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MOTIVATION RECONSIDERED: THE CONCEPT OF COMPETENCE

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When parallel trends can be observed in realms as far apart as animal behavior and psychoanalytic ego psychology, there is reason to suppose that we are witnessing a significant evolution of ideas. In these two realms, as in psychology as a whole, there is evidence of deepening discontent with theories of motivation based upon drives. Despite great differences in the language and concepts used to express this discontent, the theme is everywhere the same: Something important is left out when we make drives the operating forces in animal and human behavior.

The chief theories against which the discontent is directed are those of Hull and of Freud. In their respective realms, drive-reduction theory and psychoanalytic instinct theory, which are basically very much alike, have acquired a considerable air of orthodoxy. Both views have an appealing simplicity, and both have been argued long enough so that their main outlines are generally known. In decided contrast is the position of those who are not satisfied with drives and instincts. They are numerous, and they have developed many pointed criticisms, but what they have to say has not thus far lent itself to a clear and inclusive conceptualization. Apparently there is an enduring difficulty in making these contributions fall into shape.

In this paper I shall attempt a conceptualization which gathers up some of the important things left out by drive theory. To give the concept a name I have chosen the word *competence,* which is intended in a broad biological sense rather than in its narrow everyday meaning. As used here, competence will refer to an organism's capacity to interact effectively with its environment. In organisms capable of but little learning, this capacity might be considered an innate attribute, but in the mammals and especially man, with their highly plastic nervous systems, fitness to interact with the environment is slowly attained through prolonged feats of learning. In view of the directedness and persistence of the behavior that leads to these feats of learning, I consider it necessary to treat competence as having a motivational aspect, and my central argument will be that the motivation needed to attain competence cannot be wholly derived from sources of energy currently conceptualized as drives or instincts. We need a different kind of motivational idea to account fully for the fact that man and the higher mammals develop a competence in dealing with the environment which they certainly do not have at birth and certainly do not arrive at simply through maturation. Such an idea, I believe, is essential for any biologically sound view of human nature.

As a first step, I shall briefly examine the relevant trends of thought in several areas of psychology. From this it will become clear that the ideas advanced in this paper have already been stated, in one way or another, by workers in animal behavior, child development, cognitive psychology, psychoanalytic ego psychology, and the psychology of personality. If there is novelty in this essay, it lies in putting together

pieces which are not in themselves new. They already lie before us on the table, and perhaps by looking once more we can see how to fit them into a larger conceptual picture.

THE TREND IN ANIMAL PSYCHOLOGY

One of the most obvious features of animal behavior is the tendency to explore the environment. Cats are reputedly killed by curiosity, dogs characteristically make a thorough search of their surroundings, and monkeys and chimpanzees have always impressed observers as being ceaseless investigators. Even Pavlov, whose theory of behavior was one of Spartan simplicity, could not do without an investigatory or orientating reflex. Early workers with the obstruction method, such as Dashiell (1925) and Nissen (1930), reported that rats would cross an electrified grid simply for the privilege of exploring new territory. Some theorists reasoned that activity of this kind was always in the service of hunger, thirst, sex, or some other organic need, but this view was at least shaken by the latent learning experiments, which showed that animals learned about their surroundings even when their major needs had been purposely sated. Shortly before 1950 there was a wave of renewed interest not only in exploratory behavior but also in the possibility that activity and manipulation might have to be assigned the status of independent motives.

Exploratory Behavior

In 1953 Butler reported an experiment in which monkeys learned a discrimination problem when the only reward was the opening of a window which permitted them to look out upon the normal comings and goings of the entrance room to the laboratory. The discriminations thus formed proved to be resistant to extinction. In a later study, Butler and Harlow (1957) showed that monkeys could build up a series of four different discriminations solely for the sake of inspecting the entrance room. Butler concluded that "monkeys—and presumably all primates—have a strong motive toward visual exploration of their environment and that learning may be established on the basis of this motive just as it may be established on the basis of any motive that regularly and reliably elicits responses." Montgomery, in 1954, reported a study with rats in which the animals, their major organic needs satiated, learned to avoid the short arm of a Y maze and to take the path which led them into additional maze territory suitable for exploration. Similar findings have been described by Myers and Miller (1954), whose rats learned to press a bar for the sake of poking their heads into a new compartment and sniffing around. Zimbardo and Miller (1958) enlarged upon this study by varying the amount of novelty in the two compartments. In their report "the hypothesis advanced is that opportunity to explore a 'novel' environment or to effect a stimulus change in the environment is the reinforcing agent."

These experiments make a strong case for an independent exploratory motive. The nature of this motive can be more fully discerned in situations in which the animals are allowed a varied repertory of behavior. In 1950 Berlyne published a searching paper on curiosity, a theme which he further developed in subsequent years (1955, 1957, 1958). The rats in his experiments were confronted with an unfamiliar space and later with various novel objects placed in it. Approaching, sniffing, and examining were readily elicited by each novelty, were fairly rapidly extinguished, but were restored nearly to original strength

when a fresh novelty was added. Exploration on the part of chimpanzees has been studied by Welker (1956), who put various pairs of objects before the animals and observed the course of their interest. The objects were often first approached in a gingerly manner, with signs of uneasiness, then examined and handled quite fully, then discarded. Introducing a new pair of objects promptly reproduced the whole sequence, just as it did with the rats in Berlyne's experiments. Welker used pairs of objects to find out whether or not the chimpanzees would have common preferences. Bigness and brightness evoked more interest, and greater time was spent upon objects which could be moved, changed, or made to emit sounds and light.

Recent reviews by Butler (1958) and Cofer (1959) show that a great deal of similar work is going on in animal laboratories, generally with similar results.

Exploration as a Drive

The designers of these experiments have favored the idea that exploration should be listed as an independent primary drive. In all cases the experimental plan calls for the elimination of other primary drives by satiation. It is recognized, however, that a confirmed advocate of orthodoxy might bring up two objections to the proposed enlargement of the list of primary drives. He might claim that exploratory behavior could be explained as a consequence of secondary reinforcement, or he might contend that it is reinforced by reduction of anxiety.

The first argument meets an immediate difficulty in Butler's finding that discriminations learned on the basis of visual exploration are resistant to extinction. When reinforcement of primary drive never takes place in the experimental situation, it is to be expected that secondary reinforcement will not prevent extinction (Miller, 1951). But even in those cases where extinction is rapid, as it was with Berlyne's rats and Welker's chimpanzees, serious problems are raised by the quick recovery of exploratory behavior when a novel stimulus is introduced (Berlyne, 1950). In order to sustain the idea that secondary reinforcement accounts for this fact, we should have to suppose that primary rewards have often been connected with the exploration of novelties. It would have to be assumed, for instance, that the securing of food by young animals occurred with considerable frequency in connection with the investigation of novel objects. This image may seem to fit mature animals who search the environment for their food, but it certainly cannot apply to young mammals before they are weaned. Here the learning process can do virtually nothing to reinforce an interest in novelties. Gratification comes from following the same old cues to the same old consummatory responses, and the animal whose attention strays to some novel variation of the breast will only find himself frustrated. One can say that the whole mammalian pattern of infancy works in the opposite direction. The mother is more active than the young in providing gratifications, and the babies must be pursued and retrieved if they stray from the scene of her ministry. However one looks at it, the hypothesis of secondary reinforcement seems to me to demand improbable assumptions about the relationship in the lives of young animals between exploration and primary need gratification.

The hypothesis that exploratory behavior is related to fear and receives its reinforcement from the reduction of anxiety is at first glance considerably more plausible. It seems justified by the observation that Welker's chimpan-

zees showed uneasiness on first contact with novel objects, and it fits the behavior of rats in a new maze, as reported by Whiting and Mowrer (1943), where initial terror gave place to an exploration so feverish that the food reward was not eaten. Montgomery and Monkman (1955) have undertaken to challenge this hypothesis by a direct experimental attack. They showed that fear induced in rats before entering a novel situation did not increase exploratory behavior, and that fear induced within the novel situation decreased exploration to an extent correlated with the intensity of the fear. They find it more reasonable to suppose that fear and exploration are conflicting forms of behavior, and this view can also be defended on purely logical grounds. Fear shows itself in either freezing or avoidance, whereas exploration is clearly an instance of approach. There is hardly a more perfect example of conflict between incompatible responses than that of an animal hesitating between investigation and flight. It is clear that exploration can sometimes serve to reduce anxiety, but the proposition that it comes into existence only for this purpose cannot be so easily accepted.

What assumptions have to be made to support the thesis that exploration is motivated by anxiety reduction? It has to be assumed that certain characteristic stimuli arouse anxiety and that exploration of these stimuli is then found to reduce the anxiety. If the characteristics in question are those of novelty and unfamiliarity, we must heed Berlyne's reminder that for the infant all experience is novel and unfamiliar. Berlyne (1950) proposes that the exploratory reaction "may be one that *all* stimuli originally evoke, but which disappears (becomes habituated) as the organism becomes familiar with them." But if all stimuli at first arouse anxious tension, we would have to deduce that all response would consist of avoidance in the interest of reducing that tension. Approaching a stimulus and taking steps to increase its impact could not occur. An exploratory tendency must be there in the first place before it can achieve the function of reducing anxiety. As Woodworth (1958) expresses it, "if there were no exploratory drive to balance and overbalance the fear drive, an animal would be helpless in a novel situation." I find it hard to believe that creatures so liberally endowed with fear could ever achieve a working mastery of the environment if they were impelled toward it only by the pressure of organic needs.

Both hypotheses thus far examined —secondary reinforcement and anxiety reduction—require us to make improbable assumptions. There remains the possibility that exploration should simply be added to the list of primary drives and otherwise treated in orthodox fashion. Myers and Miller (1954) suggest that this is the appropriate course, provided the new drive shows the same functional properties as those already known. "If an exploratory tendency can produce learning like other drives such as hunger, and also show a similar pattern of satiation and recovery, these functional parallels to already known drives would help to justify its classification in the same category." Logically the problem can be dealt with in this way, but we must consider very carefully what happens to the category of drive if we admit this new applicant to membership.

Using hunger as the chief model, the orthodox conception of drive involves the following characteristics: (*a*) there is a tissue need or deficit external to the nervous system which acts upon that system as a strong persisting stimulus; (*b*) this promotes activity

which is terminated by a consummatory response with consequent reduction of need; (*c*) the reduction of need brings about the learning which gradually shapes behavior into an economical pursuit of suitable goal objects. In this scheme the tension of an aroused drive is interpreted as unpleasant, at least in the sense that the animal acts in such a way as to lower the drive and becomes quiescent when it is lowered. There are probably no living champions of so simple an orthodoxy, yet the scheme remains pervasive, and it is therefore worth while to observe that the proposed exploratory drive hardly fits it at all.

