion of the old frame of reference; (2) shift in focus; (3) evolvement of novel disciplines; and (4) new ways of seeing.

New Frame of Reference

Ideally, the paradigm shift entails expansion of the old frame of reference, but this does not always work out. Sometimes the old frame just fades away. Modern chemical understanding of gases and their bonds rules out the once powerful phlogiston theory of combustion. Contemporary ideas about mental pathology do not accord with the "devil-possession" notions of the late Middle Ages.

But sometimes the old frame of reference is not wholly discarded. More often than not, the main data and methods of the old are nested in the broader framework of the new. The old ways are seen to have been a special case of a more widely encompassing, more explanatory synthesis. In this sense Euclidean geometry is now defined as one of several cases that are broader than it in scope and just as valid. In the same manner it is possible that the social sciences could fit into some wider frame. There are two reasons for trying this fit:

(1) The actual breadth of human capabilities far exceeds the levels at which those capabilities are estimated by present-day social science.

(2) This underestimation is particularly noticeable in the matters of creative imagination, empathic sensitivities, perceptual sensibilities, and creative life styles.

The research areas that support these reasons range widely. They cover studies of creativity, hypnosis, psychotherapy, and the collection of data on small-group processes, stress research, and expectancy-set work. In addition, the areas on artistic sensitivities and on ambiguity tolerance should also be included.

Even a necessarily brief review of the field of creativity reveals its richness. The methods embraced recently for the improvement of creativity consist of discovery techniques, divergent thinking tasks, free-association training, and programmed learning. The wide variety of subjects includes university students and preschoolers, military officers and artists, the mentally retarded and the gifted, people from education and people from business.

Among the increased cognitive capabilities were enhanced concentration, the capacity to enlarge the context of a problem, a greater facility in visualizing end results in advance, heightened association between unlike elements in a situation, and more flexibility and fluency of ideas. Among the enhanced affective sensibilities were freer imagery and increased fantasy, widened empathic ways with people and with nature, decreased anxiety, and greater freedom for the unconscious. Some reviews that support and give more detail on these findings are those by Parnes,[39,40] Ray,[41] and Torrance.[42]

The moral common denominator among this range of findings is that they all focus frankly on what is good for man. The basic premise of a moral science is that men can reach agreement, out of study and research, about what is healthy psychologically, just as agreement has been achieved on what makes for a nutritious diet.

Abraham Maslow pointed out that attempts in the past to describe a natural morality had fallen short, but he felt that psychology now was at a point where this age-old dream could be realized. If men know who they really are and what they have in them to become, the very ground of their being could serve as a court of appeal to spell out the good and the bad. It is possible at last, Maslow felt, to set forth a system of morality from within.

Always before, men had been unable to establish such a system for the reason that none could determine what man's essential inner being was actually like. To have asserted that a primary state of inner being exists is not the same as having some explicit knowledge of it. Now, Maslow saw the path that might lead to the solution of this difficulty.[43] A good first move would be for psychology to leave behind its interest in pathology and to focus its attention on the study of healthy creative persons. The most creative ones, Maslow said,[44] have some personality attributes in common:

(1) They are more open to hidden levels of meaning in art and science and see the beauty in complex forms, even when these forms are not conventionally or officially regarded as beautiful.

They have a clearer view of the ideal, of the perfect, and therefore of what might be possible to accomplish. They are very apt to be innovators.

(2) Such persons use easily, naturally, and normally the language of the poets, seers, mystics, and artistic men. They employ paradoxes, parables, art, and nonverbal modes with clarity and fruitfulness. They dwell in the sensory world with delight; they have little recourse to final judgments.

(3) Those close to their subjective selves very frequently report feelings of illumination and insight that, with the force of absolute certainty, they have entered another world. William James, having experienced this in himself and knowing of it in others, called it the Noetic Quality. This quality is arational and is not an increase in facts. Rather, it is in the nature of psychological insight.

The parallel between these ideas and the independent research findings on creative people is most intriguing as shown, for instance, in empirical data on the three traits that mark the highly creative person.[45]

The first has to do with the relationships of complexity to simplicity and of order to disorder. Creative individuals seem to be able to discern more true complexity in whatever it is they attend. They prefer phenomena and visual displays not easily ordered or those that present perplexing contradictions. When confronted with an ambiguous perceptual field as in Rorschach's inkblot test, they seek a synthesizing image that will unite many diverse elements. Another relevant test is the Barron-Welsh Art Scale, in which line drawings of figures, systematically varied as to complexity, are presented with instructions to denote the most pleasing figures. The scale measures the similarity of the respondent's choices to those of artists. Artists prefer figures that are more ambiguous, more complex, less obviously balanced, moving rather than still. Barron has found that creative individuals in many different professional fields prefer the kinds of figures that artists prefer, as Maslow felt was true of creative people in general.

