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CONSCIOUSNESS IN CONTEMPORARY PSYCHOLOGY

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This prefatory chapter departs from the more usual *Annual Review of Psychology* presentation in that it is essentially an essay on one of psychology's central topical problems—consciousness—in the perspective of its twentieth century history, and through an examination of its reentry into American psychology in the last two decades.

It is not quite correct to say that nineteenth century psychologists limited their definitions of psychology to statements about consciousness. William James defined psychology as “the science of mental life, both of its phenomena and their conditions” (1890:1,1). Although he discussed the scope of psychology and its definition, he scarcely referred to consciousness at all; rather he moved to an early functionalism or purposivism: “The pursuance of future ends and the choice of means for their attainment are the mark and criterion of the presence of mentality in a phenomenon” (1890:1,8). George Trumbull Ladd (1887), however, had made consciousness more central in his definition: “Psychology may be defined as the description and explanation of states of consciousness as such.” This definition amused Yale students for many years because Ladd had insisted firmly that the “as such” was his distinctive contribution. Nevertheless, when James reacted to popular demand and prepared his *Briefer Course* (1892), he capitulated to Ladd and adopted his definition.

STRUGGLES OVER CONSCIOUSNESS IN EXPERIMENTAL PSYCHOLOGY

Experimental psychology at first restricted psychology primarily to the study of the generalized human mind. It excluded then, and anachronistically still excludes, many areas of psychology that have become committed to experimental methods. Experimental psychology, narrowly defined, was for many years considered to be the core of academic psychology, and the original controversies over consciousness occurred in its context.

Sensationism and Functionalism

In his history of experimental psychology, Boring (1950) continued to emphasize the influence of Titchener (1898, 1901–1905) as the American representative of Wundt. Reexamination of the historical record shows that the standard history is incorrect, because Wundt to some extent disavowed Titchener, and Titchener's psychology may be thought of as fundamentally non-Wundtian, despite the fact that Titchener made a career of trading on Wundt's reputation as the founding father of experimental psychology (Blumenthal 1975, 1979). This historical inaccuracy does not alter Titchener's significant influence, however, as the defender of a sensationistic reductive psychology, with introspection by a trained observer as its method.

Titchener's psychology did not satisfy the American temper, not because it used the concept of consciousness, but because of its essential sterility. The opposition came from the functionalists, of whom Angell became the major spokesman (Angell 1907). He wanted a more robust psychology that would concern itself with how people adapted themselves to their environment. He did not reject consciousness. In his *Psychology* (1904) he stated: "Mental acts, or facts of consciousness, constitute the field of psychology" (page 1). He went on to say that consciousness could only be defined in terms of itself. Introspection was not the only method of psychology, however; as other methods he mentioned objective observations of other individuals, experiment, physiological psychology, and psychophysics.

Objectivism and Behaviorism

The trends of nineteenth century physical and biological science favored objectivism. The principle of conservation of energy led in physical science to the concept of a closed system, regulated by its internal laws. Evolutionary theory led to a rejection of vitalism in biology. The trend toward objectivism in biology was given expression by Beer, Bethe & von Uexküll (1899), who made their position clear by suggesting a revision of terminology that would rid the terms of suggestive connotations. Their views were brought to America by Jacques Loeb, whose tropistic psychology (1911) came to be represented at the University of Chicago. John B. Watson studied physiology with him, and Loeb wanted Watson to do his research with him (Watson 1936). Similar stirrings were going on in Russia under the influence of Sechenov, Pavlov, and Bekhterev.

The young Watson, after a philosophical undergraduate training at Furman University in South Carolina, was impressed by the breadth of outlook of Angell, under whom he did his graduate work at Chicago, but he was perhaps more impressed by the biological methods of H. H. Donaldson, under whom he did his laboratory studies. In any case, he thought that functionalism had not gone far enough by its inclusion of observation as an occasional substitute for introspection. When he wrote his paper on "Psychology as the Behaviorist Views It" (1913), he urged that psychology go all the way in rejecting consciousness in favor of objective observation and measurement. The reasons for Watson's rejection of consciousness were good ones; otherwise he would not have attracted so many followers for so many years.

Watson saw clearly that if consciousness was to be the only subject matter of psychology, with introspection its method, then the study of animals, infants, and mentally disturbed people would be excluded from an exact psychological science because they were either totally incapable of introspection or their introspections could not be trusted. Watson was not trying to narrow psychology; instead he was trying to broaden it. In his textbook,

bearing a title similar to that of his paper announcing behaviorism, he stated in his preface that the instructor “should strive to get the beginner to view the organism as a whole as rapidly as possible and to see in the performance of each and all its acts the working of an integrated personality” (Watson 1919). He included a final chapter on personality and its disturbance in his book, at a time when other general textbooks had not gone that far beyond the laboratory.

Accommodations to Behaviorism

The trend toward objectivism was widely accepted by American psychologists and by other biological and social scientists, including those who felt no formal allegiance to behaviorism. One illustration lay in the wide adoption of the expression “behavioral science” to indicate those aspects of biological and social science that made use of the quantitative methods and models of other natural sciences without being committed to behaviorism. That expression was adopted for its social science division when the Ford Foundation became active, and lay at the basis for the naming of the Center for the Advanced Study of the Behavioral Sciences at Stanford when it was established by the Ford Foundation in the 1950s. The organization of psychological relationships around the concept of stimulus and response (S-R psychology, as it came to be known) was widespread among those who were going along with the times without accepting a strict behaviorism. In fact, the S-R conception had antedated behaviorism in the writings of Thorndike and Woodworth, related as it was to the reflex arc concept. The reflex arc concept had indeed been around long enough for an early critique by Dewey (1896).

A rationale for this accommodation to objectivism was given by the appearance of a book by a theoretical physicist, proposing that a scientific concept is best understood according to its operational definition (Bridgman 1927). According to this practice, temperature can be defined as the reading on a thermometer constructed and used in a particular way. If a concept could be defined according to the operations that were used in its measurement, then there was a kind of objectivity that did not require any deep philosophical (i.e. metaphysical) commitments on other issues. The same idea was put forth by Eddington (1929), who referred to the data of physics as “pointer readings.”

Stevens (1935), who was primarily interested in the measurement of sensory and perceptual processes—a topic long familiar in experimental psychology—soon saw the possibilities for psychology. He found that he could operationalize what had been done all along by emphasizing discriminatory responses as at the base of psychophysics. McGeoch (1935), who had followed closely in the tradition of Ebbinghaus’s studies of nonsense syllable

memorizing, found that all along he had really been an operationalist. Hence, without really changing, psychologists discovered that in their role as laboratory workers they had been operational, and so they could accommodate themselves to the new spirit of objectivity without taking on other aspects of behaviorism. In many areas, such as psychological testing and personality inventories, methods had been objective by this definition because investigators added up scores on test replies and used quantitative models such as factor analysis. In fact, an early operational statement attributed to mental testers had often been used to criticize them: "Intelligence is what intelligence tests measure."

There was something wrong about all of this, even though at the time it seemed to be an ideal way to keep peace in the family of those whose methods and interests were so diverse. Support appeared to come also from the Vienna Circle, first so named (*der Wiener Kreis*) in 1929, and the position soon became known as logical positivism. The logical positivists went beyond the operationalists in wishing to make very clear how the different statements in science are linked to verification and disconfirmation procedures. As with many other promising movements, logical positivism was also superseded, primarily because of the lack of precision in treating criteria of meaning (see Hempel 1950).

Attenuation of Behaviorism and Operationalism

Superficially, Watsonian behaviorism had appeared to sweep the field of psychology roughly between 1920 and 1950, with a new vitality in the later years produced by the success of Skinner's (1938) operant behaviorism, a success that retains the loyalty of its devotees to this day. However, the victory over mentalism was never complete. Functionalism, in one form or another, remained a dominant mode of thinking; however, it had no strong symbols around which its adherents could rally, and hence was never as visible as the more strident and committed forms of behaviorism.