In the first place, the exploratory drive appears to bear no relation whatever to a tissue need or deficit external to the nervous system. It is, of course, clearly related to certain characteristics of stimulation from the external environment, a source of motivation which Harlow (1953) would like to see restored to a serious place in contemporary psychology; but it certainly cannot be correlated with a visceral need comparable to hunger, thirst, or sex. Considering the pattern of satiation and recovery shown by Welker's chimpanzees, Woodworth (1958) remarks that "what becomes satiated is not the exploratory tendency in general, but the exploring of a particular place or object." It is possible, as Hebb (1955) has pointed out, that the so-called "reticular activation system" in the brain stem creates a kind of general drive state, and this mechanism might indeed be flexibly responsive to changes in sensory stimulation. This interesting suggestion, however, is still a far cry from viscerogenic drives; it commits us instead to the novel idea of a neurogenic motive, one in which the state of the nervous system and the patterns of external stimulation conspire to produce motivated behavior. There is even a good deal of trouble in supposing that the adequate stimuli for exploration are either strong or persistent. Novelty certainly cannot be equated with strength or persistence, and animals seem readily able to disregard the stimuli to exploration when they are weary.

In the second place, exploratory behavior cannot be regarded as leading to any kind of consummatory response. It is usual for the animal's investigation to subside gradually. If the animal at some point turns away and leaves the once novel object we may say that its curiosity is "satisfied," but we do not mean by this that the equivalent of a consummatory response has just taken place. The sequence suggests rather that curiosity wears out and slowly falls to a level where it no longer guides behavior, at least until a fresh novelty comes into view.

Finally, in the case of exploratory behavior there is real difficulty in identifying reinforcement with need reduction. Montgomery (1954), describing the learning of the Y maze, points out that the short arm, essentially a dead end, would tend to reduce the exploratory drive, whereas the long arm, itself a complex maze, would increase it—but the long arm is chosen. If the long arm functions as a reinforcing agent, "the mechanism underlying this reinforcement is an *increase,* rather than a decrease, in the strength of the exploratory drive." In this experiment, as in their natural habitat, animals do not wait to have novelty thrust upon them, nor do they avoid situations in which novelty may be found. Such behavior can be most readily conceptualized by admitting that under certain circumstances reinforcement can be correlated with an increase in arousal or excitement rather than a decrease. A drive which has no consummatory climax seems almost to require this formula-

tion. It is distinctly implausible to connect reinforcement with the waning of an agreeable interest in the environment or with a general progress from zestful alertness to boredom.

If we admit exploration to the category of drive we are thus committing ourselves to believe that drives need have no extraneural sources in tissue deficits or visceral tensions, that they are not necessarily activated by strong or persistent stimuli, that they do not require consummatory responses, and that drive increase can sometimes be a mechanism of reinforcement.

Activity and Manipulation

Exploration is not the only motive proposed by critics of drive orthodoxy, and novelty is not the only characteristic of the environment which appears to incite motivated behavior. Some workers have suggested a need for activity, which can be strengthened by depriving animals of their normal opportunities for movement. Kagan and Berkun (1954) used running in an activity wheel as the reward for learning and found it "an adequate reinforcement for the instrumental response of bar pressing." Hill (1956) showed that rats will run in an activity wheel to an extent that is correlated with their previous degree of confinement. It is certain that the activity wheel offers no novelty to the animals in these experiments. Nevertheless, they seem to want to run, and they continue to run for such long times that no part of the behavior can readily be singled out as a consummatory response. Perhaps an unpleasant internal state created by inactivity is gradually worked off, but this is certainly accomplished by a tremendous increase of kinaesthetic stimulation and muscular output which would seem to imply increased excitation in the system as a whole.

Harlow and his associates (Harlow, 1953; Harlow, Harlow, & Meyer, 1950) maintain that there is also a manipulative drive. It is aroused by certain patterns of external stimulation and reduced by actively changing the external pattern. The experiments were done with rhesus monkeys, and they involve the solving of a mechanical problem which, however, leads to no further consequences or rewards. The task might be, for instance, to raise a hasp which is kept in place by both a hook and a pin; all that can be accomplished is to raise the hasp, which opens nothing and leads to no fresh discoveries. When the hasp problem is simply installed in the living cages, the monkeys return to it and solve it as many as 7 or 8 times over several days. It seems unlikely that novelty can be postulated as the essential characteristic of the stimulus which evokes this repeated behavior. The simplest interpretation is rather that value lies for the animal in the opportunity, as Zimbardo and Miller (1958) express it, "to effect a stimulus change in the environment." This formulation suggests something like the propensities toward mastery or power that have often been mentioned in discussions of human motivation.

The addition of activity and manipulation to the list of primary drives can only make more serious the difficulties for the orthodox model that resulted from admitting exploration. But recent research with animals has put the orthodox model on the defensive even on its home grounds. It has become increasingly clear that hunger, thirst, and sex cannot be made to fit the simple pattern that seemed so helpful 40 years ago.

Changing Conceptions of Drive

In a brief historical statement, Morgan (1957) has pointed out that the

conception of drive as a noxious stimulus began to lose its popularity among research workers shortly after 1940. "On the whole," he says, "the stimulus concept of drive owed more to wishful thinking than to experimental fact." When technical advances in biochemistry and brain physiology made it possible to bring in an array of new facts, there was a rapid shift toward the view that "drives arise largely through the internal environment acting on the central nervous system." One of the most influential discoveries was that animals have as many as a dozen specific hungers for particular kinds of food, instead of the single hunger demanded by Cannon's model of the hunger drive. If an animal's diet becomes deficient in some important element such as salt, sugar, or the vitamin-B complex, foods containing the missing element will be eagerly sought while other foods are passed by, a selectivity that obviously cannot be laid to contractions of the stomach. Similarly, a negative food preference can be produced by loading either the stomach or the blood stream with some single element of the normal diet. The early work of Beach (1942) on sexual behavior brought out similar complications in what had for a time been taken as a relatively simple drive. Hormone levels appeared to be considerably more important than peripheral stimulation in the arousal and maintenance of the sex drive. Further work led Beach (1951) to conclude that sexual behavior is "governed by a complex combination of processes." He points out that the patterns of control differ tremendously from one species to another and that within a single species the mechanisms may be quite different for males and females. Like hunger, the sex drive turns out to be no simple thing.

New methods of destroying and of stimulating brain centers in animals have had an equally disastrous effect on the orthodox drive model. The nervous system, and especially the hypothalamus, appears to be deeply implicated in the motivational process. Experimental findings on hypothalamic lesions in animals encourage Stellar (1954) to believe that there are different centers "responsible for the control of different kinds of basic motivation," and that in each case "there is one main excitatory center and one inhibitory center which operates to depress the activity of the excitatory center." As research findings accumulate, this picture may seem to be too cleanly drawn. Concerning sexual behavior, for example, Rosvold (1959) concludes a recent review by rejecting the idea of a single center in the cerebrum; rather, the sex drive "probably has a wide neural representation with a complex interaction between old and new brain structures and between neural and humoral agents." Nevertheless, Miller's (1958) careful work seems to leave little doubt that motivated behavior in every way similar to normal hunger and normal pain-fear can be elicited by electrical stimulation of quite restricted areas of the hypothalamus. It is clear that we cannot regress to a model of drives that represents the energy as coming from outside the nervous system. Whatever the effects of peripheral stimulation may be, drives also involve neural centers and neural patterns as well as internal biochemical conditions.

What sort of model becomes necessary to entertain these newly discovered facts? In 1938 Lashley expressed the view that motivation should not be equated with disturbance of organic equilibrium but rather with "a partial excitation of a very specific sensorimotor mechanism irradiating to affect other systems of reaction." Beach

(1942) postulated that there must be in the nervous system "a condition analogous to Sherrington's central excitatory state." Morgan, in 1943, undertook to capture the facts in a systematic theory which seems to have been well sustained by subsequent research (Morgan, 1957). He distinguished two types of process which he called *humoral motive factors* and *central motive states.* The humoral factors consist of chemical or hormonal constituents of the blood and lymph, and they are conceived to influence behavior chiefly by a direct sensitizing action on neural centers. The central motive states have several properties: They are partly self-maintaining through neural circuits, they tend to increase the organism's general activity, they evoke specific forms of behavior not strongly controlled by the environment, and they prime or prepare consummatory responses which will occur when adequate stimulation is found. This is a far cry from the orthodox model, but we must nowadays admit that the orthodox model is a far cry from the facts.

In view of this radical evolution of the concept of drive, it is not surprising to find the drive reduction hypothesis in serious difficulties. The earlier identification of reinforcement with drive reduction has been directly attacked in a series of experiments designed to show that learning takes place when drive reduction is ruled out.

In 1950 Sheffield and Roby showed that instrumental learning would take place in hungry rats when the reward consisted not of a nutritive substance but of sweet-tasting saccharine in the drinking water. This finding appeared to be "at variance with the molar principle of reinforcement used by Hull, which identifies primary reinforcement with 'need reduction.'" The authors naturally do not question the vital importance of need reduction, but they point out that need-reducing events may accomplish reinforcement through a mechanism more direct and speedy than the reduction of the need itself. They think that "stimulation and performance of a consummatory response appears to be more important to instrumental learning—in a primary, not acquired, way—than the drive satisfaction which the response normally achieves." Their findings are in line with an earlier experiment with chickens by Wolfe and Kaplon (1941), who used different sizes of food pellets so that the number of pecks and the amount of food received could be thrown out of their usual close connection. The chickens, we might say, would rather peck than eat; learning was more strongly reinforced when four pecks were necessary than when one peck was enough to take the same amount of food.

The substitution of the consummatory response for need reduction as the immediate reinforcing mechanism is a step in advance, but it soon turns out that another step is required. Can it be shown that an aroused need which does not reach consummation has a reinforcing effect? To test this possibility Sheffield, Wulff, and Backer (1951) provided male rats with the reward of copulating with a female, but not enough times to produce ejaculation. This reward was favorable to instrumental learning even though there was no need reduction and no performance of the final consummatory act. The results were supported by Kagan (1955), whose animals showed substantial learning under the same conditions, though learning was still faster when ejaculation was permitted. Sheffield, Roby, and Campbell (1954) have proposed a *drive-induction* theory according to which the property of re-

inforcement is assigned to the excitement of an aroused drive. We have already seen that some such assumption is essential if exploration is to be assigned the status of a drive. Here it can be added that the whole theory of pregenital sexuality involves motivation without consummatory acts and without any but the most gradual need reduction. And as a final blow to the orthodox hypothesis comes the finding by Olds and Milner (1954) that positive reinforcement can be brought about by direct electrical stimulation of certain areas of the brain. Once again we learn that neural centers are deeply implicated in the plot of motivation. The simple mechanics of need reduction cannot possibly serve as the basis for a theory of learning.