A second trait of creative people is perceptual openness or resistance to premature closure. This may relate to the first, since such an attitude provides more opportunity for complexity to develop in the phenomenal field. A good measure of it derives from the theories of C. G. Jung, which contrast the perceptual attitude and the judgmental attitude. According to Jung, when a person faces an event, he performs either an act of perception (he becomes aware of something) or an act

of judgment (he comes to a conclusion, about something). If one of these action tendencies is strong in a person, the other is correspondingly weak. The judging attitude is said to lead to an orderly, prudent, planned life based on relatively closed principles, whereas the perceptual attitude leads to more openness to experience, including experience of the inner world of self. The perceptual attitude facilitates spontaneity and flexibility.

In Barron's studies every group except scientific groups is predominantly perceptual rather than judgmental, and in every group, including scientific groups, the more creative individuals are more perceptually oriented and the less creative are more judgmentally oriented. Maslow thought the same.

The third characteristic of creative persons is reliance on intuition, hunches, and inexplicable feelings. They trust the arational processes of their own mind. This, too, indicates a polarity to Jung. The act of perception itself, he says, may be of two kinds: sense-perceptive or intuitive. The sense-perceptive attitude emphasizes concrete realism and is a direct awareness of things as they are in terms of the evidence of the senses. Intuition, by contrast, is a greater awareness of deeper meanings and possibilities. Creative individuals are characteristically intuitive. Test results cited by Barron indicate that more than 90 percent of the creative individuals studied are predominantly intuitive. Experiments and interviews confirm the test scores. Maslow, too, thought that creative people relied on inner illumination.

Conceptual offerings such as those by Maslow and by Barron may signal a paradigmatic revision. Such a revision corrects the traditional scientific paradigm that purged psychology of the unique and the private. Although the older paradigm has made valuable contributions to our understanding of man, it seems evident now that this orientation can no longer exclude a moral orientation from the primary subject matter of a normal psychology. Some of the most exciting developments during the past few years have occurred in new experimental work based on what is good for man.

Shift in Focus

The second distinctive mark of a major shift in paradigm is a shift in the focus. Newton and Galileo took the subject of energy, which was merely a subtopic to Renaissance scholars primarily interested in matter, and succeeded in placing it at the very center of the physical sciences. Freud and Breuer took hypnosis and hysteria from the outer edges of

scientific respectability and moved them to a pivotal position in psychopathology.

Today the focus seems to be shifting again. The anomalies in the current paradigm seem to mark a change of the first magnitude. This change may lead to the most potent alterations of outlook and world concept since the Copernican and Newtonian pictures of actuality, which so effectively frame our perceptions of the world today.

The impressive advances of the past century of physical sciences with their emphases on prediction and control through linear determinism cannot be denied. But the place of physics at the crest of the sciences seems to have slipped. The life-science model is edging toward the summit now, and its model is a relational one rather than a linear one. In fact, the physicists themselves are changing their picture of the world to accord with this shift. In Waddington's book on Theoretical Biology,[46] one physicist subscribed to the idea that the world is an ambiguous spectrum of flow patterns. Objects, in this image of the universe, are self-maintaining in that they retain their boundaries despite the fact that fields of flow go through them to and from many other objects. Therefore, objects--and this means people, too--take on meaning through their relationships with other objects. The environment refers to the flow pattern of objects. A lake and its plants and fish would be an environment of this kind. Another example would be a city and its people and its buildings. All relate to each other and take on meaning in terms of each other, thus reflecting Maslow, Polanyi, Whitehead, and the Upanishads.

Studies in Plant Communication. This emphasis on the interlinkages and the flow patterns opens up the idea that channels of communication among men, and perhaps among other living things, are more subtle and more pervasive than has been conceived before now. Some particularly intriguing data along this line have been reported about C. Backster's work.[47]

He fixed a pair of psychogalvanic reflex electrodes (PGR) on each side of the same leaf of a Draena Massangeana plant. The chart tracings exhibited a contour typical also of human PGR reaction patterns experiencing emotional stimulation of short duration. At the exact point in time when he decided to burn the leaf, there was a dramatic change in the PGR slope in the form of a prolonged upward sweep of the stylus. Since Backster had not moved or touched the plant, apparently his thought of burning it was enough to produce the PGR response.

It seemed to him that this event, if repeatable, would tend to indicate the possibility of some undefined sensing capacity within the plant. He then dumped some live brine shrimp into boiling water and again the recording polygraph needle leaped unmistakably. Since then, Backster mechanized his shrimp-dump dishes and put in a sophisticated setup of multiple PGR monitors, programmed circuitry, and an electronic randomizer. The results still pointed to the presence of an unexpected and inexplicable range of perception in the plant.

Incidentally, Backster tried to block whatever signal was being sent and received by using a screen cage, a Faraday screen, and even a lead-lined container. His efforts did not work; the communication continued. He related anecdotally that not only could the signal not be shielded, but also that it was not within the different known frequencies, either FM or AM.

Although Backster's results certainly need to be gone over with other studies, he himself seems to be an unusually competent investigator. He testified as an expert before the 1964 Congressional Hearings on the Use of Polygraphs by the Federal Government. After CIA duty as an interrogation specialist, he became director of the Leonarde Keeler Polygraph Institute of Chicago. He brought into use the Backster Zone Comparison polygraph procedure that is now the standard method at the U.S. Army Polygraph School.