Early attacks on behaviorism were launched by the Gestalt psychologists, for whom experienced phenomena were the essence of psychology's subject matter. It was more or less by accident that Köhler (1917) was caught in Tenerife during World War I and found himself working with chimpanzees, his first excursion into animal psychology, the stronghold of behaviorism. His well-known work on insight served as an argument that animals were responsive to means-end relations in their perceptual fields, and could solve problems in a manner that indicated intellectual activity.

Tolman (1932) described his position as a *molar* or *purposive* behaviorism rather than a *molecular* one. He disowned the Watsonian form of behaviorism, and accelerated the erosion of the more standard behaviorism, even though Tolman continued to call himself a behaviorist. The promi-

nence he gave to the intervening variable and cognitive structures (including cognitive maps) contributed to the decline of the more strictly S-R psychology.

With the rise of cognitive psychology, a history that is traced a little later, there came to be inroads within the camp of the behaviorists themselves. The social learning theorists, originally strongly influenced by operant concepts, gradually saw, among other things, that imitation stood on its own feet and did not require the gradual shaping of behavior that operant conditioning called for (Bandura & Walters 1963). Then self-reinforcement began to enter, with talk of coverants (internally hidden operants) as well as operants. Coverants were even called "operants of the mind" (Homme 1965). Cognitive interpretations began to enter classical conditioning at the animal level (Rescorla 1972).

Logical positivism did not survive beyond the 1940s, and operationalism lost favor. The greatest contribution of operationalism was to method, and served well, as it still does, to make results of experiments clearly communicable. Its limitations have been increasingly recognized:

Unintentionally, and even contrary to its own purposes, modern positivism may have contributed to a "myth of methodology": that it does not matter what we do if only we do it right (Kaplan 1968:394).

Among philosophers of science, a position better described as critical realism has gradually replaced the various forms of positivism, including operationalism. Critical realism allows a place for phenomenological thinking without assigning a privileged place to the knowledge available through introspection.

EXPERIMENTAL PSYCHOLOGY BECOMES COGNITIVE

Cognition is a generic term used to designate all processes involved in knowing. Hence it covers everything from perception to reasoning. An older term for cognition was ideation, based on the notion that an idea is any cognitive experience, whether due to direct stimulation or not. Psychologists do not speak of ideas or of ideation today; that would seem to concede more to the past than is suggested by the expression cognitive process, which by now seems to be something newly discovered. It sounds so "contemporary" that nearly all writers on psychological subjects are tempted to use the word cognitive in their book titles. Cognitive psychology, like behaviorism, is not a complete psychology. The ancient classification of psychological processes as comprising cognition, affection, and conation can serve as a reminder that there is something more (Hilgard 1979). Still

it is a fair statement that during the last few years cognitive psychology has become dominant in experimental psychology over behaviorism and its related stimulus-response psychology. The reshaping of some of the standard topics of experimental psychology as a consequence of the move away from behaviorism to cognitive psychology is readily illustrated. A few examples of the new orientation follow.

Perception Reinterpreted

The senses are the primary sources of information about both the external world of things, organisms, events, and also of happenings within our own bodies. This obvious fact has taken on new aspects as perception has been reinterpreted as information processing. The information approach relates perception to other cognitive processes such as memory. For example, George Miller (1956) revived the old problem of the span of apprehension in a seminal paper in which he described the difference between a *bit* of information (the standard unit of information theory) and a *chunk* of information, the larger unit that may be recognized in perception and retrieved in short-term memory. This was not factually new. For example, Sir William Hamilton had described the matter in these words:

If you throw a handful of marbles on the floor, you will find it difficult to view at once more than six, or seven at most, without confusion; but if you group them into twos or threes or fives, you can comprehend as many groups as you can units; because the mind considers these groups only as units—it views them as wholes, and throws their parts out of consideration. (Hamilton 1859:177).

Miller's contribution was to bring this into relation to the new interest in information theory, and the paper served an important catalytic purpose. Another important innovation was a method of retrieval of simultaneously presented material introduced by Sperling (1960). He showed that if there were displayed in a tachistoscope more materials than could be reported at once, say on three lines of visual material, after the exposure had occurred the subject could be directed to recall one of the lines, and would then be almost as successful as if that line had been presented alone. Through experiments of this kind, and related ones, such as experiments on dichotic listening (Cherry 1953), attention came back from its neglected position, and control processes of other kinds began to be given the study they deserved. Such experiments, in both vision and audition, constituted the bulk of what came to be called cognitive psychology (Neisser 1967), until students of learning and memory began to define their field as cognitive psychology. Aspects of learning and problem solving were covered in a single chapter in Neisser's book under the general heading of higher mental processes.

Imagery Returns

Behaviorism and operationalism, by way of verbal report, could have permitted the study of any topic in psychology, but the preference for the externally observable (“peripheralism,” the “finger-tip” psychology) against private mental experiences (“centralism”) led to a distaste for studying mental processes such as imagery. As imagery began to be studied again, in the spirit of the new cognitive psychology, it was described as “the return of the ostracized” (Holt 1964).

It became clear that imagery could be studied in the orderly manner of other forms of information processing. For example, when a figure has to be rotated in imagery in order to determine whether or not it matches a target figure in another orientation, the time required for the judgment bears a lawful relation to the degree of rotation required (Shepard 1975). Imagery began to find a place also in studies of memory.

Cognitive Theory in Human Learning and Memory

As noted earlier, American psychologists were never unified in their allegiances to behaviorism, although the predominance of operational thinking for a time tended to conceal the disparities that existed. Particularly in the 1930s and 1940s, the major theoretical disputes in American psychology centered around theories of learning, and it soon became clear that the fundamental cleavage was between stimulus-response theories of one kind or another (whether association theories or conditioning theories) and cognitive theories. Marquis and I recognized this in our 1940 book on *Conditioning and Learning*, in which we classified the major interpretations as two forms of conditioned response theory on the one hand, and an expectancy principle on the other. Not named as such, this was nevertheless a cognitive principle: “To the extent that reward reinforcement depends upon a learned anticipation of the reward, the expectancy principle is more appropriate than effect” (page 95). By the second edition of my *Theories of Learning* (Hilgard 1956), the major cleavage was indicated as that between stimulus-response theories and cognitive theories. Hence the battle lines had been drawn many years ago, if not distinctly, and gradually the cognitive views of the Gestalt psychologists and of Tolman, with appropriate modifications, gained the ascendancy over the predominant stimulus-response positions associated with behaviorism. This came about through the convergence of many influences, both inside and outside psychology.

For consciousness to come back into psychology by way of machines may at first seem rather strange, but a case can be made for the influential role of modern high-speed computers. These instruments consist both of the hardware (transistors, circuits, devices for memory storage), and also of

software, the programs according to which they process information. This is not the place to review the history of the theory of games, the appearance of cybernetics, and of information theory. We are interested, however, in how they found their way into psychology.

Feedback provided an information alternative to reinforcement, and in that way supported cognitive psychology. Probabilistic concepts, anticipated in a provocative article by Tolman & Brunswik (1935), entered into partial reinforcement studies by Humphreys (1939), was reflected in probability matching by Grant, Hake & Hornseth (1951), and into psycholinguistic studies by Miller & Selfridge (1950). The new probabilistic mathematical learning models were introduced by Estes (1950), and soon proliferated (e.g. Bush & Mosteller 1955). An important landmark was the appearance of Miller, Galanter & Pribram's *Plans and the Structure of Behavior* (1960), in which they dared to introduce a subjective behaviorism. On the simulation of higher mental processes, the work of Newell & Simon (1956) led to the general problem solver. Of peculiar interest is the appearance in computer programs of executive routines, which modify the attack on problems as the solution proceeds. These executive programs look very much like a controlling "self" introduced into the problem-solving process.