Twenty years of research have thus pretty much destroyed the orthodox drive model. It is no longer appropriate to consider that drives originate solely in tissue deficits external to the nervous system, that consummatory acts are a universal feature and goal of motivated behavior, or that the alleviation of tissue deficits is the necessary condition for instrumental learning. Instead we have a complex picture in which humoral factors and neural centers occupy a prominent position; in which, moreover, the concept of neurogenic motives without consummatory ends appears to be entirely legitimate. Do these changes remove the obstacles to placing exploration, activity, and manipulation in the category of drives?

Perhaps this is no more than a question of words, but I should prefer at this point to call it a problem in conceptual strategy. I shall propose that these three new "drives" have much in common and that it is useful to bring them under the single heading of competence. Even with the loosening and broadening of the concept of drive, they are still in important respects different from hunger, thirst, and sex. In hunger and thirst, tissue deficits, humoral factors, and consummatory responses retain an important position. The mature sex drive depends heavily on hormonal levels and is sharply oriented toward consummation. Tendencies like exploration do not share these characteristics, whatever else they have in common with the better known drives. It is in order to emphasize their intrinsic peculiarities, to get them considered in their own right without a cloud of surplus meanings, that I prefer in this essay to speak of the urge that makes for competence simply as motivation rather than as drive.

THE TREND IN PSYCHOANALYTIC EGO PSYCHOLOGY

Rather an abrupt change of climate may be experienced as we turn from the animal laboratory to the psychoanalytic treatment room, but the trends of thought in the two realms turn out to be remarkably alike. Here the orthodox view of motivation is to be found in Freud's theory of the instincts —they might be known to us as drives if an early translator had been more literal with the German *Trieb*.

Freud's Theories of Instinct and Ego

In his final work, Freud (1949) described instincts as "somatic demands upon mental life" and as "the ultimate cause of all activity." He wrote further:

> It is possible to distinguish an indeterminate number of instincts and in common practice this is in fact done. For us, however, the important question arises whether we may not be able to derive all of these instincts from a few fundamental ones. . . . After long doubts and vacillations we have decided to assume the existence of only two basic instincts, *Eros* and the *destructive instinct* (Freud, 1949, p. 20).

The history of Freud's long doubts and vacillations has been lucidly related by Bibring (1941). Up to 1914 Freud used a two-fold classification of sexual instincts and ego instincts. The ego instincts made their appearance in his case histories in a somewhat moral character, being held responsible for the disastrous repression of sexual needs, but in systematic usage they were conceived as serving the goal of self-preservation, and hunger was generally taken as an appropriate model. In 1914, when he evolved the concept of narcissism and saw that it threatened to blur the line between sexual and ego tendencies, Freud (1925b) still expressed himself as unwilling to abandon an idea which followed the popular distinction of love and hunger and which reflected man's dual existence "as reproducer and as one who serves his own ends." Various facts, particularly those of sadism and masochism, served to overcome his reluctance, so that he finally united self-preservation and preservation of the species under the heading of Eros or life instincts, establishing destructiveness or the death instinct as the great antagonist in a profound biological sense (Freud, 1948). This highly speculative step proved to be too much for some of his otherwise loyal followers, and the earlier orthodoxy did not become entirely extinct.

It is easier to follow Freud's reasoning when we bear in mind the simultaneous development of his ideas about the mental apparatus. Bibring (1941) points out that even in his early thinking a sharp contrast was always drawn between instinct and mental apparatus. Instinct supplied the energy in the form of powerful, persisting internal stimuli; the apparatus guided it into channels which produced organized behavior and eventually put a stop to the persisting stimulation. In 1915 Freud wrote:

> The nervous system is an apparatus having the function of abolishing stimuli which reach it or of reducing excitation to the lowest possible level; an apparatus which would even, if this were feasible, maintain itself in an altogether unstimulated condition. . . . The task of the nervous system is—broadly speaking—*to master stimuli* (Freud, 1925c, p. 63).

During the next decade there was a considerable growth in his ideas about the mental apparatus, culminating in the well known division into id, ego, and superego. The activities of the ego now received much fuller recognition. Freud (1927) assigned to it "the task of self-preservation," which it accomplished through its several capacities of perception, memory, flight, defense, and adaptive action. One can see Freud's thought moving from a mechanical analogy—an engine and its fuel—toward a much more adaptational conception of the mental apparatus. Ego instincts did not wholly disappear, but the decline in their systematic importance was compensated by the insight that self-preservative tendencies were to some extent built into the whole living system. It is significant that as he took this course he came to question the earlier tension-reduction theory. In the last year of his life he declared it to be probable "that what is felt as pleasure or unpleasure is not the *absolute* degree of the tensions but something in the rhythm of their changes" (Freud, 1949).

Freud's tendency to revise his thinking makes it difficult to pin down an orthodox doctrine, but most workers will probably agree that his main emphasis was upon somatically based drives, a mental apparatus which received its power from the drives, and, of course, the multitude of ways in

which the apparatus controlled, disguised, and transformed these energies. His treatment of the ego was far from complete, and it was not long before voices were raised against the conception that so vital and versatile a part of the personality could be developed solely by libidinal and aggressive energies.

An Instinct to Master

In 1942 Hendrick proposed that this difficulty be met by assuming the existence of an additional major instinct. "The development of ability to master a segment of the environment," he wrote, and the need to exercise such functions, can be conceptualized as an "instinct to master," further characterized as "an inborn drive to do and to learn how to do." The aim of this instinct is "pleasure in exercising a function successfully, regardless of its sensual value." The simpler manifestations are learning to suck, to manipulate, to walk, to speak, to comprehend and to reason; these functions and others eventually become integrated as the ego. "The central nervous system is more than a utility," Hendrick declared. The infant shows an immediate desire to use and perfect each function as it ripens, and the adult secures gratification from an executive function efficiently performed regardless of its service to other instincts.

Hendrick's procedure in this and two supporting papers (1943a, 1943b) is quite similar to that of the animal psychologists who propose listing exploration as an additional primary drive. The instinct to master has an aim—to exercise and develop the ego functions—and it follows hedonic principles by yielding "primary pleasure" when efficient action "enables the individual to control and alter his environment." It is to this extent analogous to the instincts assumed by Freud. But just as an exploratory drive seemed radically to alter the whole conception of drive, so the instinct to master implied a drastic change in the psychoanalytic idea of instinct. Critics were quick to point out that Freud had always conceived of instincts as having somatic sources external to the ego apparatus, a condition not met by the proposed instinct to master. There was nothing comparable to erogenous zones, to orgasm, or to the sequence of painful tension followed by pleasurable release. Mastery, the critics agreed, could not be an instinct, whatever else it might be.

It is of interest that Fenichel (1945), who definitely rejected Hendrick's proposal, gives us another close parallel to the animal work by attributing mastering behavior to anxiety-reduction. He argued that mastery is "a general aim of every organism but not of a specific instinct." He agreed that there is "a pleasure of enjoying one's abilities," but he related this pleasure to cessation of the anxiety connected with not being able to do things. "Functional pleasure," he wrote, "is pleasure in the fact that the exercise of a function is now possible without anxiety," and he contended that when anxiety is no longer present, when there is full confidence that a given situation can be met, then action is no longer accompanied by functional pleasure. We must certainly agree with Fenichel that anxiety *can* play the part he assigns it, but the proposal that all pleasure in ego functions comes from this source raises the same difficulties we have already considered in connection with exploratory behavior. That we exercise our capacities and explore our surroundings only to reduce our fear of the environment is not, as I have already argued, an assumption that enjoys high probability on biological grounds.

Hartmann on the Ego

A less radical change in the orthodox model is proposed by Hartmann, who, in a series of papers since 1939, often in conjunction with Kris and Loewenstein, has been refining and expanding Freud's views on the ego and the instincts. While the ego is conceived as a "substructure" of the personality, this term is somewhat metaphorical because in practice the ego has to be defined by its functions. The list of functions, which includes grasping, crawling, walking, perceiving, remembering, language, thinking, and intention, covers much the same ground that was indicated by Hendrick, but Hartmann does not attribute their growth to an instinct. On the other hand, Hartmann (1950) early came to the conclusion that development could not be explained, as Freud had seemed to conceive it, simply as a consequence of conflict between instinctual needs and frustrating realities. The instincts alone would never guarantee survival; they require mediation by the innate ego apparatus if they are to meet "the average expectable environmental conditions." He therefore proposed that we conceive of an autonomous factor in ego development, an independent maturation of functions taking place in a "conflict-free ego sphere." Functions such as locomotion ripen through maturation and through learning even when they are not caught up in struggles to obtain erotic and aggressive gratification or to avoid anxiety. As Anna Freud (1952) has pointed out, walking becomes independent of instinctual upheavals a few weeks after its beginning; thereafter, it serves the child impartially in situations of conflict and those that are free from conflict.

Hartmann's idea of autonomous ego development has of course been assumed all along by workers in child psychology, but it is an important step to relate it to Freud's disclosures concerning unconscious motivation. In what now looks like an excess of enthusiasm for his own concepts, Freud (1925a) undertook to explain the outgrowing of the pleasure principle and the substituting of the reality principle as a simple and direct consequence of the frustration of instinctual needs. However, the reality principle contained the idea of postponing an immediate gratification in favor of a future one, and Hartmann (1956) properly notes that the capacities for postponement and anticipation cannot be conjured into existence simply by the collision of frustrating reality and ungratified need. Important as frustrations may be, these capacities must already be available, "some preparedness for dealing with reality" must already exist, before the frustration can produce its momentous educative effect. It can be seen from this example that Hartmann's analysis opens the way for profitable commerce between developmental psychologies inside and outside of psychoanalysis.

Hartmann's emphasis on adaptation permits him to perceive much more that is autonomous about the ego than was ever seriously included in Freud's systematic thought. He allows, for instance, that aims and interests which develop in the beginning as defenses against instincts may later become part of conflict-free spheres of activity—become interests in their own right—and thus achieve "secondary autonomy," a concept very close to Allport's (1937) functional autonomy of motives (Hartmann, 1950). He deals with the possibility that adaptive skills developing in the conflict-free sphere may have a decisive influence on the handling of conflicts. These skills have a history of their own, shaped jointly

by the child's abilities and by the responses evoked from parents. As Monroe (1955) has expressed it, they have "a very important role in the development of the conscious and semiconscious psychological self." They may thus have a direct influence upon the outcome when a child becomes involved in conflict. Rapaport (1958) sees Hartmann's ideas on the autonomy of the ego as vital to the proper understanding not only of healthy development but also of psychopathology itself.