Backster's kind of data calls attention to the data in other fields such as hypnosis and parapsychology, where the information channels now appear to be broader than was thought likely in the past. Anecdotal reports and empirical work, both with careful attempts at validation, continue to turn up: anthropologists have noted the extraordinary capacities of primitive tribes to speak and hear across mountain ranges; psychologists have long noted unusual specialized abilities such as people with eidetic imagery, absolute pitch, and memory of long random sequences of letters and numbers; and hypnotists have helped to induce markedly increased discriminations of stimuli from self, from others, and from nature toward which the subjects had been previously insensible.

Hypnosis. Many ways have proven serviceable in bringing about the hypnotic effect: role-taking, direct suggestion, goal-oriented aims, and through sensory-ideational deprivation.[48]

In all these efforts the explicit set and the unverbalized expectancies among the persons concerned were able to ease or to hinder the hypnotic process. And this was true whether the subjects were normal

executives, children, or students, or whether they were patients suffering from disease or neurosis. Also, the scope of their heightened capacities included greater control of fatigue effects, pulse rate, eye reflexes, gastric contractions, galvanic skin responses, memory retention, and extrasensory perceptions. Reviews and general support of these results are to be found in Weitzenhoffer,[49] Moss,[50] and Hilgard.[51,52]

Quasi-Sensory Communications Work. Since there is not space here to look completely at the meaningful amounts of data that have been growing in this area of parapsychology, it is convenient to refer to several excellent surveys.[53,54,55] The data add up to a tenable case: unusual sensing abilities that can be put under the useful heading of "extrasensory perception" show up consistently, although Hansel[56] and Sudre[57] still think the data are inadequate for a firm conclusion.

Certainly, the issues raised by the work in this area are basic ones. The matter of telepathic communications has been provoking psychologists for at least a century. In 1937 Rhine[58] summed up his work by declaring that his findings showed humans are able to communicate without the use of the senses as we understand them. But it was easy--and probably scientifically justifiable--to reject this finding on the basis that the empirical methods were loose, that the ESP was only intermittent, and that predictability and repeatability were not forthcoming.

But statistical evidence continued to appear in widely separated laboratories,[59,60,61] inducing an increased willingness to restudy the alleged behavior that up to now has been brushed aside. The problem has been to design an empirical procedure so that both the adherents and the antagonists to the hypothesis of ESP would be satisfied that justice was done to the phenomenon. Also, to lend credibility to the event in case the findings turned out positive, the experiment should try to tie in the ESP behavior to the already verified body of psychological facts. This last appears necessary to convince men like D. O. Hebb, a renowned experimentalist, who frankly once said, ". . . I do not accept ESP for a moment, because it does not make sense . . . my own rejection of his (Rhine's views) is--in a literal sense--prejudice."[62]

Yet the strength of the gathering evidence casts growing doubt on the validity of such prejudice. Two recent experiments will do as examples. Krippner took as his point of departure the frequent association of an altered state of consciousness such as dreaming or trance with a paranormal event.[63] His initial studies focused on the sleeping subject and consisted of the attempt to incorporate into his dream experience

aspects of randomly selected target pictures that were viewed by an agent who could in no way communicate his impressions through ordinary sensory channels. He then worked on subjects in a state of hypnosis rather than of sleep and, using a similar design, sought to influence paranormally the content of hypnotically induced dreams. His findings confirm that paranormal processes appear to be facilitated in both these altered states of consciousness.

McBain and his colleagues seem also to have designed a worthy experiment.[64] First, they prudently used the neutral term QSC (quasi-sensory communication) instead of the prejudicial term ESP (which commits one to an "extrasensory mechanism"). Then they examined the anecdotal literature on telepathic communications, finding two major features in almost all of these occurrences: the communicants transmitted materials of an emotional nature and they shared a common basis of verbal rapport.

The experimenters noted that if they observed these two features in the selection of materials and of sample, then they could show the occurrence or nonoccurrence of QSC in a randomly chosen, normal population. Of course, the experiment had to observe all the usual safeguards against error, chiefly against the possibility of the subjects using normal sensory means.

They used 22 pairs of student volunteers, picked for hypnotic susceptibility and paired with each other on the basis of similarity of concept ratings on the semantic differential. The partners then randomly sent and received lists of the specific concepts under rigid control of sensory channels such as automated presentations, objective recordings, and physical isolation from each other. Under these conditions the amounts of correct guesses turned out well beyond what "hits" could have been expected by chance alone.

Findings like these and growing numbers of similar ones seem to establish QSC as a potentially worthwhile supposition for the emerging newer image of human conduct. They help to enlighten, for instance, that subtle complex of family communications that can produce school-motivated or -unmotivated children. QSC might also help to clarify how unwanted experimenter bias creeps into empirical situations.[65]

Novel Disciplines

Still another aspect of major scientific change comes into view in the form of novel disciplines that are subsets of the older disciplines.

Traditional psychology splits up into transpersonal psychology, humanistic psychology, and altered states of consciousness. T-group work, Gestalt therapy, sensitivity groups, and encounter groups proliferate from the older source of psychotherapy in the same way that quantum physics or molecular biology has issued from late developments.