Mathematical models and computer programs identified the new learning and problem-solving models with information processing, but the more subjective aspects of consciousness were not immediately incorporated formally into the experiments. The issues raised by the information-processing approach soon led to the introduction of imagery as important in memory, whether in the more conventional paired-associate learning (Bower 1972, Paivio 1971) or in other forms of memory performance, such as the use of mnemonic devices (Bower 1970).

Cognitive psychology is not necessarily a consciousness psychology, a point that should be clear from the early formulation of cognitive psychology in behavioral terms by Tolman (1932). What happened was that in seeking greater understanding the restrictiveness of behaviorism had to be relaxed in order that introspection could be permitted when useful. This change has been noted by one of Skinner's leading PhDs:

... conceptions of learning and cognition couched in terms of mental processes did not begin to grow to the stature of formal theories until the recent relaxation of the hold of behavioristic thinking. . . . Only in the last few years have we seen a major release from inhibition and the appearance in the experimental literature on a large scale of studies reporting the introspections of subjects undergoing memory searches, manipulation of images, and the like (Estes 1975:5).

By now the experimental study of learning has practically identified itself with cognitive psychology, as in the six-volume handbook edited by Estes (1975-1978).

MANY TOPICAL AREAS IN PSYCHOLOGY BECOME COGNITIVE

Because of the preempting of information processing by experimental psychologists, cognitive psychology has tended to take on some of the narrowness of definition previously associated with experimental psychology. Cognitive psychology is by its nature much broader, and some of the trends within areas not conventionally assigned to experimental psychology may be noted.

Developmental Psychology: Piaget

The return of interest in Piaget, after many years of neglect, is a phenomenon to be understood according to the sociology of science. The climate for a cognitive psychology rather than a motivational one had to be right before his genetic epistemology would replace Freud's dynamic psychology as the most influential position in developmental psychology. Piaget's stages are the stages of cognitive development, neither the psychosexual stages of Freud nor the psychosocial stages of Erickson. For example, one looks in vain for sibling rivalries among Piaget children. Some of Piaget's later work, particularly the conservation experiments, were of a kind that could be more readily understood by American psychologists, and these experiments, in which Inhelder played a large part, may be responsible for the resurgence of interest (e.g. Inhelder & Piaget 1958). I am inclined to believe, though I cannot document it, that American psychologists *needed* Piaget, rather than that they adopted Piaget because they were convinced by reading his books.

There had been a flurry of interest in Piaget in the late 1920s and early 1930s, during which period five of his books were published in English, the latest in 1932. Then there was a period of neglect until a revival of interest in cognition coincided with further English translations of his books, beginning in 1950. Many of the translated books had appeared in French much earlier, but their influence awaited their translation—or perhaps brought about their translation because both British and American psychologists were ready for their message. Bruner incorporated an active interest in Piaget in the Center for Cognitive Studies that he and George Miller established at Harvard in 1960. Bruner had already written a favorable commentary on Inhelder and Piaget's *The Growth of Logical Thinking* (Bruner 1959), and he brought Inhelder to the Center in 1961 to serve as a representative of the Piaget work. Others contributed to the accelerating interest (e.g. Hunt 1961). The appearance of Flavell's (1963) book helps to date the rising interest in Piaget, while cognitive psychology was flourishing in the more traditional experimental psychology.

Psycholinguistics

As information theory developed, the role of language as the characteristic human communication device had to come into prominence. Early experiments on the amount of information conveyed by different approximations to normal language made use of the analytic methods of information analysis (Miller & Selfridge 1950). Skinner's (1957) operant behavior approach was attacked by Chomsky (1959), whose transformational grammar gave greater centrality to the speaker's initiative than Skinner's environmentalistic interpretations. Whether or not Chomsky was right, the debate was provocative, and a new interest in psycholinguistics developed, with concern over how deeper structures are revealed and understood. This discussion, debate, and experimentation became part of the new cognitive psychology (e.g. Clark & Clark 1977).

Sleep and Dreams

When methods are discovered by researchers that make psychologists feel comfortable with the results as adequately scientific, their prior philosophical commitments are unlikely to stand in the way. The discovery of REM sleep by Aserinsky & Kleitman (1953), followed up by Dement & Kleitman (1957), is a case in point. If rapid eye movements that occurred within a specified EEG level of sleep could be shown to be quantitatively related to the appearance of reported dreams upon immediate awakening, here was a scientific finding acceptable to the operationally minded. It did open up other questions, however, about dream contents, and made the dream-diary methods more acceptable than they had been before. A case has been made that these experiments teach psychologists how to combine objective and subjective methods in a sensible manner (Stoyva & Kamiya 1968). Dreams, if remembered, are obviously conscious products, regardless of the concealed dream work that produces them. The dream studies have made psychologists more comfortable than they once were about these products, which were almost universally missing in the early accounts of social learning theorists and in the accounts of others limited by the strictures of objectivism.

Psychopharmacology

The drug culture of the 1960s, while not responsible for cognitive psychology, had important influences upon it. One could not do studies of LSD and other hallucinogens without becoming interested in subjective hallucinatory phenomena. It had been many years since Klüver (1928) had published on mescaline; his books were republished in 1966 because the interest had by then revived.

Social Psychology

Social psychology took a path of development not strictly parallel to that of psychology. The influence of behaviorism was felt, however, in making social psychology more experimental, as in the textbook by Floyd Allport (1924). Allport began by accepting both behavior and consciousness as legitimate subject matter, but immediately indicated that behavior, as an explanatory principle, was more fundamental. Strong support for an experimental social psychology was given by Murphy & Murphy (1931). Writing from the standpoint of an objective psychologist, Dashiell (1935) contributed a chapter on experimental social psychology to the Murchison *Handbook of Social Psychology*. However, there were all along counter forces. Gordon Allport (1937), whose personality psychology and social psychology were closely related by way of the study of attitudes, was offended by behaviorism and retained a strong countervailing influence through the early 1960s.

The word *cognitive*, prominent in McDougall's social psychology, began to come back strongly with Tolman's (1932) introduction of the expression *cognitive structure*, taken over by Lewin (1935). It gained new prominence in the concept of cognitive dissonance proposed by Festinger (1957). Cognitive in these contexts does not rest on quantitative studies of information processing, as in the cognitive psychology of the memory theorists, but represents a somewhat parallel line of development. The two lines have, in some instances, come back together, as in Wyer's (1974) work on impression formation.

As noted earlier, the use of cognitive concepts is not synonymous with the use of introspective reports, because cognitive structures can be inferred, perhaps as intervening variables (Tolman 1932, Hull 1943). However, the new relaxation of the influence of radical behaviorism has led more investigators in social psychology to use subjective phenomenal reports. Some social psychologists have asked recipients to list the thoughts that come to mind during or after a persuasive message is received (e.g. Greenwald 1968). These thought processes tend to be described in cognitive language. The freedom to use introspective reports on mental processes has not gone unchallenged, as evidenced by a debate on this issue (Nisbett & Wilson 1977, Smith & Miller 1978).

Psychology of Personality

During the first half of the century, personality psychology, in the general upsurge of interest in quantitative measurement, tended to move toward attitude scaling and later to factor analysis, particularly under the influence of Thurstone (1929, 1931). These methods, although they required the

subjects to record their judgments, were undertaken in the same spirit of objectivity as intelligence measurement. Again, however, there were alternatives, particularly through the projective tests made prominent by Murray (1938), in part under the influence of psychoanalytic conceptions. The TAT and the Rorschach inkblots became favorites, despite their somewhat ambiguous quantitative supports. The concept of cognitive styles also was introduced. While the methods of studying cognitive styles were objective, the inferences were to individual differences in the perception of the surroundings. One of the best known of the dimensions is that of field dependence and field independence, as studied by the rod-and-frame test and related measures (e.g. Witkin et al 1954, 1977).