In explaining the autonomous growth of the ego, Hartmann makes generous use of the concept of maturation, but he naturally does not exclude learning. Hartmann (1950) entertains the possibility, mentioned casually from time to time by Freud (1916, 1949), that ego functions are supplied with their own sources of energy independent of instincts, and that there is pleasure connected with their mere exercise. However, he makes little systematic use of this idea, relying instead upon a concept more central in Freud's thinking, that of the neutralization of drive energies. Freud (1927) found that he could "make no headway" in accounting for the varied activities of the ego without assuming "a displaceable energy, which is in itself neutral, but is able to join forces either with an erotic or with a destructive impulse, differing qualitatively as they do, and augment its total cathexis." He speculated that the neutral energy came from Eros and could be conceived as desexualized libido. Hartmann, Kris, and Loewenstein (1949) carried the idea forward a logical step by proposing that the energies of aggressive instincts could similarly be neutralized and placed at the disposal of the ego. Neutralized energy contributes to the development of the ego and makes possible a continuing interest in the objects of the environment regardless of their immediate relation to erotic or aggressive needs. Hartmann (1955) finds this concept particularly helpful in unscrambling the confusions that have arisen over the concept of sublimation.

The doctrine of neutralized instinctual energies is a curious one, and we should bear in mind the complex clinical findings that perhaps suggested it. Freud was an unquestioned genius in detecting the subtle operation of erotic urges and aggressive fantasies, along with elaborate mechanisms of defense, behind the seemingly objective or "neutral" activities of everyday life. Remarkable transformations of interest could sometimes be observed in the course of development. For example, a patient's childhood erotic rivalry and aggressive competition with his father might later disappear beneath a strong objective interest in running the family business; then suddenly, on the brink of success, this interest might come to a total halt, paralyzed by anxiety because the underlying instinctual goals came too close to symbolic fulfilment. The reappearance of instinctual preoccupations in such a case lends a certain color to the idea that they have somehow been driving the behavior all the time, even though the daily pursuit of business goals seems utterly remote from instinctual gratifications.

It is worth noticing that Freud's procedure in making the assumption of neutralized instinctual energy is similar to the one followed by orthodox behaviorists in connection with primary drives. These theorists started from the assumption that all behavior was powered by a limited number of organic drives, and then, in order to protect this assumption, they developed further hypotheses, such as secondary reinforcement, to account for motivated behavior that bore no obvious

relation to primary goals. At the point where he could "make no headway" without postulating neutralization, Freud could conceivably have made a good deal of headway if he had been willing to assume that neutral energy, neither sexual nor aggressive, was available as a natural endowment in the first place. But he preferred to protect his assumption of two primary drives and to interpret other energies as transformations of these drives. Even so, the concept seems superfluous if we take Freud at his word about the nature of the life instincts. Freud (1949) made it clear that Eros included more than instincts having a sexual aim; its larger goal was "to establish even greater unities and to preserve them thus—in short, to bind together." Under this formula, it would seem possible to include energies inherently directed toward building up the integrated functions of the ego. But Freud did not exploit the full range of his theory of Eros and proposed only that neutral energies should be conceived as desexualized.

The concept of neutralization has in some respects had a good effect on psychoanalytic ego psychology. In Hartmann's writings, as we have seen, and in Rapaport's (1951, 1954) work on thinking, it has encouraged a strong interest in autonomous ego functions and a fresh analysis of their place in personality. Nevertheless, it seems to me an awkward conceptualization, one which in the end is likely to lead, as Colby (1955) has expressed it, to a "metapsychological snarl." The theory requires that instinctual energies can completely change their aims, which makes one wonder what purpose was served in the first place by defining them as having aims. It preserves an image of mobility of energies that seems much out of line with recent research on animal motivation, where energy is being conceived in a constantly closer relation to specific structures. To my mind it thus compares unfavorably with its quite straightforward alternative, which is that the alleged neutralized energies are there in the first place as part of the natural make-up of an adaptive organism. I shall later develop this possibility by means of the concept of competence in its motivational aspect, and I believe that this concept gains support from certain other lines of work in the psychoanalytic tradition.

Motility and a Sense of Industry

The trend away from instinct orthodoxy is illustrated by the work of Kardiner (1947) on what he calls "the development of the effective ego." Kardiner's reflections arose from his work on the traumatic neuroses of war. In these disorders the main threat is to self-preservation, and some of the most important symptoms, such as defensive rituals and paralyses, are lodged in the action systems that normally bring about successful adaptive behavior. It thus becomes pertinent to study the growth of action systems, to discover how they become integrated so as to maintain "controlled contact" with the environment and "controlled exploitation of objects in the outer world," and to work out the conditions which either favor or disrupt this acquired integration. Thinking along these lines, Kardiner is led to conclusions just about the opposite of Freud's: It is the successful and gratifying experiences, not the frustrations, that lead to increasingly integrated action and to the discrimination of self from outer world. Frustration produces chiefly disruptions and inhibitions which are unfavorable to the early growth of the ego. Children are gratified when they discover the connection between a movement executed

and the accompanying and subsequent sensations. They are still more gratified when they carry out actions successfully; this "gives rise to the triumphant feeling of making an organ obedient to the will of the ego." Such experiences build up "a definite self- or body-consciousness which becomes the center and the point of reference of all purposeful and coördinated activity." Growth of the ego, in short, depends heavily upon action systems and the consequences of action. The course and vicissitudes of this development have to be studied in their own right, and they cannot be understood as side effects of the stages of libidinal development.

A similar theme is pursued to even more radical conclusions by Mittelmann (1954) in his paper on motility. Mittelmann regards motility, which manifests itself most typically in skilled motor actions such as posture, locomotion, and manipulation, as an "urge in its own right" in the same sense that one speaks of oral, excretory, or genital urges. From about 10 months of age it has a distinctly "driven" character, and there is restlessness and anger if it is blocked. During the second and third years the motor urge "dominates all other urges," so that it is proper to "consider this period the motor level of ego and libido development." The child makes tremendous efforts to learn to walk, and to walk well, and he exhibits joyous laughter as he attains these ends. Restrictions of motility may occur because the parents are anxious or because the child's assertiveness troubles them, and a lasting injury to the parent-child relationship may result. Clumsiness in motor or manipulative accomplishments may lead to self-hatred and dependence, for "the evolution of self-assertiveness and self-esteem is intimately connected with motor development." Motility is of central importance in many of the most characteristic functions of the ego. Partly by its means the infant differentiates himself from other objects, and the child's knowledge of objects depends on an extensive activity of manipulation and examination. "Thus motility becomes one of the most important aspects of reality testing." Because it is an element in all cognitive behavior, it can also be considered "the dominant integrative function." Mittelmann bases motor development, in short, on an independent urge, and he sees this urge as the really crucial motive behind the development of the ego.

Like Kardiner, Mittelmann does not attempt to formulate in detail the nature of the motility urge. It is likened not to an instinct but to a "partial instinct," and this seems to place it somewhere between Hendrick's *instinct to master* and Hartmann's dimly sketched independent energies of the ego. This indefiniteness may irk the systematic theorist, but Mittelmann's account of the part played by motility in ego development easily stands as a significant contribution. Even more influential in this respect is the work of Erikson (1953), who has given a highly detailed timetable of ego development. Erikson stays with the libido theory as far as it will go, but he passes beyond its reach in his account of the latency period and some of the later crises of growth. It is clear that something more than the orthodox instincts is involved in the "enormous value" with which the child in the second year "begins to endow his autonomous will." Something more would seem to be implied in the expanding imagination and initiative of the "phallic" child. Certainly more is involved during the school years, when children address themselves to motor, manual, and intellectual achievements and need "a

sense of being able to make things and make them well and even perfectly: this is what I call the *sense of industry.*" Erikson's (1952) theory of play is also influenced by the idea that learning to deal with the animate and inanimate worlds is an important preoccupation of childhood: "the playing child advances forward to new stages of real mastery." Action systems, motility, and a sense of industry all direct our attention to behavior which can scarcely be contained in the old bottle of instinct theory.

Glancing back over these trends in psychoanalytic ego psychology, we cannot fail to be impressed by striking similarities to the trend in animal work. Using Reik's familiar metaphor, we might say that those who listen with their two ears and those who listen with the third ear have apparently been hearing much the same sounds. In both realms there is discontent with drive orthodoxy. In both there is persistent pointing to kinds of behavior neglected or explained away by drive orthodoxy: exploration, activity, manipulation, and mastery. Similar theories have been proposed to account for the energies in such behavior: (*a*) they are derived or transformed in some way from the primary drives or instincts (secondary reinforcement, neutralization of drive energies); (*b*) they are powered by the need to reduce anxiety; (*c*) they can be accounted for only by postulating a new primary drive (exploratory drive, instinct to master). When these explanations are considered to have failed, the one remaining course is to work out a different idea of motivation. In his study of action systems, Kardiner prefers to leave the question of energy sources unanswered, but Erikson's sense of industry and Mittelmann's motility urge point to a motivational base which is only remotely analogous to primary drives or fundamental instincts. I believe that the difficulties in this undertaking can be greatly reduced by the concept of competence, to which we shall shortly turn.

Related Developments in General Psychology

If a systematic survey were in order, it would be easy to show a parallel drift of opinion in other parts of the psychological realm. Among theorists of personality, for example, something like drive orthodoxy is to be found in the work of Dollard and Miller (1950), who have translated the main concepts of Freud's psychoanalysis, including processes such as repression and displacement, into the language of reinforcement theory. With them we might put Mowrer (1950), whose searching analysis of fear as an acquired drive has led him to postulate anxiety-reduction as the master motive behind the development of the ego. Discontent with drive orthodoxy has long been expressed by Allport (1937, 1946), who not only argues for a functional autonomy of motives from their infantile roots in primary drives but also seriously questions the law of effect, the very cornerstone of reinforcement theory. Little comfort for the orthodox can be found in Murray's (1938) detailed taxonomy of needs, especially when it comes to needs such as achievement and construction, which can be tied to primary drives only by conceptual acrobatics. Murray and Kluckhohn (1953), moreover, have made a case for pleasure in activity for its own sake, reviving the *Funktionslust* proposed many years ago by Karl Bühler (1924) and recently developed in some detail by French (1952). They also argue for intrinsic mental needs: "the infant's mind is not acting most of the time as the instrument of some urgent animal drive, but is pre-

occupied with *gratifying itself.*" Murphy (1947) takes the view that all tissues can become seats of tension and thus participants in drive; in addition to visceral drives, he postulates two independent forms, activity drives and sensory drives. Then there are workers such as Goldstein (1939) who approach the whole problem with a holistic philosophy which precludes the dictatorship of any isolated or partial drives. Goldstein (1940) assumes one master tendency, that toward self-actualization, of which the so-called visceral drives are but partial and not really isolated expressions, and which can find expression also in an urge toward perfection—toward completing what is incomplete, whether it be an outside task or the mastery of some function such as walking. It has been shown by the Ansbachers (1956) that Adler, never a friend of instinct orthodoxy, in his later years reached an idea very similar to the urge toward perfection. Maslow (1954, 1955), too, belongs with the heterodox. He insists that we should take account of growth motivation as well as the deficiency motivation implied in the visceral drives, and he offers the valuable idea of a hierarchy of motives, according to which the satisfaction of "lower" needs makes it possible for "higher" needs to emerge and become regnant in behavior.