Of great interest is the fact that the new regroupings in psychology are exciting parallel searches in physiology. Changes in respiratory rate, CO_2 levels, blood pressure, and skin resistance are now under observation as they covary with states of meditation and of alpha wave production. In other words, the great changes in scientific paradigm that seem to be upon us are bringing in their own needed technology.

Bio-feedback studies rank prominently among the new technologies. They have shown a path toward more effective use of an access to unconscious functions such as expanded time and space boundaries, repressed thoughts, and hypnogogic revery. The production and self-control of alpha wave activity in bio-feedback work has been the region of greatest concentration. Many diverse groups have undergone study; among them are physicists, psychologists, bus drivers, zen masters, artists, and, of course, the perennial college students.

These subjects report durable improvements in their awareness of internal processes, in their abilities to sustain attention, and in their greater access to feelings of serenity and well-being. Furthermore, the increased alpha wave output has some associated physiological effects such as the significant slowing of the metabolic and respiratory rates.

The basic mechanism employed in feedback training is an electronic system that informs the person whether his own selected physiological process is happening or not, thereby enabling him to gain some degree of voluntary control over this process. An important possible application of bio-feedback research is that such training might help an individual to learn to monitor his own physiological responses to a situation in an accurate and sensitive manner, and even guide him in learning to alter his physiology deliberately at times when this would be desirable for his physical or psychological well-being.

That physiological reactions confirm the reality of inner events has been established for a very long time. There are the literary cliches like "the hot tears of anger" and "pale w'th fear." But these are general events; they do not inform the observer about what inner space has been visited.

The feedback experiments give promise that the explicit dimensions of human inner space may some day be mapped. Serenity-tension, cognitive-affective, and similar areas may serve psychology as external dimensions of brain wave amplitude, intensity, and length do now.

Sensory feedback as a technique has been known as far back as the 1920s. J. H. Schultz in Germany had used it on subjects to allow them to control heart rate. In 1952 Gardner Murphy, partially influenced by a coworker, Bjorn Christiansen, who had studied feedback earlier, concluded that people were usually blocking emotional information from themselves by muscle tension. He proposed that such blocks could be lifted by feedback techniques, using general skin response (GSR) as an instrumental indicator. Charles Snyder built a GSR acoustical indicator in 1962 for Murphy's feedback research project at the Menninger Foundation.

Since then, Elmer Green at the Menninger Foundation, Barbara Brown at Veteran's Administration in Sepulveda, and Joe Kamiya at Langley Porter Clinic in San Francisco have independently developed processes whereby the human subject can observe his own brain rhythms in the EEG.

Although results on feedback training have so far yielded encouraging results, there exists at present no idea of what the limits are. Results with animals have demonstrated that some particularly complex processes can be rapidly brought under control, such as blood flow in one ear lobe, blood flow in the stomach lining, peristalsis, and kidney functioning.[66] EEG activity can be controlled by animals and humans.[67] Heart rate can also be controlled by humans and blood pressure can be lowered.[68] Similarly, with humans, GSR, EMG, skin temperature, and vasodilation are controllable.[69,70,71,72]

In one experiment subjects were allowed to gain insight into the effect of various types of mental activity on their EEG for a practice period of 15 minutes, observing the effects on a feedback tone keyed to their EEG alpha wave rhythm. After this short practice period all were able to show some ability to control the alpha waves after the tone was turned off.[73]

New Ways of Seeing

One final benchmark of the revolution lies in the spread of the new ways of seeing into the popular discourse. This effect may sometimes take very little time. In the case of Sigmund Freud's work, the literary and painting world rapidly picked up on the significance of dreams and the unconsciousness; surrealism, automatic writing, and free-associative

processes all appeared rapidly in both art products and the common vision of the educated.

The deep substance of psychoanalysis was not always reached in these ways, and as the new bent of science penetrates deeper into the life of man, it will be distorted by common usage, by approximate similes, and by actual misunderstanding. But the profound change will manifest itself inevitably. After all, we view our children's relationships with their teachers differently after Freud's work on identification models, and relativity has come to mean more than the curvature of light.

Defining a new vision, particularly in its early stages, is an elusive task. The observer can try to grasp the shifts in emphasis, the changing shapes, the new angle of insight. Always, there is the peril that he will seize upon the vivid highlight and miss the main point. But the same danger exists in the attempts to sense a new trend in painting, in sculpture, in philosophy. The scientists note that it is by some of these newer trends that their own new horizons are lighted.

The basic orientations and the visual preferences are altering. The older techniques of straight-line extrapolations and correlational curves were more than a means of formal graphics. They gave to psychologists' vision a linear mode and a specific causality with considerable predictive power. Today the emphasis is changing over to the "interaction," to the "context," to the "significant." Our image of the dynamics now stresses the shifting interface, the perceptions among persons that partake of openness, of complexity, and of mutation rather than of fixed and explicit identity.