Personality psychologists, originally strongly influenced by social learning theory, in keeping with the new trend now may add the adjective cognitive in reconceptualizing personality, as by Mischel (1973). He has more recently presented a further interpretation of the interface between cognition and personality (Mischel 1979). Emerging interest in the self in its social context may also be noted as a sign of the times (e.g. Gordon & Gergen 1968).

Hypnosis

A serious laboratory interest in hypnosis had not been apparent in American academic psychology between the appearance of Hull's book in 1933 and the middle 1950s. Twenty years later, Weitzenhoffer (1953) summarized the field and showed that it had not been altogether dead in the meantime. New laboratories began to operate in the late 1950s, by Martin T. Orne at Harvard (later moved to the University of Pennsylvania) and by Theodore X. Barber at the Medfield Foundation. Other laboratories were established at Stanford and elsewhere. By its very nature, hypnosis deals with alterations in conscious experience and in the interplay between voluntary and involuntary control processes, hence is relevant to cognitive psychology.

Clinical Psychology

The influence of psychoanalysis upon clinical psychology was in part cognitive all along, and its emphasis upon two thought processes—primary and secondary—was directly cognitive (Hilgard 1962). However, attempts were made, according to the spirit of the times, to translate psychoanalytic thought and practice into the terms of an essentially Hullian learning theory (e.g. Dollard & Miller 1950). The competing position of Rogers (1951) on client-centered therapy placed the initiative with the client, and in retrospect seems more cognitive in its approach.

More recently, biofeedback, despite its dependence upon electrophysiological equipment, actually emphasizes the attainment of voluntary control through feedback in line with the intentions of the person being treated. To distinguish between this and operant conditioning, Pribram (1976), along with a few others, has preferred to differentiate between operant conditioning as a feedback method for gaining the changes according to the intentions of the therapist, and biofeedback as a *feed-forward* mechanism achieving the goals intended by the patient. In that sense, biofeedback relies on cognitive processes in the effort to gain voluntary control. The behavior therapists themselves are paying more attention to the person's expectations and plans as influential in producing the changes that are desired (Bandura 1974). The role of cognitive formulations in therapy was challenged by Wolpe (1978), but his objections soon received vigorous rebuttals (Beck & Mahoney 1979, Ellis 1979, Lazarus 1979).

Humanistic and Transpersonal Psychology

An orientation to a new humanistic psychology with emphasis on human values had been developing within the psychological profession while cognitive psychology was taking hold. Abraham Maslow had written on motivation and personality (Maslow 1954). He pointed out that the needs most studied by psychologists, classified by him as deprivation needs, were lower in a hierarchy. Only when they are satisfied can the more distinctly human needs play their proper role; for example, the needs to experience order and beauty, and, finally, the highest need for self-actualization, to find self-fulfillment and realize one's potential. He was influential in establishing a new organization in 1961, the American Association of Humanistic Psychology, with its *Journal of Humanistic Psychology*.

The more extreme followers of humanistic psychology, having had the heady experience of opening new frontiers, have gone further into a "fourth force" of transpersonal psychology, which also has its society and its journal (Tart 1975b). (The other three were behaviorism, psychoanalysis, and humanistic psychology). The exact definition of transpersonal psychology, as beyond humanistic psychology, is somewhat elusive, but there appears to be some preoccupation with the miraculous, the esoteric, and the occult.

Sometimes extreme groups lead those who are nearer the center to show that they have not been oblivious to the problems that the extreme groups focus upon. Then the new "movement" may have made its contribution through enriching the topics that psychologists study, even though most psychologists do not become disciples, and even if the new movement disappears in any recognizable form.

PROBLEMS CREATED BY THE RETURN OF CONSCIOUSNESS TO PSYCHOLOGY

The new cognitive psychology, to the extent that it remains close to information processing and computer modeling of human thinking and problem solving, is a disciplined enterprise based on the intellectual advances that these and related developments, such as psycholinguistics, have made possible. However, opening the doors to a freer exploration of mental activities, although a virtue to those who are disciplined to scientific procedures and values, may turn into a vice for those who see the new freedom as an opportunity for free-floating uncritical fantasies about mental life.

The New Dualism: Heuristic or Metaphysical?

The new interest in consciousness has produced a wave of writing on the mind-body problem, with each of the classical proposals favored by individual writers, even though every writer believes that new arguments or aspects have been contributed to the discussion. The question arises anew if a realm of the mental has equal status with the realm of the physical, in which case a kind of Cartesian dualism again appears. I do not propose to review this literature; one example will suffice—the volume edited by Globus, Maxwell & Savodnik (1976). In it we have a strong defense of what appears to be a new dualism by Sir John Eccles, a proposal from Roger Sperry that consciousness is an emergent with causal properties which could be understood if we really knew the emergent brain processes controlled by consciousness, a position by Karl Pribram described as constructional realism, and many others. My reaction is that psychologists and physiologists have to be modest in the face of this problem that has baffled the best philosophical minds for centuries. I do not see that our methods give us any advantage at the ultimate level of metaphysical analysis.

A heuristic solution appears to me to be quite appropriate in the spirit of critical realism. That is, there are conscious facts and events that can be shared through communication with others like ourselves, and there are physical events that can be observed or recorded on instruments, and the records then observed and reflected upon. Neither of these sets of facts produces infallible data, for data, if accurate, may be incomplete, and inferences, regardless of how the data are obtained, may be faulty. It is the task of the scientist to use the most available techniques for verification of the data base and for validation of the inferences from these data. The position here recommended is sometimes called a double-language theory that need not commit itself regarding ultimates.

The heuristic method applies as well to the issue of freedom and determinism. It is always futile to try to prove that a past event could have been different from what it was, even though we may detect considerable novelty that we would wish to attribute to an author, artist, or inventor; in discussing the past, determinism wins the logical arguments. The prediction of future events is a different matter. Some events are highly predictable, some are not, and may never be. It is a matter of faith that if we knew all the causes, the future, too, would be predictable, but we cannot know when the cow will kick over the lamp that will set the city on fire. The heuristic argument evades the metaphysical issue of freedom and determinism by accepting a heuristic dualism, or critical realism, in which mental events may have their consequences in the control of actions. The limitations upon that control are evident, and for natural science purposes have to be studied empirically, perhaps probabilistically.

The new dualism, if we may call it that (Galanter 1979), is not a permission to accept the claims of esoteric and paranormal psychologies. The new freedom does not mean that "anything goes."

The New Introspectionism as Method

The new introspection that is permitted is of the phenomenological variety, that is, a free commentary on whatever cognitive material the subject is aware of, not at all the restricted introspections of a trained observer, as required in the sensationist psychology.

In the study of human memory there is now an increasing interest in the internal processes that go on, such as the decisions to rehearse in order to retain new information that is in short-term memory so that it can be retained in long-term memory (Atkinson & Shiffrin 1968; Waugh & Norman 1965). Rehearsal can be studied by the "thinking aloud" method (Rundus & Atkinson 1970). Such processes are so important that short-term memory is sometimes called "working memory" (Baddeley 1976), and other aspects of "working memory" are important enough to classify as an intermediate-term memory, between short and long-term (Bower 1975).

The recently accumulating studies on the stream of consciousness serve also to introduce the new introspectionism. They are more introspective in some respects than the studies of learning and memory because they rely heavily on uninstructed or *stimulus-independent* mentation, that is on spontaneous fantasy, as in daydreaming. These studies are well summarized in a recent multiple-author book (Pope & Singer 1978). The question may well be asked: Does the stream of consciousness belong solely to the literary figures, such as James Joyce, Virginia Woolf, and T. S. Eliot, or can it be assimilated to a scientific psychology? The contemporary investigators an-

swer that it belongs to psychology today as much as it did when William James proposed the importance of the stream of thought, which the literary writers acknowledge as an inspiration to their work.