Mention of these names must suffice here to show that the trends observed in animal psychology and psychoanalytic ego psychology are pervasive in contemporary psychological thought. Doubtless the same controversies and problems could be pointed out in child development, in cognitive psychology, and in other fields. But in order to advance to my main theme, I shall select only certain developments which bear directly on the concept of competence.

Needs for Excitement and Novelty

Human experience provides plentiful evidence of the importance of reducing excessive levels of tension. Men under wartime stress, men under pressure of pain and extreme deprivation, men with excessive work loads or too much exposure to confusing social interactions, all act as if their nervous systems craved that utterly unstimulated condition which Freud once sketched as the epitome of neural bliss. But if these same men be granted their Nirvana they soon become miserable and begin to look around for a little excitement. Human experience testifies that boredom is a bad state of affairs about which something must be done. Hebb (1949) has been particularly insistent in reminding us that many of our activities, such as reading detective stories, skin-diving, or driving cars at high speeds, give clear evidence of a need to raise the level of stimulation and excitement. Men and animals alike seem at times bent on increasing the impact of the environment and even on creating mild degrees of frustration and fear. Hebb and Thompson (1954) reflect upon this as follows:

> Such phenomena are, of course, well known in man: in the liking for dangerous sports or roller coasters, where fear is deliberately courted, and in the addiction to bridge or golf or solitaire, vices whose very existence depends upon the level of difficulty of the problems presented and an optimal level of frustration. Once more, when we find such attitudes toward fear and frustration in animals, we have a better basis for supposing that we are dealing with something fundamental if a man prefers skis to the less dangerous snowshoes, or when we observe an unashamed love of work (problem solving and frustration included) in the scientist, or in the business man who cannot retire. Such behavior in man is usually accounted for as a search for prestige, but the animal data make this untenable. It seems much more likely that solving problems and running mild risks are inherently

rewarding, or, in more general terms, that the animal will always act so as to produce an optimal level of excitation (Hebb & Thompson, 1954, p. 551).

The concept of optimal stimulation has been developed by Leuba (1955), who sees it as helpful in resolving some of the problems of learning theory. Believing that most theorizing about motivation has been based upon "powerful biological or neurotic drives," Leuba bids us look at the much more common learning situations of nursery, playground, and school, where "actions which increase stimulation and produce excitement are strongly reinforced, sometimes to the dismay of parents and teachers." He proposes that there is an optimal level of stimulation, subject to variation at different times, and that learning is associated with movement toward this optimal level, downward when stimulation is too high and upward when it is too low. A similar idea is expressed by McReynolds (1956) concerning the more restricted concept of "rate of perceptualization." Monotonous conditions provide too low a rate, with boredom; excessive stimulation produces too high a rate, with disruptive excitement; the optimal rate yields the experience of pleasure. These ideas are now amply supported by recent experimental work on sensory deprivation (Lilly, 1956; Hebb, 1958).

In recent papers Young (1949, 1955) has argued for an hedonic theory of motivation, one in which affective processes "constitute a form of primary motivation." According to Young's theory, "an organism behaves so as to maximize positive affective arousal (delight, enjoyment) and to minimize negative arousal (distress)." McClelland (1953) has offered a version of hedonic theory which is of particular value in understanding the significance of novelty. Affective arousal occurs when a stimulus pattern produces a discrepancy from the existing adaptation level. Small discrepancies produce pleasant affect and a tendency to approach; large ones produce unpleasantness and a tendency toward avoidance. The child at play, like the young chimpanzee and the exploring rat, needs frequent novelty in the stimulus field in order to keep up his interest—in order to maintain pleasant discrepancies from whatever adaptation level he has reached. Hebb's (1949) theory of the neurological correlates of learning also deals with novelty, though in a somewhat different way. He equates sustained interest with a state of neural affairs in which "phase sequences" are relatively complex and are growing, in the sense of establishing new internal relations. Such a state follows most readily from a stimulus field characterized by difference-in-sameness; that is, containing much that is familiar along with certain features that are novel. If the field is entirely familiar, phase sequences run off quickly, are short-circuited, and thus fail to produce sustained interest. Hebb's theory, which has the engaging quality of being able to explain why we enjoy reading a detective story once but not right over again, expresses in a neurological hypothesis the familiar fact that well-learned, habituated processes do not in themselves greatly interest us. Interest seems to require elements of unfamiliarity: of something still to be found out and of learning still to be done.

It seems to me that these contributions, though differing as to details, speak with unanimity on their central theme and would force us, if nothing else did, to reconsider seriously the whole problem of motivation. Boredom, the unpleasantness of monotony, the attraction of novelty, the tendency

to vary behavior rather than repeating it rigidly, and the seeking of stimulation and mild excitement stand as inescapable facts of human experience and clearly have their parallels in animal behavior. We may seek rest and minimal stimulation at the end of the day, but that is not what we are looking for the next morning. Even when its primary needs are satisfied and its homeostatic chores are done, and organism is alive, active, and up to something.

Dealing with the Environment

If we consider things only from the viewpoint of affect, excitement, and novelty, we are apt to overlook another important aspect of behavior, its effect upon the environment. Moving in this direction, Diamond (1939) invites us to consider the motivational properties of the sensorineural system, the apparatus whereby higher animals "maintain their relations to the environment." He conceives of this system as demanding stimulation and as acting in such a manner as to "force the environment to stimulate it." Even if one thinks only of the infant's exploring eyes and hands, it is clear that the main direction of behavior is by no means always that of reducing the impact of stimulation. When the eyes follow a moving object, or when the hand grasps an object which it has touched, the result is to preserve the stimulus and to increase its effect. In more elaborate explorations the consequence of a series of actions may be to vary the manner in which a stimulus acts upon the sense organs. It is apparent that the exploring, manipulating child produces by his actions precisely what Hebb's theory demands as a basis for continuing interest: he produces differences-in-sameness in the stimulus field.

In a critical analysis of Freud's views on the reality principle, Charlotte Bühler (1954) makes a strong case for positive interests in the environment, citing as evidence the responsiveness and adaptiveness of the newborn baby as well as the exploratory tendencies of later months. The problem is worked out in more detail by Schachtel (1954) in a paper on focal attention. Acts of focal attention are characteristically directed at particular objects, and they consist of several sustained approaches "aimed at active mental grasp" while excluding the rest of the field. These qualities can be observed even in the infant's early attempts to follow a moving object with his eyes, and they show more clearly in his later endeavors to learn how objects are related both to himself and to one another. Such behavior bespeaks "a relatively autonomous capacity for object interest." Schachtel makes the proposal that this interest is pursued precisely at those times when major needs are in abeyance. High pressure of need or anxiety is the enemy of exploratory play and is a condition, as every scientist should know, under which we are unlikely to achieve an objective grasp of the environment. Low need pressure is requisite if we are to perceive objects as they are, in their constant character, apart from hopes and fears we may at other times attach to them. Schachtel doubts that "the wish for need-satisfaction alone would ever lead to object perception and to object-oriented thought." Hence an autonomous capacity to be interested in the environment has great value for the survival of a species.

Being interested in the environment implies having some kind of satisfactory interaction with it. Several workers call attention to the possibility that satisfaction might lie in having an effect upon the environment, in dealing

with it, and changing it in various ways. Groos (1901), in his classical analysis of play, attached great importance to the child's "joy in being a cause," as shown in making a clatter, "hustling things about," and playing in puddles where large and dramatic effects can be produced. "We demand a knowledge of effects," he wrote, "and to be ourselves the producers of effects." Piaget (1952) remarks upon the child's special interest in objects that are affected by his own movements. This aspect of behavior occupies a central place in the work of Skinner (1953), who describes it as "operant" and who thus "emphasizes the fact that the behavior *operates* upon the environment to generate consequences." These consequences are fed back through the sense organs and may serve to reinforce behavior even when no organic needs are involved. A rat will show an increased tendency to press a bar when this act produces a click or a buzz. A baby will continue to investigate when his efforts produce rattling or tinkling sounds or sparkling reflections from a shiny object. The young chimpanzees in Welker's experiment spent the longest time over objects which could be lighted or made to emit sounds. Skinner finds it "difficult, if not impossible, to trace these reinforcing effects to a history of conditioning." "We may plausibly argue," he continues, "that a capacity to be reinforced by any feedback from the environment would be biologically advantageous, since it would prepare the organism to manipulate the environment successfully before a given state of deprivation developed."

Woodworth's Behavior-Primacy Theory

The most far-reaching attempt to give these aspects of behavior a systematic place in the theory of motivation is contained in Woodworth's recent book, *Dynamics of Behavior* (1958). Woodworth takes his start from the idea that a great deal of human behavior appears to be directed toward producing effects upon the environment without immediate service to any aroused organic need. "Its incentives and rewards are in the field of behavior and not in the field of homeostasis." This is illustrated by exploratory behavior, which is directed outward toward the environment.

> Its long-range value as the means of making the child acquainted with the world he has to deal with later, and so equipping him through play for the serious business of life, can scarcely lie within the little child's horizon. His goals are more limited and direct: to see this or that object more closely, to find what is behind an obstacle, to hear the noise an object makes when it strikes the floor, to be told the name of a thing or person (Woodworth, 1958, p. 78).

More complex play, such as building with blocks, illustrates the same outgoing tendency and reveals more plainly the element of finding out what one can and cannot do with objects. Even social play falls into the pattern. Playmates do not chiefly supply affection or satisfy organic needs; rather, they "afford the opportunity to do something interesting in the environment."

Woodworth draws a contrast between *need-primacy* theories of motivation and the *behavior-primacy* theory. The latter holds that "all behavior is directed primarily toward dealing with the environment." It is to be noted that "dealing with the environment" means a good deal more than receiving stimuli and making responses. Stimuli must be taken as indicators of objects in space, and responses must be adapted to produce effects upon these objects. Even the so-called "mental" capacities, such as memory and ideational think-

ing, become in time high-level methods of dealing with the environment. Woodworth leaves no doubt as to what he considers basic in motivation. "We are making the claim that this direction of receptive and motor activity toward the environment is the fundamental tendency of animal and human behavior and that it is the all-pervasive primary motivation of behavior." Organic drives have to break into this constantly flowing stream of activity and turn it in a special direction. But the goals of drives cannot be achieved without effective action upon one's surroundings. The ever-present, ever-primary feature of motivation is the tendency to deal with the environment.