Some important part of the new image is couched in the necessary accommodations of the physicists' standards of prediction to the demands of the "indeterminacy principle." Yet there is more to the new paradigm than indeterminacy's constraints on perception. Perceptual preferences themselves tend more toward the indeterminate, the complex, the ambiguous, than had heretofore been suspected. Here the complex and the ambiguous does not mean "unclear" but rather that meanings coexist at multiple levels; these levels nest in each other and mutually reinforce each others meanings. In talking about the computer, for example, there is the level of the digit circuitry, the level of the program language, the level of the metaprograms in the compiler, and the level of the avowed intentions of the programmer. To comprehend the computer, all these levels of meaning are needed.

In psychology an increasing body of research has suggested that humans prefer complex visual environments over simple ones.[74,75,76,77,78]

The various investigators describing such environments use terms such as "ambiguity," "complexity," "incongruity," and "surprisingness," thus suggesting both the difficulty of clear-cut terms and the existence of a common factor, that is, an open-ended or indeterminate quality that results in those perceptual rates found optimal by the observers. Psychologists have considered ambiguity to be present in a stimulus if that stimulus is unexpected, is relatively different from others preceeding it, and is novel in its context--whether this context is spatial or temporal.

The pioneer reports indirectly indicating the importance of a sensorily rich environment come from sensory deprivation experiments at McGill University, which turned up significant (but not large) performance declines in their subjects over a variety of thinking tasks immediately after their release from a sensorily restricted environment.[79,80,81,82,83]

In these studies the subjects' sensory intake was limited by having them lie on a bed, wearing translucent goggles, gloves, and cardboard cuffs. The room itself was quiet, except for an audible hum that served to mask any variations in the sound level. Unexpectedly, the first subjects reported illusory visions; in a second sample of 14 who were asked to report any visual imagery, all reported something present. Some said there were dots and lines, but a majority spoke of more complicated patterns with figures and even whole scenes. These visual phenomena became more complex and more numerous as the days went on. When the subjects came back to their normal surroundings, they reported perceptual disturbances such as hallucinations.

As these findings became known to psychologists, who also noted that the sensorily deprived subjects were unanimous in expressing their active discomfort with the restrictions set up in the McGill experiments, research grew up around the question of whether complex visual stimuli would be gratifying since simple and restricted stimuli were so displeasing.

Infants were used as the first subjects in the studies of human perceptual preferences because the investigators felt that the unlearned infantile perceiving patterns would be clearer indicators of basic preferences for complexity or simplicity than of any later learned preferences. Fantz[84] found that infants looked at a checkerboard pattern much longer than at simple solid-color squares of the same size. Berlyne[85,86] likewise reported that when he presented three-to-nine months-old infants with a choice of three patterns ranging from simple to complex, the visual attention of his small subjects was initially directed to the complex--and he interprets this as preference.

Munsinger and Kessen[87] exposed a sample of 617 college students, varying from the artistically sophisticated to the naive, to random sequences of visual form and language that presented choices from the most complex to the simplest. The hypotheses of the experiment were that: (1) every person has a preference for a certain degree of environmental ambiguity (called here "uncertainty"); (2) the preferred degree of ambiguity is that with which the person can cope because it relates to his previous experiences; and (3) through training, a person finds ways to cope with greater ambiguity and thus learns to prefer the greater amount.

When their positive results bore out their hypotheses, Munsinger and Kessen were able to conclude that adults consistently prefer variability and uncertainty in their visual and auditory stimulation (although this preference ceases if pushed so far that the stimuli are chaotic). Here the experiments controlled exposure times, but in another study of the adult preference for complexity and intricate figures, the subjects were allowed to control their own stimuli. In this investigation Berlyne[88] told his subjects that they could look at a tachistoscopically exposed object for 0.14 second by pushing a lever, which they could push as often as they cared to look at the particular object. When they no longer wished to look at this object, another was put into the tachistoscope. The first set of objects varied in complexity (measured by Berlyne as the number of distinguishable parts); the second set varied in redundancy of configurations (redundancy in information theory increases with the symmetry, regularity, and expectedness of a figure).

Again, the findings firmly supported the idea that humans prefer complexity in their visual environment. No matter how Berlyne's series of stimuli were randomized, his subjects preferred the complex ones to the redundant ones.

Given such findings the physiological psychologists asked, "Can an enriched environment improve the perceiver's brain in quantifiable chemical or anatomical degrees?" In other words, does the perceived environment affect the human brain? By the nature of the evidence required, such questions can only be answered by animal experiments. Krech, Rosenzweig, and Bennett[89,90] carefully matched three groups of rats and placed each group in contrasting environments: a visually enriched condition, a visually impoverished condition, and a standard one. These three environments differed only in the amount of perceptual stimulation available. The rats in the enriched environment improved over the other two groups in brain weight and message capacity, in problem solving, and in learning. These results held even when mature rats were used instead of young ones. "These latter results" the experimenters add, "may be encouraging to those of us who are gray around the edges."[91]

III CONCLUSION

The new paradigm seems to have cast its weight in the direction of greater emphasis on the nature of men's inner lives.

Concerning this emphasis, the point is that the older paradigm of scientific thinking served the purposes of control and prediction so that men could extend their sway over hostile nature. The scientific model for action was the managing of objects; now that model is broadening into questions about man's inner nature.