The methods used by these investigators fit readily into the traditions of familiar psychological experimentation. Singer (1978) has presented a table summarizing a large number of studies on daydreaming and the stream of thought initiated by him in 1960, which have led to ten books placing the experiments in various contexts. The topics of investigation include individual difference studies, which rely on questionnaires and factor analyses, often with the investigation of behavioral correlates of the questionnaire responses; cognitive studies of stimulus-independent thought; physiological studies of correlates of daydreaming and imaginative processes; make-believe play and fantasy in childhood studied by block play, modeling, and imaginative games; and other topics, such as the use of imagery methods in psychotherapy. As for method, the following five procedures have been distinguished for obtaining systematic reports of inner experience: questionnaires, thinking out loud, thought-sampling (descriptive), thought-sampling (using ratings), and event-recording (Klinger 1978). The thought-sampling procedures help to illustrate what is done. A subject is carrying out some kind of task and then is interrupted and asked to tell what has been going on in his or her mind at the time. The subject reconstructs as well as possible whatever was going on before the interruption. To avoid some of the complexities and idiosyncrasies with such narrative reporting, the rating method has also been used, in which the reply requires only the acknowledgement of the presence or absence of thoughts extraneous to the immediate situation, during, say, the preceding 15 seconds. This report can be made by simply pressing a key to indicate yes or no, and is not as disruptive as the narrative or descriptive report of what has been going on. These experiments are far removed from the old debates over the necessary presence of images in thought or the possibility of imageless thought—an issue over which earlier introspective psychology floundered badly.

These illustrations of memory and the stream of thought are samples of what can happen when mental processes are accepted without embarrassment, and treated in a matter-of-fact manner according to the best methods available. It is the new freedom that counts, more than any strikingly new methods or insights.

PERSISTENT PROBLEMS FOR A PSYCHOLOGY OF CONSCIOUSNESS

The new freedom does not in itself solve problems; instead it calls attention to neglected problems whose solutions may be as baffling as ever. We may

even be poorly prepared for handling them because of their long neglect, so that, in some instances, we lack even an appropriate vocabulary. In this section attention is called to potentially manageable problems which may benefit from the renewed interest in consciousness.

Sensitivity and Control

Two basic modes of consciousness are by now widely recognized: the passive receptive states, as when we lie back and listen to music, and active, productive mental activities, as when we make plans and fantasy how to complete them (e.g. Deikman 1971, Shallice 1972).

The distinction between active and passive is never sharp because we can actively seek experiences that yield passive satisfactions, and a monitoring function intrudes into the ongoing enjoyment of fantasy as well as into the active pursuit of goals. However, the classification into passive and active is not without value. In the passive mode we may include an open awareness of the environment, the relaxed enjoyment of our own daydreaming, or esthetic enjoyments in which we are recipients rather than performers. A search of one's own consciousness gives an individual who feels at odds with society the hope of some sort of restoration or reconciliation, as the counter-culture of the 1960s demonstrated. It emphasized the passive mode of consciousness, assigning supreme value to sensitivity to the present moment, detached from concern for the past or the future.

Much of the popular literature on consciousness has been concerned with the passive mode, as in meditation, exploring the depths of consciousness or seeking consciousness expansion. Psychologists have to take account of these strivings and at least try to understand the individual needs that the various exercises and seekings express.

The active mode, by contrast, is defined by the need to make decisions and to act upon them. Planning is a major part of mental life, whether the plan is simple and readily fulfilled, like mailing a letter on time at the corner box, or long-range in its achievement, like planning a medical career and initiating the fulfillment of the academic requirements. Consciousness plays an active role as the person looks ahead, initiates action, and presses on against obstacles and discouragements.

Important aspects of control processes become significant in studies of divided attention and in task interferences when more than one thing is attempted at a time (e.g. Kahneman 1973, Shallice 1978). Attention suffered a curious neglect for many years; it is significant that it and other control processes are again given the centrality that they deserve for an understanding of human mental processes.

Hierarchical Controls, the Central Executive, and the Self Concept

Control systems imply a master-servant analogy. The thermostat, with small energy, turns on a high-energy furnace, making the furnace the servant of the thermostat. When through cybernetics and information theory feedback concepts became increasingly prominent, it became necessary to view controls as part of a complex system. Such a complex system—the human organism, for example—has relatively independent integrative mechanisms to maintain its survival, to support postural adjustments, to permit locomotion and language, to pay attention, and all the rest. These possibilities for action cannot be allowed to run wild; if brain cells discharge too rapidly and concurrently, as under the influence of strychnine on the brain surface, the result is a convulsion. Hence regulatory processes are required if the intentions of the person are to be fulfilled. These regulatory processes, systematically interrelated, imply a flexible hierarchy, so that there is order, but a changing one, in which now one system now another is in the commanding position, or, as servant, is actively functioning.

It is commonplace for cognitive psychologists to diagram events according to block diagrams, representing the “condition” of a system in the course of change. Lines and arrows connect the block diagrams to indicate the transformations that take place as the information moves from one condition to another, for example, from short-term to long-term memory. What is new, however, is the inclusion of blocks hovering over the others, or of feedback loops represented by supplementary lines, indicating control processes. These are variously labeled executive functions, expectations, rehearsal, or pertinence, indicating often aspects not well integrated into the formal quantitative aspects of the system (for examples see Atkinson & Shiffrin 1968, Greeno & Bjork 1973, Hilgard & Bower 1975, Norman 1976). The recognition that these supplementary control processes exist is a gain for keeping psychological knowledge in perspective.

If hierarchical cognitive controls have a supreme command post, that may be designated (metaphorically) as a central executive. This was noted earlier in connection with computer problem-solvers, in which the executive program may “decide” that one direction of solution is proving futile, and “commands” that another course of action be tried.

Commonsense psychology assigns the executive control to a self or ego, and one of the tasks for contemporary psychology is to come to grips with this problem. Some years ago I attempted to formulate a distinction between the self of awareness, that is, the self from the point of view of the experiencing person, and the inferred self, based on information available to others

(Hilgard 1949). Unfortunately, I did not follow up on my own suggestion. The self has again been receiving attention (e.g. Gordon & Gergen 1968).

There are many subordinate problems here, such as the problem of the unity of the self, an illusion that derives, I believe, from the subjective experience of the continuity of memory, so that I am the same person today that I remember myself to have been in the past. Actually, there are many discontinuities that are overlooked, associated with the various social roles that we are called upon to play, alterations of sleep and waking, mood swings, selective attention and inattention. These are given dramatic expression in the occasional appearance of authenticated cases of multiple personalities. The problem of the self is with us again, and we shall have to find some satisfactory way of conceiving it, particularly, though not exclusively, in its relation to executive control functions.

Conscious, Nonconscious, Subconscious, and Unconscious

We need a set of adjectives to describe the relationships between information that has been registered and the manner in which that information is represented in consciousness. Conscious memories are familiar, and we may take them for granted without asserting their veridicality. If the information is not represented in consciousness and not stored in memory so that under some circumstances it can be retrieved, it can be called *nonconscious*. Presumably there are regulatory processes in the body that are of this kind, perhaps the homeostatic ones that regulate blood and hormones. A *subconscious* process is one that is not available to consciousness, whether it was once conscious or perhaps never conscious, but the information is retrievable to recall under appropriate circumstances, as, for example, by automatic writing under hypnosis. The distinction between subconscious and unconscious is more difficult to make without commitment to some sort of theory. If one wishes to insist upon a logical distinction, an *unconscious* process can be classified as one that is inferred to be similar to a conscious process but is not retrievable except by inference. The inference to unconscious processes from dream interpretation, whether by Freud's or Jung's method, would support this interpretation.

These classifications do not belong to psychopathology only, but have to be faced in any complete cognitive psychology. For example, the problem of parallel vs intermittent (serial) processing is a genuine problem in cognitive psychology. Information may be registered and processed that is not perceived, as for example in split brain experiments or in experiments using metacontrast to make a normally suprathreshold exposure imperceptible.