It may appear to some workers that Woodworth has overshot the mark by making primary what has commonly been regarded as secondary, and by reducing the familiar drives to what sounds a little like a subordinate station. Woodworth's theory, however, like Goldstein's concept of self-actualization, probably should be construed not as an attempt to down-grade the drives but rather as an insistence that they be kept in the context of a whole living organism which during its waking hours is more or less constantly active. Woodworth's emphasis on dealing with the environment makes his theory a point of culmination for many of those driftings away from drive orthodoxy which we have found to be persistent in so many different areas of psychology. It will soon appear that the concept of competence, to which I now turn, represents in many respects a similar way of thinking. It emphasizes dealing with the environment, and it belongs in the trend away from drive *orthodoxy,* but it is not intended to supplant, or even to subsume, such dynamic forces as hunger, sex, aggression, and fear, which everyone knows to be of huge importance in animal and human nature.

COMPETENCE AND THE PLAY OF CONTENTED CHILDREN

A backward glance at our survey shows considerable agreement about the kinds of behavior that are left out or handled poorly by theories of motivation based wholly on organic drives. Repeatedly we find reference to the familiar series of learned skills which starts with sucking, grasping, and visual exploration and continues with crawling and walking, acts of focal attention and perception, memory, language and thinking, anticipation, the exploring of novel places and objects, effecting stimulus changes in the environment, manipulating and exploiting the surroundings, and achieving higher levels of motor and mental coordination. These aspects of behavior have long been the province of child psychology, which has attempted to measure the slow course of their development and has shown how heavily their growth depends upon learning. Collectively they are sometimes referred to as adaptive mechanisms or as ego processes, but on the whole we are not accustomed to cast a single name over the diverse feats whereby we learn to deal with the environment.

I now propose that we gather the various kinds of behavior just mentioned, all of which have to do with effective interaction with the environment, under the general heading of competence. According to Webster, competence means fitness or ability, and the suggested synonyms include capability, capacity, efficiency, proficiency, and skill. It is therefore a suitable word to describe such things as grasping and exploring, crawling and walking, attention and perception, language and thinking, manipulating and changing the surroundings, all of which

promote an effective—a competent—interaction with the environment. It is true, of course, that maturation plays a part in all these developments, but this part is heavily overshadowed by learning in all the more complex accomplishments like speech or skilled manipulation. I shall argue that it is necessary to make competence a motivational concept; there is a *competence motivation* as well as competence in its more familiar sense of achieved capacity. The behavior that leads to the building up of effective grasping, handling, and letting go of objects, to take one example, is not random behavior produced by a general overflow of energy. It is directed, selective, and persistent, and it is continued not because it serves primary drives, which indeed it cannot serve until it is almost perfected, but because it satisfies an intrinsic need to deal with the environment.

No doubt it will at first seem arbitrary to propose a single motivational conception in connection with so many and such diverse kinds of behavior. What do we gain by attributing motivational unity to such a large array of activities? We could, of course, say that each developmental sequence, such as learning to grasp or to walk, has its own built-in bit of motivation—its "aliment," as Piaget (1952) has expressed it. We could go further and say that each item of behavior has its intrinsic motive —but this makes the concept of motivation redundant. On the other hand, we might follow the lead of the animal psychologists and postulate a limited number of broader motives under such names as curiosity, manipulation, and mastery. I believe that the idea of a competence motivation is more adequate than any of these alternatives and that it points to very vital common properties which have been lost from view amidst the strongly analytical tendencies that go with detailed research.

In order to make this claim more plausible, I shall now introduce some specimens of playful exploration in early childhood. I hope that these images will serve to fix and dramatize the concept of competence in the same way that other images—the hungry animal solving problems, the child putting his finger in the candle flame, the infant at the breast, the child on the toilet, and the youthful Oedipus caught in a hopeless love triangle—have become memorable focal points for other concepts. For this purpose I turn to Piaget's (1952) studies of the growth of intelligence from its earliest manifestations in his own three children. The examples come from the first year of life, before language and verbal concepts begin to be important. They therefore represent a practical kind of intelligence which may be quite similar to what is developed by the higher animals.

As early as the fourth month, the play of the gifted Piaget children began to be "centered on a result produced in the external environment," and their behavior could be described as rediscovering the movement which by chance exercised an advantageous action upon things" (1952, p. 151). Laurent, lying in his bassinet, learns to shake a suspended rattle by pulling a string that hangs from it. He discovers this result fortuitously before vision and prehension are fully coordinated. Let us now observe him a little later when he has reached the age of three months and ten days.

> I place the string, which is attached to the rattle, in his right hand, merely unrolling it a little so that he may grasp it better. For a moment nothing happens. But at the first shake due to chance movement of his hand, the reaction is immediate: Laurent starts when looking at the rattle and then violently strikes his right hand alone, as if

he felt the resistance and the effect. The operation lasts fully a quarter of an hour, during which Laurent emits peals of laughter (Piaget, 1952, p. 162).

Three days later the following behavior is observed.

Laurent, by chance, strikes the chain while sucking his fingers. He grasps it and slowly displaces it while looking at the rattles. He then begins to swing it very gently, which produces a slight movement of the hanging rattles and an as yet faint sound inside them. Laurent then definitely increases by degrees his own movements. He shakes the chain more and more vigorously and laughs uproariously at the result obtained. (Piaget, 1952, p. 185).

Very soon it can be observed that procedures are used "to make interesting spectacles last." For instance, Laurent is shown a rubber monkey which he has not seen before. After a moment of surprise, and perhaps even fright, he calms down and makes movements of pulling the string, a procedure which has no effect in this case, but which previously has caused interesting things to happen. It is to be noticed that "interesting spectacles" consist of such things as new toys, a tin box upon which a drumming noise can be made, an unfolded newspaper, or sounds made by the observer such as snapping the fingers. Commonplace as they are to the adult mind, these spectacles enter the infant's experience as novel and apparently challenging events.

Moving ahead to the second half of the first year, we can observe behavior in which the child explores the properties of objects and tries out his repertory of actions upon them. This soon leads to active experimentation in which the child attempts to provoke new results. Again we look in upon Laurent, who has now reached the age of nine months. On different occasions he is shown a variety of new objects—for instance a notebook, a beaded purse, and a wooden parrot. His carefully observing father detects four stages of response: (*a*) visual exploration, passing the object from hand to hand, folding the purse, *etc.*; (*b*) tactile exploration, passing the hand all over the object, scratching, *etc.*; (*c*) slow moving of the object in space; (*d*) use of the repertory of action: shaking the object, striking it, swinging it, rubbing it against the side of the bassinet, sucking it, *etc.*, "each in turn with a sort of prudence as though studying the effect produced" (1952, p. 255).

Here the child can be described as applying familiar tactics to new situations, but in a short while he will advance to clear patterns of active experimentation. At 10 months and 10 days Laurent, who is unfamiliar with bread as a nutritive substance, is given a piece for examination. He manipulates it, drops it many times, breaks off fragments and lets them fall. He has often done this kind of thing before, but previously his attention has seemed to be centered on the act of letting go. Now "he watches with great interest the body in motion; in particular, he looks at it for a long time when it has fallen, and picks it up when he can." On the following day he resumes his research.

He grasps in succession a celluloid swan, a box, and several other small objects, in each case stretching out his arm and letting them fall. Sometimes he stretches out his arm vertically, sometimes he holds it obliquely in front of or behind his eyes. When the object falls in a new position (for example on his pillow) he lets it fall two or three times more on the same place, as though to study the spatial relation; then *he modifies the situation.* At a certain moment the swan falls near his mouth; now he does not suck it (even though this object habitually serves this purpose), but drops it three times more while merely making the gesture of opening his mouth (Piaget, 1952, p. 269).

These specimens will furnish us with sufficient images of the infant's use of his spare time. Laurent, of course, was provided by his studious father with a decidedly enriched environment, but no observant parent will question the fact that babies often act this way during those periods of their waking life when hunger, erotic needs, distresses, and anxiety seem to be exerting no particular pressure. If we consider this behavior under the historic headings of psychology we shall see that few processes are missing. The child gives evidence of sensing, perceiving, attending, learning, recognizing, probably recalling, and perhaps thinking in a rudimentary way. Strong emotion is lacking, but the infant's smiles, gurgles, and occasional peals of laughter strongly suggest the presence of pleasant affect. Actions appear in an organized form, particularly in the specimens of active exploration and experimentation. Apparently the child is using with a certain coherence nearly the whole repertory of psychological processes except those that accompany stress. It would be arbitrary indeed to say that one was more important than another.

These specimens have a meaningful unity when seen as transactions between the child and his environment, the child having some influence upon the environment and the environment some influence upon the child. Laurent appears to be concerned about what he can do with the chain and rattles, what he can accomplish by his own effort to reproduce and to vary the entertaining sounds. If his father observed correctly, we must add that Laurent seems to have varied his actions systematically, as if testing the effect of different degrees of effort upon the bit of environment represented by the chain and rattles. Kittens make a similar study of parameters when delicately using their paws to push pencils and other objects ever nearer to the edge of one's desk. In all such examples it is clear that the child or animal is by no means at the mercy of transient stimulus fields. He selects for continuous treatment those aspects of his environment which he finds it possible to affect in some way. His behavior is selective, directed, persistent—in short, motivated.

Motivated toward what goal? In these terms, too, the behavior exhibits a little of everything. Laurent can be seen as appeasing a stimulus hunger, providing his sensorium with an agreeable level of stimulation by eliciting from the environment a series of interesting sounds, feels, and sights. On the other hand we might emphasize a need for activity and see him as trying to reach a pleasurable level of neuromuscular exercise. We can also see another possible goal in the behavior: the child is achieving knowledge, attaining a more differentiated cognitive map of his environment and thus satisfying an exploratory tendency or motive of curiosity. But it is equally possible to discern a theme of mastery, power, or control, perhaps even a bit of primitive self-assertion, in the child's concentration upon those aspects of the environment which respond in some way to his own activity. It looks as if we had found too many goals, and perhaps our first impulse is to search for some key to tell us which one is really important. But this, I think, is a mistake that would be fatal to understanding.

We cannot assign priority to any of these goals without pausing arbitrarily in the cycle of transaction between child and environment and saying, "This is the real point." I propose instead that the real point is the trans-

actions as a whole. If the behavior gives satisfaction, this satisfaction is not associated with a particular moment in the cycle. It does not lie solely in sensory stimulation, in a bettering of the cognitive map, in coordinated action, in motor exercise, in a feeling of effort and of effects produced, or in the appreciation of change brought about in the sensory field. These are all simply aspects of a process which at this stage has to be conceived as a whole. The child appears to be occupied with the agreeable task of developing an effective familiarity with his environment. This involves discovering the effects he can have on the environment and the effects the environment will have on him. To the extent that these results are preserved by learning, they build up an increased competence in dealing with the environment. The child's play can thus be viewed as serious business, though to him it is merely something that is interesting and fun to do.