What Aristotle termed architectonic questions of ethics and politics are beginning to dominate the scientific consciousness. Social scientists and philosophers of science have discovered in the past few years that although their methods must remain free of human bias, their scientific questions affect people so seriously that all investigators are inevitably involved in value commitments.

The need for a sense of identity and a sense of community is a deep one in the United States. A newer scientific paradigm is beginning to reveal that these two needs arise in men from a new interest in their inner lives. From this viewpoint identity and community are not granted by a social system; they are seized from within. The newer values center on moral feelings, personal knowledge, authenticity, and participatory democracy.

These newer values in the pursuit of self-knowledge lead eventually to political awareness. For self-knowledge is not a retreat to inwardness; it is an awareness of the outer structures that shape one's life. It is an awareness that any country is a configuration of cultural myths, economic power, and political stakes. Presuppositions such as these help to shape what counts as a "fact," a "problem," and even the "solutions to problems," as Kuhn has pointed out.[38]

Where can the social sciences go from there? It is possible, as one alternative, that the new scientific paradigm will come in only through the replacement of the unconverted elders by the younger adherents to the new. But perhaps change can come about in a simpler fashion. If the social disciplines could live with a pluralism in methods that views techniques as means and not as ends, if the social scientist could search

for relevant truths rather than for petty accuracies, present dissents might profitably turn into real gains.

From this point of view it would seem that allegiance to a scientific tradition would not necessarily entail a reductionist approach to the humanistic quest, nor that a concern with humanism entails a dismissive attitude toward the material, behavioristic aspects of the psyche. A given social scientist might find that both models were useful, depending on the problem under study.

A reasonable conclusion could be that a fundamental aspect of the new paradigm forming in social science is that subjective experience must be taken into account with the same seriousness that is now accorded only to external behavior. Closely linked to this is the acknowledgment that social science is intrinsically a moral inquiry. That is, social science, by its concern with the question of what man's growth should be, is prescriptive in the same sense that medicine is when it inquires about what men's physical conditions should be.

Besides the formation of a new paradigm, there are some wider social implications of a moral science. Moral science would tend to redefine research in the context of implementing mankind's welfare and in this way would give priorities to greater inclusion of the implicit values and assumptions of the scientist. Also, the goals of moral science, would be more open to selection by more of the stakeholders in society than our present paradigms.

The principles of inquiry shaped by these considerations lead to the following recommendations:

(1) That research be tied to its consequences, not only in becoming aware of these consequences but also in testing their alternative forms.

(2) That political choices based on these consequences be opened to study by the involved parties.

(3) That the research processes themselves include persons of differing stakes in the society and of differing social perspectives.

In short, moral science must respond both to dissident and to establishment. It must study those places where self-interests clash with social benefits, where the latent results of an action destroy the intended ones, where grievous social troubles lie. Moral science could thus widen

the range of educational philosophies. It could suggest new operative goals and values for the government-business-public system. It has everything to do with the future weight and status of social scientists in the world of business and of government.

Many scientists are coming to see, and to form the new paradigm around such seeing, that the basically significant question is why do humans look one place and not another for the facts of reality. When it grows clear that the places in which scientists peer for the nature of reality are chosen by arational factors--by the current economic structures, by the chances of position, by hopes for fresh stimulation, by the exhaustion of old ways, and by various other guidances far from the current reaches of understanding--a certain weakening in the reliance on scientific objectivity comes about.

Facts remain facts, but their weight has been reduced. The Copernican universe did not completely push over the Aristotelian theory, but the latter never again regained its old-time position as the final explanation. Similarly, the current objective universe still contains much value. But this is not enough. A subjective universe remains to be taken into account. Such subjectivity in the past has always entailed a good deal of self-instruction, for here there are few authorities. When men have persevered in such self-instruction, a transcendental philosophy of some kind has always resulted.

REFERENCES

1. Einstein, A., and L. Infeld, The Evolution of Physics, Simon and Schuster, New York, 1938

2. Polanyi, M., The Logic of Liberty, University of Chicago Press, 1951

3. _____, Personal Knowledge, University of Chicago Press, 1958

4. _____, The Study of Man, University of Chicago Press, 1959

5. Bridgman, P. W., The Logic of Modern Physics, Macmillan, New York, 1927

6. _____, The Way Things Are, Harvard University Press, 1959

7. Cassidy, H. G., The Sciences and the Arts, Harper, New York, 1962

8. Conant, J. B., On Understanding Science, Yale University Press, 1947

9. _____, Science and Common Sense, Yale University Press, 1951

10. Holton, G., Introduction to Concepts and Theories in Physical Science, Harvard University Press, 1952

11. _____, "Modern Science and the Intellectual Tradition," Science CXXXI, No. 3408 (1960), pp. 1187-93