One situation that has been studied is the covert perception of events that have been obliterated from conscious perception by suggestions of hypnotic analgesia or hypnotic deafness. It has been shown that some subjects are

able to reduce felt pain and hearing substantially through suggestion while hypnotized, as in the pain or hearing as reported at the overt level in hypnosis. Some but not all of these can report much more intense experiences at the covert level when the information is retrieved simultaneously by automatic writing or retrospectively through automatic talking. The metaphor of a "hidden observer" has been used to describe the covert cognitive system (Hilgard 1977). The interpretation favored is that parallel processing goes on at the two levels, one within the hypnotic consciousness, the other in a concealed (temporarily subconscious) cognitive system.

Altered and Alternate States of Consciousness

The fringe movements in psychology, including transpersonal psychology with its emphasis upon Eastern religions and other consciousness-expanding cults, have led to an interest in altered states of consciousness (Tart 1969, 1975a), or perhaps alternate states of consciousness (Zinberg 1977). The discussions are not entirely clear about the concept of state. A fully appropriate state theory should imply a rather dramatic change, as in the phase changes recognized in physics, from, say, ice to water to steam. The gradual softening of wax is more difficult to describe as a change in state, although at the extremes there are differences between solid and liquid wax.

My own belief is that the state controversy has been overplayed, in part because there is a confusion between classification and inferences as to cause. There is no harm in classifying as states extreme changes in condition, such as sleep and waking, or sobriety and drunkenness, or profoundly hypnotized and nonhypnotized. The objection lies in attributing whatever occurs within that condition to a consequence of that condition. This corresponds, of course, to the old criticism of instinct. There is no harm in noting differences between animal groups in their species-specific behavior, another name for instinctive behavior. It is only when behavior is explained as due to the possession of the instinct (pigeons return home because they have a homing instinct) that the concept causes trouble. The same applies to state, and the same tendency to unwarranted criticism applies.

Psychologists are to be warned, however, against unjustified uses of the state concept merely because it is a permissible one. One illustration is a proposal for state-specific sciences by Tart (1972). Tart asserts in essence that there are altered states of consciousness so far removed from ordinary consciousness that only those who have experienced them (or perhaps *are* experiencing them) have the qualifications to study them. His arguments, presented abstractly, appear reasonable, but they have no substantial justification. The general idea is familiar enough—it takes a thief to catch a thief; the best antialcoholic is a reformed alcoholic; LSD therapy requires the therapist to take LSD; only a psychoanalyzed person can be a psy-

choanalytic practitioner. Tart makes no reference to such precedents. The grain of truth in these beliefs, which has to be sorted out from the fallacious, is not enough to justify Tart's exaggerations of the knowledge-giving values of altered states of consciousness. In a curious neglect of other precedents, he makes no mention of Jung, for whom these matters were a serious concern (e.g. Jung 1968).

There are experimentable problems in defining and characterizing altered or alternate states, and these justify investigation. The issue is not whether the state concept can sometimes be useful as a classificatory scheme; it will continue to be so used in restricted and specified contexts by those who have any curiosity about consciousness.

There are many other problems about the nature of consciousness that cannot be covered in this short survey (e.g. Natsoulas 1978). For example, Jaynes (1977) has raised the important question about the origin of the modern conception of consciousness, based on the argument that in the time of Homer what we now interpret as consciousness was considered to be the voices of the gods. The Greeks may actually have "heard" the voices as some psychotics do today. In any case, consciousness is so largely metaphorical that it is difficult to discern how greatly our interpretations of conscious experience are culturally determined.

Consciousness and the Brain

The neurosciences have made great advances in the last years, and there is great hope that new discoveries will continue to advance psychological knowledge. The heuristic position is still sound, however, that psychological knowledge stands on its own, and physiological knowledge stands on its own. The two cannot conflict in any deeper sense. That is, the limited capacity of the brain to process information limits what can be stored and retrieved from memory. At the same time, if some mnemonic expert shows a memory startling in its comprehensiveness, this must change our estimate of the brain's capacity. Truth value does not lie in the nerves of the brain any more than in the accomplishments of the person, regardless of the preferences of some scientists for one or the other source of information.

The results of the experiments on surgically separating the two hemispheres have excited major interest because of the global differences in functioning of the two hemispheres, as in the assignment of the differences between the thought processes of East and West to this distinction (Ornstein 1977), or in the proposal of a new typology of personal streams of consciousness based on the functional asymmetry of the hemispheres (Bakan 1978). The separate roles of the two hemispheres enter into Jaynes' speculations about the bicameral mind. The distinction is having its impact upon education (Chall & Mirsky 1978). We can expect some tempering of the initial

enthusiasm as the findings settle down, but there will be residual advances as correlations between brain activity and conscious processes become better known (Gazzangia & Le Doux 1978).

CONCLUDING REMARKS

The interpretation of the deeper meaning of contemporary events is the most difficult task of historical writing. The relative recency of the changed attitudes toward consciousness within psychology has been documented throughout, but a few added landmarks may help to keep the march of events in perspective. Here are some of the dates on which relevant new journals began their publication: *Cognition*, 1971; *Cognitive Psychology*, 1970; *Cognitive Science*, 1977; *Cognitive Therapy and Research*, 1977; *Journal of Altered States of Consciousness*, 1973; *Journal of Humanistic Psychology*, 1961; *Journal of Mental Imagery*, 1977; *Journal of Transpersonal Psychology*, 1969; *Memory and Cognition*, 1973.

The opening up of psychology, without sacrifice of the gains that have been made in tight theorizing and precise experimentation, is all to the good. The exploitation of the new freedom by those who have a distaste for the discipline of science will have to be guarded against, but this risk must not discourage those who have retained a curiosity about all aspects of the mind and human behavior, and at the same time are determined to retain and advance psychology's stature as a scientific enterprise.

Literature Cited

- Allport, F. H. 1924. *Social Psychology*. Boston: Houghton Mifflin. 453 pp.
- Allport, G. W. 1937. *Personality: A Psychological Interpretation*. New York: Holt. 588 pp.
- Angell, J. R. 1904. *Psychology: An Introductory Study of the Structure and Functions of Human Consciousness*. New York: Holt. 402 pp.
- Angell, J. R. 1907. The province of functional psychology. *Psychol. Rev.* 14:61-91
- Aserinsky, E., Kleitman, N. 1953. Regularly occurring periods of eye motility, and concomitant phenomena, during sleep. *Science* 118:273-74
- Atkinson, R. C., Shiffrin, R. M. 1968. Human memory: A proposed system and its control processes. In *The Psychology of Learning and Motivation*, ed. K. W. Spence, J. T. Spence, 2:89-195. New York: Academic. 249 pp.
- Baddeley, A. D. 1976. *The Psychology of Memory*. New York: Basic Books. 430 pp.
- Bakan, P. 1978. Two streams of consciousness: A typological approach. See Pope & Singer 1978, pp. 159-84
- Bandura, A. 1974. Behavior theory and models of man. *Am. Psychol.* 29:859-69
- Bandura, A., Walters, R. H. 1963. *Social Learning and Personality Development*. New York: Holt, Rinehart & Winston. 329 pp.
- Beck, A. T., Mahoney, M. J. 1979. Schools of "thought." *Am. Psychol.* 34:93-98
- Beer, T., Bethe, A., von Uexküll, J. 1899. Vorschläge zu einer objectivierenden Nomenklatur in der Physiologie des Nervensystems. *Biol. Zentralbl.* 19: 517-21
- Blumenthal, A. L. 1975. A reappraisal of Wilhelm Wundt. *Am. Psychol.* 30: 1081-88
- Blumenthal, A. L. 1979. Wilhelm Wundt—founding father. Presented at Am. Assoc. Adv. Sci., Houston
- Boring, E. G. 1950. *A History of Experimental Psychology*. New York: Appleton-Century Crofts. 777 pp. 2nd ed.