Bearing in mind these examples, as well as the dealings with environment pointed out by other workers, we must now attempt to describe more fully the possible nature of the motivational aspect of competence. It needs its own name, and in view of the foregoing analysis I propose that this name be *effectance.*

EFFECTANCE

The new freedom produced by two decades of research on animal drives is of great help in this undertaking. We are no longer obliged to look for a source of energy external to the nervous system, for a consummatory climax, or for a fixed connection between reinforcement and tension-reduction. Effectance motivation cannot, of course, be conceived as having a source in tissues external to the nervous system. It is in no sense a deficit motive. We must assume it to be neurogenic, its "energies" being simply those of the living cells that make up the nervous system. External stimuli play an important part, but in terms of "energy" this part is secondary, as one can see most clearly when environmental stimulation is actively sought. Putting it picturesquely, we might say that the effectance urge represents what the neuromuscular system wants to do when it is otherwise unoccupied or is gently stimulated by the environment. Obviously there are no consummatory acts; satisfaction would appear to lie in the arousal and maintaining of activity rather than in its slow decline toward bored passivity. The motive need not be conceived as intense and powerful in the sense that hunger, pain, or fear can be powerful when aroused to high pitch. There are plenty of instances in which children refuse to leave their absorbed play in order to eat or to visit the toilet. Strongly aroused drives, pain, and anxiety, however, can be conceived as overriding the effectance urge and capturing the energies of the neuromuscular system. But effectance motivation is persistent in the sense that it regularly occupies the spare waking time between episodes of homeostatic crisis.

In speculating upon this subject we must bear in mind the continuous nature of behavior. This is easier said than done; habitually we break things down in order to understand them, and such units as the reflex arc, the stimulus-response sequence, and the single transaction with the environment seem like inevitable steps toward clarity. Yet when we apply such an analysis to playful exploration we lose the most essential aspect of the behavior. It is constantly circling from stimulus to perception to action to ef-

fect to stimulus to perception, and so on around; or, more properly, these processes are all in continuous action and continuous change. Dealing with the environment means carrying on a continuing transaction which gradually changes one's relation to the environment. Because there is no consummatory climax, satisfaction has to be seen as lying in a considerable series of transactions, in a trend of behavior rather than a goal that is achieved. It is difficult to make the word "satisfaction" have this connotation, and we shall do well to replace it by "feeling of efficacy" when attempting to indicate the subjective and affective side of effectance.

It is useful to recall the findings about novelty: the singular effectiveness of novelty in engaging interest and for a time supporting persistent behavior. We also need to consider the selective continuance of transactions in which the animal or child has a more or less pronounced effect upon the environment—in which something happens as a consequence of his activity. Interest is not aroused and sustained when the stimulus field is so familiar that it gives rise at most to reflex acts or automatized habits. It is not sustained when actions produce no effects or changes in the stimulus field. Our conception must therefore be that effectance motivation is aroused by stimulus conditions which offer, as Hebb (1949) puts it, difference-in-sameness. This leads to variability and novelty of response, and interest is best sustained when the resulting action affects the stimulus so as to produce further difference-in-sameness. Interest wanes when action begins to have less effect; effectance motivation subsides when a situation has been explored to the point that it no longer presents new possibilities.

We have to conceive further that the arousal of playful and exploratory interest means the appearance of organization involving both the cognitive and active aspects of behavior. Change in the stimulus field is not an end in itself, so to speak; it happens when one is passively moved about, and it may happen as a consequence of random movements without becoming focalized and instigating exploration. Similarly, action which has effects is not an end in itself, for if one unintentionally kicks away a branch while walking, or knocks something off a table, these effects by no means necessarily become involved in playful investigation. Schachtel's (1954) emphasis on focal attention becomes helpful at this point. The playful and exploratory behavior shown by Laurent is not random or casual. It involves focal *attention* to some object—the fixing of some aspect of the stimulus field so that it stays relatively constant—and it also involves the focalizing of *action* upon this object. As Diamond (1939) has expressed it, response under these conditions is "relevant to the stimulus," and it is change in the *focalized* stimulus that so strongly affects the level of interest. Dealing with the environment means directing focal attention to some part of it and organizing actions to have some effect on this part.

In our present state of relative ignorance about the workings of the nervous system it is impossible to form a satisfactory idea of the neural basis of effectance motivation, but it should at least be clear that the concept does not refer to any and every kind of neural action. It refers to a particular kind of activity, as inferred from particular kinds of behavior. We can say that it does not include reflexes and other kinds of automatic response. It does not include well-learned, automa-

tized patterns, even those that are complex and highly organized. It does not include behavior in the service of effectively aroused drives. It does not even include activity that is highly random and discontinuous, though such behavior may be its most direct forerunner. The urge toward competence is inferred specifically from behavior that shows a lasting focalization and that has the characteristics of exploration and experimentation, a kind of variation within the focus. When this particular sort of activity is aroused in the nervous system, effectance motivation is being aroused, for it is characteristic of this particular sort of activity that it is selective, directed, and persistent, and that instrumental acts will be learned for the sole reward of engaging in it.

Some objection may be felt to my introducing the word *competence* in connection with behavior that is so often playful. Certainly the playing child is doing things for fun, not because of a desire to improve his competence in dealing with the stern hard world. In order to forestall misunderstanding, it should be pointed out that the usage here is parallel to what we do when we connect sex with its biological goal of reproduction. The sex drive aims for pleasure and gratification, and reproduction is a consequence that is presumably unforeseen by animals and by man at primitive levels of understanding. Effectance motivation similarly aims for the feeling of efficacy, not for the vitally important learnings that come as its consequence. If we consider the part played by competence motivation in adult human life we can observe the same parallel. Sex may now be completely and purposefully divorced from reproduction but nevertheless pursued for the pleasure it can yield. Similarly, effectance motivation may lead to continuing exploratory interests or active adventures when in fact there is no longer any gain in actual competence or any need for it in terms of survival. In both cases the motive is capable of yielding surplus satisfaction well beyond what is necessary to get the biological work done.

In infants and young children it seems to me sensible to conceive of effectance motivation as undifferentiated. Later in life it becomes profitable to distinguish various motives such as cognizance, construction, mastery, and achievement. It is my view that all such motives have a root in effectance motivation. They are differentiated from it through life experiences which emphasize one or another aspect of the cycle of transaction with environment. Of course, the motives of later childhood and of adult life are no longer simple and can almost never be referred to a single root. They can acquire loadings of anxiety, defense, and compensation, they can become fused with unconscious fantasies of a sexual, aggressive, or omnipotent character, and they can gain force because of their service in producing realistic results in the way of income and career. It is not my intention to cast effectance in the star part in adult motivation. The acquisition of motives is a complicated affair in which simple and sovereign theories grow daily more obsolete. Yet it may be that the satisfaction of effectance contributes significantly to those feelings of interest which often sustain us so well in day-to-day actions, particularly when the things we are doing have continuing elements of novelty.

THE BIOLOGICAL SIGNIFICANCE OF COMPETENCE

The conviction was expressed at the beginning of this paper that some such

concept as competence, interpreted motivationally, was essential for any biologically sound view of human nature. This necessity emerges when we consider the nature of living systems, particularly when we take a longitudinal view. What an organism does at a given moment does not always give the right clue as to what it does over a period of time. Discussing this problem, Angyal (1941) has proposed that we should look for the general pattern followed by the total organismic process over the course of time. Obviously this makes it necessary to take account of growth. Angyal defines life as "a process of self-expansion"; the living system "expands at the expense of its surroundings," assimilating parts of the environment and transforming them into functioning parts of itself. Organisms differ from other things in nature in that they are "self-governing entities" which are to some extent "autonomous." Internal processes govern them as well as external "heteronomous" forces. In the course of life there is a relative increase in the preponderance of internal over external forces. The living system expands, assimilates more of the environment, transforms its surroundings so as to bring them under greater control. "We may say," Angyal writes, "that the general dynamic trend of the organism is toward an increase of autonomy.... The human being has a characteristic tendency toward self-determination, that is, a tendency to resist external influences and to subordinate the heteronomous forces of the physical and social environment to its own sphere of influence." The trend toward increased autonomy is characteristic so long as growth of any kind is going on, though in the end the living system is bound to succumb to the pressure of heteronomous forces.

Of all living creatures, it is man who takes the longest strides toward autonomy. This is not because of any unusual tendency toward bodily expansion at the expense of the environment. It is rather that man, with his mobile hands and abundantly developed brain, attains an extremely high level of competence in his transactions with his surroundings. The building of houses, roads and bridges, the making of tools and instruments, the domestication of plants and animals, all qualify as planful changes made in the environment so that it comes more or less under control and serves our purposes rather than intruding upon them. We meet the fluctuations of outdoor temperature, for example, not only with our bodily homeostatic mechanisms, which alone would be painfully unequal to the task, but also with clothing, buildings, controlled fires, and such complicated devices as self-regulating central heating and air conditioning. Man as a species has developed a tremendous power of bringing the environment into his service, and each individual member of the species must attain what is really quite an impressive level of competence if he is to take part in the life around him.

We are so accustomed to these human accomplishments that it is hard to realize how long an apprenticeship they require. At the outset the human infant is a slow learner in comparison with other animal forms. Hebb (1949) speaks of "the astonishing inefficiency of man's first learning, as far as immediate results are concerned," an inefficiency which he attributes to the large size of the association areas in the brain and the long time needed to

bring them under sensory control. The human lack of precocity in learning shows itself even in comparison with one of the next of kin: as Hebb points out, "the human baby takes six months, the chimpanzee four months, before making a clear distinction between friend and enemy." Later in life the slow start will pay dividends. Once the fundamental perceptual elements, simple associations, and conceptual sequences have been established, later learning can proceed with ever increasing swiftness and complexity. In Hebb's words, "learning at maturity concerns patterns and events whose parts at least are familiar and which already have a number of other associations."

This general principle of cumulative learning, starting from slowly acquired rudiments and proceeding thence with increasing efficiency, can be illustrated by such processes as manipulation and locomotion, which may culminate in the acrobat devising new stunts or the dancer working out a new ballet. It is especially vivid in the case of language, where the early mastery of words and pronunciation seems such a far cry from spontaneous adult speech. A strong argument has been made by Hebb (1949) that the learning of visual forms proceeds over a similar course from slowly learned elements to rapidly combined patterns. Circles and squares, for example, cannot be discriminated at a glance without a slow apprenticeship involving eye movements, successive fixations, and recognition of angles. Hebb proposes that the recognition of visual patterns without eye movement "is possible only as the result of an intensive and prolonged visual training that goes on from the moment of birth, during every moment that the eyes are open, with an increase in skill evident over a perod of 12 to 16 years at least."