12. Oppenheimer, J. R., Open Mind, Simon and Schuster, New York, 1955

13. _____, "Science and Culture," Encounter, XIX, No. 4 (1962), pp. 3-10

14. Thompson, G., The Inspiration of Science, Oxford University Press, London, 1961

15. Bronowski, J., The Common Sense of Science, Heinemann, London, 1951

16. Bronowski, J., Science and Human Values, Harper Torchbook, New York, 1959 (first published 1956)

17. Bronowski, J., and B. Mazlish, The Western Intellectual Tradition, Harper, New York, 1960

18. Eiseley, L., The Immense Journey, Gollancz, London, 1958

19. _____, Darwin's Century, Gollancz, London, 1959

20. _____, The Firmament of Time, Gollancz, London, 1961

21. Dubos, R., The Dreams of Reason, Columbia University Press, 1961

22. Koyre, A., From the Closed World to the Infinite Universe, Johns Hopkins Press, Baltimore, Maryland, 1957

23. Hanson, N. R., Patterns of Discovery, Cambridge University Press, 1958

24. Toulmin, S., The Philosophy of Science, Hutchinson's University Library, London, 1953

25. _____, Foresight and Understanding, Hutchinson, London, 1961

26. Toulmin, S., and J. Goodfield, The Fabric of the Heavens, Hutchinson, London, 1962

27. Butterfield, H., The Origins of Modern Science, Bell, London, 1949 (new edition 1957)

28. Cohen, I. B., Franklin and Newton, American Philosophical Society, Philadelphia, 1956

29. Gillespie, C. C., The Edge of Objectivity, Princeton University Press, Princeton, and Oxford University Press, London, 1960

30. Kuhn, T. S., The Structure of Scientific Revolutions, University of Chicago Press, 1962

31. Maslow, A. H., Politics 3, Research Memorandum 6747-12, Stanford Research Institute, Menlo Park, California, March 1971

32. Marcuse, H., On Liberation, Beacon Press, Boston, Massachusetts, 1969, p. 25

33. Goodman, P., New Reformation, Random House, New York, 1970

34. Roszak, T., The Making of a Counterculture, Doubleday, New York, 1969

35. Horney, K., Neurosis and Human Growth, Norton, New York, 1950

36. Kantor, R. E., "Theoretical and Practical Considerations of Extreme Regression in Reactive Schizophrenics," J. Humanistic Psychol., Vol. 4, No. 2 (Fall 1964), pp. 154-164

37. Laing, R. D., The Politics of Experience, Pantheon Books, New York, 1966

38. Kuhn, T. S., The Structure of Scientific Revolutions, University of Chicago Press, 1970 edition

39. Parnes, S. J., "The Literature of Creativity (Part I)," J. Creative Behavior, Vol. 1 (1967), pp. 52-57

40. Parnes, S. J., and E. A. Brunnelle, "The Literature of Creativity (Part II)," J. Creative Behavior, Vol. 1 (1967), pp. 191-240

41. Ray, W. S., The Experimental Psychology of Original Thinking, MacMillan Co., New York, 1967

42. Torrence, P. E., "The Minnesota Studies of Creative Behavior: National and International Extensions," J. Creative Behavior, Vol. 1 (1967), pp. 137-154

43. Maslow, A. H., Motivation and Personality, 2nd edition, Harper, New York, 1970

44. _____, "Various Meanings of Transcendence," J. Transpersonal Psychology, Vol. 1 (Spring 1969), pp. 56-66

45. Barron, F., Creativity and Psychological Health, D. Van Nostrand Co., Princeton, New Jersey, 1963

46. Waddington, C. H., Towards a Theoretical Biology, Aldine Publishing Co., Chicago, Illinois, 1969

47. Bacon, T., "The Man Who Reads Nature's Secret Signals," National Wildlife, Vol. 7, No. 2 (1969), pp. 4-8

48. Harman, W. H., Belief Systems, Scientific Findings, and Educational Policy, Research Note, EPRC 6747-4, Stanford Research Institute, Menlo Park, California, November 1967

49. Weitzenhoffer, A. M., "The Nature of Hypnosis: Part II," Amer. J. Clin. Hypnosis, Vol. 6 (1963), pp. 40-72

50. Moss, C. S., Hypnosis in Perspective," MacMillan Company, New York, 1965

51. Hilgard, E. R., "Hypnosis," Ann. Rev. Psychol., Vol. 16 (1965), pp. 119-156

52. _____, Hypnotic Susceptibility, Harcourt, Brace, and World, New York, 1965

53. Steinour, H., Exploring the Unseen World, Citadel Press, New York, 1959

54. Heywood, R., Beyond the Reach of Sense, E. P. Dutton Co., New York, 1961

55. Rhine, J. B., New World of the Mind, Sloane, New York, 1953

56. Hansel, C.E.M., ESP: A Scientific Evaluation, Chas. Scribners Sons, New York, 1966

57. Sudre, R., Parapsychology, Citadel Press, New York, 1960

58. Rhine, J. B., New Frontiers of the Mind, Farrar & Rhinehart, New York, 1937

59. Duane, D. T., "Extrasensory Encephalographic Induction Between Identical Twins," Science, Vol. 150 (1965), pp. 367 ff.