- Bower, G. H. 1970. Analysis of a mnemonic device. *Am. Sci.* 58:496-510
- Bower, G. H. 1972. Mental imagery and associative learning. In *Cognition in Learning and Memory*, ed L. W. Gregg, pp. 51-88. New York: Wiley. 263 pp.
- Bower, G. H. 1975. Cognitive psychology: An introduction. See Estes 1975, 1:25-80
- Bridgman, P. W. 1927. *The Logic of Modern Physics*. New York: Macmillan. 228 pp.
- Bruner, J. S. 1959. Inhelder and Piaget's *The Growth of Logical Thinking*. I. A psychologist's viewpoint. *Br. J. Psychol.* 50:363-70
- Bush, R. R., Mosteller, F. 1955. *Stochastic Models for Learning*. New York: Wiley. 365 pp.
- Chall, J. S., Mirsky, A. F., eds. 1978. *Education and the Brain*. 77th Yearb. Natl. Soc. Study Educ., Pt. 2. Chicago: Univ. Chicago Press. 413 pp.
- Cherry, E. C. 1953. Some experiments on the recognition of speech, with one and two ears. *J. Acoust. Soc. Am.* 25:975-79
- Chomsky, N. 1959. Review of Skinner's *Verbal Behavior*. *Language* 35:26-58
- Clark, H. H., Clark, E. V. 1977. *Psychology and Language: An Introduction to Psycholinguistics*. New York: Harcourt Brace Jovanovich. 608 pp.
- Dashiell, J. F. 1935. Experimental studies of the influence of social situations on the behavior of human adults. In *Handbook of Social Psychology*, ed. C. Murchison, 1097-1158. Worcester, Mass: Clark Univ. Press. 1195 pp.
- Deikman, A. J. 1971. Bimodal consciousness. *Arch. Gen. Psychiatry* 25:481-89
- Dement, W., Kleitman, N. 1957. The relation of eye movements during sleep to dream activity: An objective method for the study of dreaming. *J. Exp. Psychol.* 53:339-46
- Dewey, J. 1896. The reflex arc concept in psychology. *Psychol. Rev.* 3:357-70
- Dollard, J., Miller, N. E. 1950. *Personality and Psychotherapy*. New York: McGraw-Hill. 488 pp.
- Eddington, A. S. 1929. *The Nature of the Physical World*. New York: Macmillan. 361 pp.
- Ellis, A. 1979. On Joseph Wolpe's espousal of cognitive-behavior therapy. *Am. Psychol.* 34:98-99
- Estes, W. K. 1950. Toward a statistical theory of learning. *Psychol. Rev.* 57:94-107
- Estes, W. K. 1975. The state of the field: General problems of theory and metatheory. In *Handbook of Learning and Cognitive Processes*, ed. W. K. Estes, 1:1-24. Hillsdale, NJ: Erlbaum. 303 pp.
- Estes, W. K., ed. 1975-1978. *Handbook of Learning and Cognitive Processes*. Hillsdale, NJ: Erlbaum. 6 vols.
- Festinger, L. 1957. *A Theory of Cognitive Dissonance*. Evanston, Ill: Row, Peterson. 291 pp.
- Flavell, J. H. 1963. *The Developmental Psychology of Jean Piaget*. Princeton, NJ: Van Nostrand. 472 pp.
- Galanter, E. 1979. *Psychophysics and the new dualism*. Presented at Am. Assoc. Adv. Sci., Houston
- Gazzaniga, M. S., Le Doux, J. E. 1978. *The Integrated Mind*. New York: Plenum. 168 pp.
- Globus, G. G., Maxwell, G., Savodnik, I., eds. 1976. *Consciousness and the Brain*. New York: Plenum. 365 pp.
- Gordon, C., Gergen, K. J. 1968. *The Self in Social Interaction*, Vol. 1. *Classic and Contemporary Perspectives*. New York: Wiley. 473 pp.
- Grant, D. A., Hake, H. W., Hornseth, J. P. 1951. Acquisition and extinction of a verbal conditioned response with differing percentages of reinforcement. *J. Exp. Psychol.* 42:1-5
- Greeno, J. G., Bjork, R. A. 1973. Mathematical learning theory and the new "mental forestry." *Ann. Rev. Psychol.* 24:81-116
- Greenwald, A. G. 1968. Cognitive learning, cognitive response to persuasion, and attitude change. In *Psychological Foundations of Attitudes*, ed. A. G. Greenwald, T. C. Brock, T. M. Ostrom, pp. 147-70. New York: Academic. 407 pp.
- Hamilton, W. 1859. Prefatory notice. *The Collected Works of Dugald Stewart*, Vol. 2. Edinburgh: Constable. 505 pp. 4 vols.
- Hempel, C. 1950. Problems and changes in the empiricist critique of meaning. *Rev. Int. Philos.* 4:41-63
- Hilgard, E. R. 1949. Human motives and the concept of the self. *Am. Psychol.* 4:374-82
- Hilgard, E. R. 1956. *Theories of Learning*. New York: Appleton-Century-Crofts. 563 pp. 2nd ed.
- Hilgard, E. R. 1962. Impulsive versus realistic thinking: An examination of the distinction between primary and secondary processes in thought. *Psychol. Bull.* 59:477-88
- Hilgard, E. R. 1977. *Divided Consciousness: Multiple Controls in Human Thought and Action*. New York: Wiley. 300 pp.
- Hilgard, E. R. 1979. The trilogy of mind: Cognition, affection, and conation. *J. Hist. Behav. Sci.* In press