On the motor side there is likewise a lot to be cumulatively learned. The playing, investigating child slowly finds out the relationships between what he does and what he experiences. He finds out, for instance, how hard he must push what in order to produce what effect. Here the S-R formula is particularly misleading. It would come nearer the truth to say that the child is busy learning R-S connections —the effects that are likely to follow upon his own behavior. But even in this reversed form the notion of bonds or connections would still misrepresent the situation, for it is only a rare specimen of behavior that can properly be conceived as determined by fixed neural channels and a fixed motor response. As Hebb has pointed out, discussing the phenomenon of "motor equivalence" named by Lashley (1942), a rat which has been trained to press a lever will press it with the left forepaw, the right forepaw, by climbing upon it, or by biting it; a monkey will open the lid of a food box with either hand, with a foot, or even with a stick; and we might add that a good baseball player can catch a fly ball while running in almost any direction and while in almost any posture, including leaping in the air and plunging forward to the ground. All of these feats are possible because of a history of learnings in which the main lesson has been the effects of actions upon the stimulus fields that represent the environment. What has been learned is not a fixed connection but a flexible relationship between stimulus fields and the effects that can be produced in them by various kinds of action.

One additional example, drawn this

time from Piaget (1952), is particularly worth mentioning because of its importance in theories of development. Piaget points out that a great deal of mental development depends upon the idea that the world is made up of objects having substance and permanence. Without such an "object concept" it would be impossible to build up the ideas of space and causality and to arrive at the fundamental distinction between self and external world. Observation shows that the object concept, "far from being innate or ready-made in experience, is constructed little by little." Up to 7 and 8 months the Piaget children searched for vanished objects only in the sense of trying to continue the actions, such as sucking or grasping, in which the objects had played a part. When an object was really out of sight or touch, even if only because it was covered by a cloth, the infants undertook no further exploration. Only gradually, after some study of the displacement of objects by moving, swinging, and dropping them, does the child begin to make an active search for a vanished object, and only still more gradually does he learn, at 12 months or more, to make allowance for the object's sequential displacements and thus to seek it where it has gone rather than where it was last in sight. Thus it is only through cumulative learning that the child arrives at the idea of permanent substantial objects.

The infant's play is indeed serious business. If he did not while away his time pulling strings, shaking rattles, examining wooden parrots, dropping pieces of bread and celluloid swans, when would he learn to discriminate visual patterns, to catch and throw, and to build up his concept of the object? When would he acquire the many other foundation stones necessary for cumulative learning? The more closely we analyze the behavior of the human infant, the more clearly do we realize that infancy is not simply a time when the nervous system matures and the muscles grow stronger. It is a time of active and continuous learning, during which the basis is laid for all those processes, cognitive and motor, whereby the child becomes able to establish effective transactions with his environment and move toward a greater degree of autonomy. Helpless as he may seem until he begins to toddle, he has by that time already made substantial gains in the achievement of competence.

Under primitive conditions survival must depend quite heavily upon achieved competence. We should expect to find things so arranged as to favor and maximize this achievement. Particularly in the case of man, where so little is provided innately and so much has to be learned through experience, we should expect to find highly advantageous arrangements for securing a steady cumulative learning about the properties of the environment and the extent of possible transactions. Under these circumstances we might expect to find a very powerful drive operating to insure progress toward competence, just as the vital goals of nutrition and reproduction are secured by powerful drives, and it might therefore seem paradoxical that the interests of competence should be so much entrusted to times of play and leisurely exploration. There is good reason to suppose, however, that a strong drive would be precisely the wrong arrangement to secure a flexible, knowledgeable power of transaction with the environment. Strong drives cause us to learn certain lessons well, but they

do not create maximum familiarity with our surroundings.

This point was demonstrated half a century ago in some experiments by Yerkes and Dodson (1908). They showed that maximum motivation did not lead to the most rapid solving of problems, especially if the problems were complex. For each problem there was an optimum level of motivation, neither the highest nor the lowest, and the optimum was lower for more complex tasks. The same problem has been discussed more recently by Tolman (1948) in his paper on cognitive maps. A cognitive map can be narrow or broad, depending upon the range of cues picked up in the course of learning. Tolman suggests that one of the conditions which tend to narrow the range of cues is a high level of motivation. In everyday terms, a man hurrying to an important business conference is likely to perceive only the cues that help him to get there faster, whereas a man taking a stroll after lunch is likely to pick up a substantial amount of casual information about his environment. The latent learning experiments with animals, and experiments such as those of Johnson (1953) in which drive level has been systematically varied in a situation permitting incidental learning, give strong support to this general idea. In a recent contribution, Bruner, Matter, and Papanek (1955) make a strong case for the concept of breadth of learning and provide additional evidence that it is favored by moderate and hampered by strong motivation. The latter "has the effect of speeding up learning at the cost of narrowing it." Attention is concentrated upon the task at hand and little that is extraneous to this task is learned for future use.

These facts enable us to see the biological appropriateness of an arrangement which uses periods of less intense motivation for the development of competence. This is not to say that the narrower but efficient learnings that go with the reduction of strong drives make no contribution to general effectiveness. They are certainly an important element in capacity to deal with the environment, but a much greater effectiveness results from having this capacity fed also from learnings that take place in quieter times. It is then that the infant can attend to matters of lesser urgency, exploring the properties of things he does not fear and does not need to eat, learning to gauge the force of his string-pulling when the only penalty for failure is silence on the part of the attached rattles, and generally accumulating for himself a broad knowledge and a broad skill in dealing with his surroundings.

The concept of competence can be most easily discussed by choosing, as we have done, examples of interaction with the inanimate environment. It applies equally well, however, to transactions with animals and with other human beings, where the child has the same problem of finding out what effects he can have upon the environment and what effects it can have upon him. The earliest interactions with members of the family may involve needs so strong that they obscure the part played by effectance motivation, but perhaps the example of the well fed baby diligently exploring the several features of his mother's face will serve as a reminder that here, too, there are less urgent moments when learning for its own sake can be given free rein.

In this closing section I have brought together several ideas which bear on the evolutionary significance

of competence and of its motivation. I have sought in this way to deepen the biological roots of the concept and thus help it to attain the stature in the theory of behavior which has not been reached by similar concepts in the past. To me it seems that the most important proving ground for this concept is the effect it may have on our understanding of the development of personality. Does it assist our grasp of early object relations, the reality principle, and the first steps in the development of the ego? Can it be of service in distinguishing the kinds of defense available at different ages and in providing clues to the replacement of primitive defenses by successful adaptive maneuvers? Can it help fill the yawning gap known as the latency period, a time when the mastery of school subjects and other accomplishments claim so large a share of time and energy? Does it bear upon the self and the vicissitudes of self-esteem, and can it enlighten the origins of psychological disorder? Can it make adult motives and interests more intelligible and enable us to rescue the concept of sublimation from the difficulties which even its best friends have recognized? I believe it can be shown that existing explanations of development are not satisfactory and that the addition of the concept of competence cuts certain knots in personality theory. But this is not the subject of the present communication, where the concept is offered much more on the strength of its logical and biological probability.

SUMMARY

The main theme of this paper is introduced by showing that there is widespread discontent with theories of motivation built upon primary drives. Signs of this discontent are found in realms as far apart as animal psychology and psychoanalytic ego psychology. In the former, the commonly recognized primary drives have proved to be inadequate in explaining exploratory behavior, manipulation, and general activity. In the latter, the theory of basic instincts has shown serious shortcomings when it is stretched to account for the development of the effective ego. Workers with animals have attempted to meet their problem by invoking secondary reinforcement and anxiety reduction, or by adding exploration and manipulation to the roster of primary drives. In parallel fashion, psychoanalytic workers have relied upon the concept of neutralization of instinctual energies, have seen anxiety reduction as the central motive in ego development, or have hypothesized new instincts such as mastery. It is argued here that these several explanations are not satisfactory and that a better conceptualization is possible, indeed that it has already been all but made.

In trying to form this conceptualization, it is first pointed out that many of the earlier tenets of primary drive theory have been discredited by recent experimental work. There is no longer any compelling reason to identify either pleasure or reinforcement with drive reduction, or to think of motivation as requiring a source of energy external to the nervous system. This opens the way for considering in their own right those aspects of animal and human behavior in which stimulation and contact with the environment seem to be sought and welcomed, in which raised tension and even mild excitement seem to be cherished, and in which novelty and variety seem to be enjoyed for their own sake. Several reports are cited which bear upon in-

terest in the environment and the rewarding effects of environmental feedback. The latest contribution is that of Woodworth (1958), who makes dealing with the environment the most fundamental element in motivation.

The survey indicates a certain unanimity as to the kinds of behavior that cannot be successfully conceptualized in terms of primary drives. This behavior includes visual exploration, grasping, crawling and walking, attention and perception, language and thinking, exploring novel objects and places, manipulating the surroundings, and producing effective changes in the environment. The thesis is then proposed that all of these behaviors have a common biological significance: they all form part of the process whereby the animal or child learns to interact effectively with his environment. The word *competence* is chosen as suitable to indicate this common property. Further, it is maintained that competence cannot be fully acquired simply through behavior instigated by drives. It receives substantial contributions from activities which, though playful and exploratory in character, at the same time show direction, selectivity, and persistence in interacting with the environment. Such activities in the ultimate service of competence must therefore be conceived to be motivated in their own right. It is proposed to designate this motivation by the term effectance, and to characterize the experience produced as a *feeling of efficacy*.

In spite of its sober biological purpose, effectance motivation shows itself most unambiguously in the playful and investigatory behavior of young animals and children. Specimens of such behavior, drawn from Piaget (1952), are analyzed in order to demonstrate their constantly transactional nature. Typically they involve continuous chains of events which include stimulation, cognition, action, effect on the environment, new stimulation, *etc.* They are carried on with considerable persistence and with selective emphasis on parts of the environment which provide changing and interesting feedback in connection with effort expended. Their significance is destroyed if we try to break into the circle arbitrarily and declare that one part of it, such as cognition alone or active effort alone, is the real point, the goal, or the special seat of satisfaction. Effectance motivation must be conceived to involve satisfaction—a feeling of efficacy —in transactions in which behavior has an exploratory, varying, experimental character and produces changes in the stimulus field. Having this character, the behavior leads the organism to find out how the environment can be changed and what consequences flow from these changes.

In higher animals and especially in man, where so little is innately provided and so much has to be learned about dealing with the environment, effectance motivation independent of primary drives can be seen as an arrangement having high adaptive value. Considering the slow rate of learning in infancy and the vast amount that has to be learned before there can be an effective level of interaction with surroundings, young animals and children would simply not learn enough unless they worked pretty steadily at the task between episodes of homeostatic crisis. The association of interest with this "work," making it play and fun, is thus somewhat comparable to the association of sexual pleasure with the biological goal of reproduction. Effectance motivation need not be

conceived as strong in the sense that sex, hunger, and fear are strong when violently aroused. It is moderate but persistent, and in this, too, we can discern a feature that is favorable for adaptation. Strong motivation reinforces learning in a narrow sphere, whereas moderate motivation is more conducive to an exploratory and experimental attitude which leads to competent interactions in general, without reference to an immediate pressing need. Man's huge cortical association areas might have been a suicidal piece of specialization if they had come without a steady, persistent inclination toward interacting with the environment.

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