60. Krippner, S., "An Experimental Study in Hypnosis and Telepathy," Amer. J. Clin. Hypnosis, Vol. 11 (1968), pp. 45-54

61. Moss, T., and J. A. Gengerelli, "Telepathy and Emotional Stimuli," J. Abn. Psychol., Vol. 73 (1967), pp. 341-348

62. Hebb, D. O., "The Role of Neurological Ideas in Psychology," J. Personality, Vol. 20 (1951), pp. 39-55. Quotation is from p. 45

63. Krippner, S., ibid.

64. McBain, W. N., et al., "Quasi-Sensory Communication: An Investigation Using Semantic Matching and Accentuated Affect," J. Personality and Soc. Psychol., Vol. 14, No. 4, 1970, pp. 281-291

65. Rosenthal, R., Experimental Effects in Behavioral Research, Appleton-Century-Crofts, New York, 1966

66. Muller, M. E., "Learning of Visceral and Glandular Responses," Science, Vol. 163 (1969), pp. 434-445

67. Hart, J. T., Autocontrol of EEG Alpha (paper delivered to the Society for Psychophysiological Research), San Diego, California, October 1967

68. Kamiya, J., Conditional Discrimination of the EEG Alpha Rhythm in Humans (paper presented to the Western Psychological Association), San Francisco, California, 1962

69. _____, "Operant Control of the EEG Alpha Rhythm and Some of Its Reported Effects on Consciousness," from Altered States of Consciousness, edited by C. T. Tart, Wiley and Sons, New York, 1969

70. Mulholland, T., The Concept of Attention and Electroencephalographic Alpha Rhythm (paper presented to the National Physical Laboratory conference on The Concept of Attention in Neurophysiology, Teddington, England, October 1967), to be published in the Proceedings

71. Murray, E. N., and E. S. Katkin, "Comment on Two Recent Reports of Operant Heart Rate Conditioning," Psychophysiology, Vol. 5 (1968), pp. 192-195

72. Green, E. W., E. D. Walters, A. M. Green, and G. Murphy, "Feedback Technique for Deep Relaxation," Psychophysiology (in press)

73. Nowlis, D. P., and J. Kamiya, "The Control of Electroencephalographic Alpha Rhythms Through Auditory Feedback and the Associated Mental Activity," Psychophysiology (in press)

74. Piaget, J., The Psychology of Intelligence, Routledge and Kegan Paul, London, 1947

75. Bruner, J. S., "Personality Dynamics and the Process of Perceiving," R. Blake and G. Ramsey, eds., in Perception: An Approach to Personality, Ronald, New York, 1959, pp. 121-147

76. McReynolds, P., "Anxiety, Perception, and Schizophrenia," D. Jackson, ed., in The Etiology of Schizophrenia, Basic Books, New York, 1960, pp. 248-294

77. Miller, G.G.A., E. E. Galanter, and K. H. Pribram, Plans and the Structure of Behavior, Holt, New York, 1960

78. Simon, H. A., "An Information-Processing Theory of Intellectual Development, W. Kessen and C. Kuhlman, eds., in Thought in the Young Child, Monographs of Social Research in Child Development, Vol. 27 (1962), No. 2 and entire No. 83

79. Bexton, W. H., W. Heron, and T. H. Scott, "Effects of Decreased Variation in the Sensory Environment," Can. J. Psychol., Vol. VIII (1954), pp. 70-76

80. Heron, W., B. K. Doane, and T. H. Scott, "Visual Disturbances After Prolonged Perceptual Isolation," Can. J. Psychol., Vol. IX (1955), pp. 13-18

81. Heron, W., "The Pathology of Boredom," Scientific American, 1961 (1957)

82. Scott, T. H., W. H. Bexton, W. Heron, and B. K. Doane, "Cognitive Effects of Perceptual Isolation," Can. J. Psychol., Vol. XIII (1959), pp. 200-209

83. Doane, B. K., et al., "Changes in Perceptual Function After Isolation," ibid., pp. 210-219

84. Fants, R. L., "Pattern Vision in Young Infants," Psychol. Rev., Vol. VIII (1958), pp. 43-48

85. Berlyne, D. E., "The Influence of Complexity and Novelty in Visual Figures on Orienting Responses," J. Experimental Psychol., Vol. LV (1958), pp. 289-296

86. _____, "Supplementary Report: Complexity and Orienting Responses with Longer Exposure," J. Experimental Psychol., Vol. LVI (1958), pp. 183 ff

87. Munsinger, H., and W. Kessen, "Uncertainty, Structure, and Preference," Psychological Monographs: General and Applied, Vol. 78 (1964), No. 9, pp. 1-24 (whole No. 586)

88. Berlyne, D. E., Conflict, Arousal, and Curiosity, McGraw-Hill, 1960

89. Krech, D., M. R. Rosenzweig, and E. L. Bennett, "Effects of Environmental Complexity and Training on Brain Chemistry," J. Comparative and Physiological Psychology, Vol. LIII (1960), pp. 509-519

90. _____, "Relation Between Brain Chemistry and Problem-Solving Among Rats Raised in Enriched and Impoverished Environments," J. Comparative and Physiological Psychology, Vol. LV (1962), pp. 801-807

91. Rosenzweig, M. R., "Environmental Complexity, Cerebral Change, and Behavior, Amer. Psychologist, Vol. XXI (1966), pp. 321-332