- Hilgard, E. R., Bower, G. H. 1975. *Theories of Learning*. Englewood Cliffs, NJ: Prentice-Hall. 698 pp. 4th ed.
- Hilgard, E. R., Marquis, D. G. 1940. *Conditioning and Learning*. New York: Appleton-Century. 429 pp.
- Holt, R. R. 1964. Imagery: The return of the ostracized. *Am. Psychol.* 19:254-64
- Homme, L. E. 1965. Control of coverants, the operants of the mind. *Psychol. Rec.* 15:425-34
- Hull, C. L. 1933. *Hypnosis and Suggestibility: An Experimental Approach*. New York: Appleton-Century. 416 pp. (Paper ed., 1968, New York: Appleton-Century-Crofts)
- Hull, C. L. 1943. *Principles of Behavior*. New York: Appleton-Century-Crofts. 422 pp.
- Humphreys, L. G. 1939. Acquisition and extinction of verbal expectations in a situation analogous to conditioning. *J. Exp. Psychol.* 25:294-301
- Hunt, J. McV. 1961. *Intelligence and Experience*. New York: Ronald. 416 pp.
- Inhelder, B., Piaget, J. 1958. *The Growth of Logical Thinking from Childhood to Adolescence*. New York: Basic Books. 356 pp.
- James, W. 1890. *Principles of Psychology*. New York: Holt. 2 vols.
- James, W. 1892. *Psychology: Briefer Course*. New York: Holt. 478 pp.
- Jaynes, J. 1977. *The Origins of Consciousness in the Breakdown of the Bicameral Mind*. Boston: Houghton Mifflin. 467 pp.
- Jung, C. G. 1968. *Psychology and Alchemy*. Princeton: Princeton Univ. Press. 571 pp. 2nd ed.
- Kahneman, D. 1973. *Attention and Effort*. Englewood Cliffs, NJ: Prentice-Hall. 246 pp.
- Kaplan, A. 1968. Positivism. *Int. Encycl. Soc. Sci.* 12:389-95
- Klinger, E. 1978. Modes of normal conscious flow. See Pope & Singer 1978, pp. 226-58
- Klüver, H. 1928. *Mescal: The Divine Plant and Its Psychological Effects*. London: Kegan Paul, Trench, Trubner. 111 pp.
- Klüver, H. 1966. *Mescal, and Mechanisms of Hallucinations*. Chicago: Univ. Chicago Press. 108 pp.
- Köhler, W. 1917. *Intelligenzprüfungen an Menschenaffen*. Berlin: Springer. English translation, *The Mentality of Apes*. 1925. New York: Harcourt, Brace. 293 pp.
- Ladd, G. T. 1887. *Elements of Physiological Psychology*. New York: Scribner's. 696 pp.
- Lazarus, A. A. 1979. A matter of emphasis. *Am. Psychol.* 34:100
- Lewin, K. 1935. *A Dynamic Theory of Personality*. New York: McGraw-Hill. 286 pp.
- Loeb, J. 1911. The significance of tropisms for psychology. *Pop. Sci. Mon.* 79: 105-25
- Maslow, A. H. 1954. *Motivation and Personality*. New York: Harper. 411 pp.
- McGeoch, J. A. 1935. Learning as an operationally defined concept. *Psychol. Bull.* 32:688
- Miller, G. A. 1956. The magical number seven plus or minus two: Some limits on our capacity for processing information. *Psychol. Rev.* 63:81-97
- Miller, G. A., Galanter, E. H., Pribram, K. H. 1960. *Plans and the Structure of Behavior*. New York: Holt. 226 pp.
- Miller, G. A., Selfridge, J. A. 1950. Verbal context and the recall of meaningful material. *Am. J. Psychol.* 63:176-85
- Mischel, W. 1973. Toward a cognitive social learning reconceptualization of personality. *Psychol. Rev.* 80:252-83
- Mischel, W. 1979. On the interface of cognition and personality. *Am. Psychol.* 34: In press
- Murphy, G., Murphy, L. B. 1931. *Experimental Social Psychology*. New York: Harper. 709 pp.
- Murray, H. A. 1938. *Explorations in Personality*. New York: Oxford Univ. Press. 761 pp.
- Natsoulas, T. 1978. Consciousness. *Am. Psychol.* 33:906-14
- Neisser, U. 1967. *Cognitive Psychology*. New York: Appleton-Century-Crofts. 351 pp.
- Newell, A., Simon, H. A. 1956. The logic theory machine. *IRE Trans. Inf. Theory* IT-2:61-69
- Nisbett, R. E., Wilson, T. D. 1977. Telling more than we can know: Verbal reports on mental processes. *Psychol. Rev.* 84:231-59
- Norman, D. A. 1976. *Memory and Attention: An Introduction to Information Processing*. New York: Wiley. 262 pp. 2nd ed.
- Ornstein, R. E. 1977. *The Psychology of Consciousness*. New York: Harcourt Brace & World. 255 pp. 2nd ed.
- Paivio, A. 1971. *Imagery and Verbal Processes*. New York: Holt, Rinehart & Winston, 596 pp.
- Pope, K. S., Singer, J. L., eds. 1978. *The Stream of Consciousness: Scientific Investigations into the Flow of Human Experience*. New York: Plenum. 375 pp.
- Pribram, K. H. 1976. Self-consciousness and intentionality. In *Consciousness and*

- Self-Regulation (Advances in Research)*
ed. G. E. Schwartz, D. Shapiro, 1:51-100. New York: Plenum. 400 pp.
- Rescorla, R. A. 1972. Informational variables in Pavlovian conditioning. In *Psychology of Learning and Motivation: Advances in Research and Theory*, ed. K. Spence, J. T. Spence, 6:1-46. New York: Academic. 312 pp.
- Rogers, C. R. 1951. *Client-Centered Therapy*. Boston: Houghton Mifflin. 560 pp.
- Rundus, D. J., Atkinson, R. C. 1970. Rehearsal processes in free recall: A procedure for direct observation. *J. Verb. Learn. Verb. Behav.* 9:99-105
- Shallice, T. 1972. Dual functions of consciousness. *Psychol. Rev.* 79:383-93
- Shallice, T. 1978. The dominant action system: An information-processing approach to consciousness. See Pope & Singer 1978, pp. 137-58
- Shepard, R. N. 1975. Form, formation, and transformation of internal representation. In *Information Processing and Cognition: The Loyola Symposium*, ed. R. Solso, pp. 87-122. Hillsdale, NJ: Erlbaum. 438 pp.
- Singer, J. L. 1978. Experimental studies of daydreaming and the stream of thought. See Pope and Singer 1978, pp. 187-223
- Skinner, B. F. 1938. *The Behavior of Organisms*. New York: Appleton-Century. 457 pp.
- Skinner, B. F. 1957. *Verbal Behavior*. New York: Appleton-Century-Crofts. 478 pp.
- Smith, E. R., Miller, F. D. 1978. Limits on perception of cognitive processes: A reply to Nisbett and Wilson. *Psychol. Rev.* 85:355-62
- Sperling, G. 1960. The information available in brief visual presentations. *Psychol. Monogr.* 74, Whole No. 498:1-29
- Stevens, S. S. 1935. The operational definition of concepts. *Psychol. Rev.* 42:517-27
- Stoyva, J., Kamiya, J. 1968. Electrophysiological studies of dreaming as the prototype of a new strategy in the study of consciousness. *Psychol. Rev.* 75:192-205
- Tart, C. T., ed. 1969. *Altered States of Consciousness*. New York: Wiley. 575 pp.
- Tart, C. T. 1972. States of consciousness and state-specific science. *Science* 176: 1203-10
- Tart, C. T. 1975a. *States of Consciousness*. New York: Dutton. 305 pp.
- Tart, C. T., ed. 1975b. *Transpersonal Psychologies*. New York: Harper & Row. 502 pp.
- Thurstone, L. L. 1929. Theory of attitude measurement. *Psychol. Rev.* 36:222-41
- Thurstone, L. L. 1931. Multiple factor analysis. *Psychol. Rev.* 38:406-27
- Titchener, E. B. 1898. The postulates of a structural psychology. *Philos. Rev.* 7:499-565
- Titchener, E. B. 1901-1905. *Experimental Psychology: A Manual of Laboratory Practice*. New York: Macmillan. 2 Vols., 433 pp., 422 pp.
- Tolman, E. C. 1932. *Purposive Behavior in Animals and Men*. New York: Appleton-Century. 463 pp.
- Tolman, E. C., Brunswik, E. 1935. The organism and the causal texture of the environment. *Psychol. Rev.* 42:43-77
- Watson, J. B. 1913. Psychology as the behaviorist views it. *Psychol. Rev.* 20:158-77
- Watson, J. B. 1919. *Psychology from the Standpoint of a Behaviorist*. Philadelphia: Lippincott. 429 pp.
- Watson, J. B. 1936. John Broadus Watson. In *A History of Psychology in Autobiography*, ed. C. Murchison, 3:271-81. Worcester, Mass: Clark Univ. Press. 327 pp.
- Waugh, N. C., Norman, D. A. 1965. Primary memory. *Psychol. Rev.* 72:89-104
- Weitzenhoffer, A. M. 1953. *Hypnotism: An Objective Study in Suggestibility*. New York: Wiley. 380 pp.
- Witkin, H. A., Lewis, H. B., Hertzman, M., Machover, K., Meissner, P. B., Wapner, S. 1954. *Personality through Perception*. New York: Harper. 571 pp.
- Witkin, H. A., Moore, C. A., Goodenough, D. R., Cox, P. W. 1977. Field-dependent and field-independent cognitive styles and their educational implications. *Rev. Educ. Res.* 47:1-64
- Wolpe, J. 1978. Cognition and causation in human behavior and its therapy. *Am. Psychol.* 33:437-46
- Wyer, R. S. 1974. *Cognitive Organization and Change: An Information Processing Approach*. Hillsdale, NJ: Erlbaum. 502 pp.
- Zinberg, N. E., ed. 1977. *Alternate States of Consciousness*. New York: Free Press. 294 pp.