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Stress, the bugaboo of modern life, comes from many different sources and affects us all in one way or another. Viewing human functioning as a problem-solving phenomenon, stress is here explained in terms of tension that results from the organism's inability to master presenting problems and its consequent need to devote excess energy and resources to maintenance activities. This encompassing theoretical scheme proposes to reduce the conceptual barriers between various biochemical, physical, psychological, and sociocultural models of stress.

A PROPOSED FRAMEWORK FOR THE ANALYSIS OF STRESS IN THE HUMAN ORGANISM

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THE study of stress in the human organism has recently become a focus of interest to students of the behavioral and biological sciences, and in a relatively short period of time, a vast literature has been amassed on the impact and consequence of such stress. Basically, these studies can be subsumed under two broad headings. First, there are numerous studies concerned with the effect of stress upon biological functioning, and second, there are studies of the human organism's ability to adapt to and cope with various types of "stressors." We do not intend to summarize the entire literature that has developed in these two areas, nor even to designate the significant work in each area. Before formulating our own approach, however, we will attempt to summarize briefly the directions which studies of stress have taken, and consider some commonly used definitions of stress.

Studies concerning the effect of stress on biological functioning fall into three broad areas. The first focuses upon the effect of stress on various physiological processes. Such studies have demonstrated that subjects experiencing stress often display changes in gastric function (Margolin et al., 1950), mucous membranes (Wolff et al., 1948), excretion of hippuric acid (Persky, Grinker, Mirsky, & Gamm, 1950), biochemical composition of the blood (Diethelm, Fleetwood, & Milhorat, 1950), cardiac functioning (Stevenson & Duncan, 1950; Wolf et al., 1948), and a host of related phenomena. See, for example, Barker and Barker (1950); Malmo, Shagass, and Davis (1950); Stevenson (1950); Straub, Ripley, and Wolf (1950); and Duncan, Stevenson, and Wolff (1951).

A second area of study has shown stress to be related to the genesis, onset, course, and outcome of a wide variety of human ailments, including such diseases as cardiovascular disorders (Wolff, 1950a; Reiser et al., 1950), ulcerative colitis (Lindemann, 1950; Grace, 1950), dermatitis (Kepecs & Robin, 1950), Graves' disease (Lidz & Whitehorn, 1950; Ham, Alexander, & Carmichael, 1950), glaucoma (Ripley, 1950), dyspnea (Willard, Swan, & Wolf, 1950), osteoarthritis (Lihn, Menninger, & Mayman, 1950), rheumatoid arthritis (King, 1955; Hellman, 1950; Gottschalk, Serota, & Shapiro, 1950), and others. (For data on diabetes mellitus, see Hinkle, Edwards and Wolf [1951]; for studies of nasal disease, see Holmes, Treuting, and Wolff [1950]; for studies of vascular headaches, see Marcussen [1950]; for studies of bladder and bowel function during periods of stress, see Almy, Kern, and Abbot [1950]. The reader's

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attention is also directed to the following materials: Wolff [1947, 1950b, 1953]; Dubos [1951]; and Grace and Graham [1952]).

Finally, there are general studies concerning the effect of stress upon illness. These have focused primarily on the relationship between life experiences and amount of illness experienced by an individual during a given period of time. These include studies by Mechanic (1959), Hinkle (1954, 1957), Hinkle et al. (1958), Christenson and Hinkle (1961), Scott (mimeo), Simmons and Wolff (1954), Jackson (1962), Downes (1949), Reusch (1948), Mechanic and Volkart (1961), and Reusch, Jacobson, and Loeb (1948).

Whereas the studies mentioned above have focused on the relationship of stress and illness, other studies have been concerned with the ways in which the human organism attempts to cope with stressful situations, experiences, or events. A great deal of attention has been focused on the nature of defense, and the effort to maintain equilibrium in the face of difficult, and in some cases, almost intolerable circumstances. The "traumatic event," whether of a natural or experimental nature, is commonly the focus of study in these investigations. For example, there are studies of individual and group reactions to bombing raids (Janis, 1951), impending surgery (Janis, 1958), crucial student examinations (Mechanic, 1962), combat conditions (Grinker & Speigel, 1945; Basowitz, Persky, Korchin, & Grinker, 1955), and unsolvable situations (Funkenstein, King, & Drollette, 1957). These studies have done much to illuminate the dynamics of coping and adapting to stress, while still others have examined the effects of stress on various psychological processes, such as perception (Postman & Bruner, 1948), ability to perform (Mechanic, 1962), and so on (see, for example, Liebman, 1955).

But while a great deal of information has been amassed concerning man's reactions to stress, there appears to be some considerable disagreement as to the exact meaning of the stress concept. Medical and biological studies of stress (variously referred to as "life stress," "the emotions," "life situations") and bodily function ordinarily use the concept in reference to a state or condition of the organism. (This view of stress has emerged primarily from the works of three men: Cannon [1936], Wolff [1953], and Selye [1956].) It is assumed that the organism is in disequilibrium with one or more of its environments and that its activities while under stress are directed to establishing homeostasis. As Hinkle has noted, this usage of the term is derived from, and analogous to, the concept of stress as applied to mechanical systems. Thus, stress is conceived as "a state in which the load consists of the pathogenic agent, stressor, or life situation; the stress consists of the internal forces, conditions, or adaptive reactions set up within the organism in response to the load; and strain is the disease, the pathologic change or the disorders of adaptation produced by the stress" (Hinkle, mimeo, a).

A second usage of the term stress refers to natural or experimentally induced circumstances thrust upon the individual from one or more of his environments. Examples of such situations are physical trauma (Cannon, 1939), death (Volkart, 1957), various wartime conditions such as internment in prison camps (Cohen, 1953), and so on. (See Janis [1951, 1958]; Mechanic [1962]; Basowitz et al. [1955]; Grinker and Speigel [1945]; and Fox [1959].) Mechanic (1962, pp. 4–5), in summarizing this approach to the study of stress, notes that when used in this sense "the investigators intuitively select various aspects of the physical, social, and cultural environments that he assumes are likely to lead to experiences of discomfort for most people living within some designated group, the discomfort being reflected by some social and psychological responses." One drawback of such an approach to the study of stress, however, is that many everyday situations which generate tensions are overlooked, leaving the impression that stress is equivalent to trauma or catastrophy. The result is that studies of stressful situations that commonly occur in daily life have been comparatively rare.

Still another application of the stress concept refers to the response of the organism. Mechanic (1962, p. 5), in summarizing this viewpoint, notes that "the term . . . has been used to refer to emotional tensions

either reported or observed, from which it is inferred that the individual is exposed to some stressful situation." When used this way, the concept is consistent with the usual biomedical usage of the term.

Finally, and clearly related to the latter usage, stress is used to refer to "the discomforting responses of persons in particular situations" (Mechanic, 1962, p. 7). Here primary attention is focused upon a person's perception of the challenges confronting him. Stress occurs if the individual does not have available to him the tools and knowledge to either successfully deal with or avert challenges which arise in particular situations.

Each of these views has its own particular merits when taken in conjunction with the problems they were designed to deal with. However, it is becoming increasingly necessary to come to grips with the fact that models of stress designed to deal with physiological processes do not quite "fit" when applied to psychological or sociocultural phenomena. Conversely, the models developed by the behavioral scientists, emphasizing as they do the cognitive and perceptual processes, are inadequate for studies of stress implicating physiological processes. Thus we are faced with a challenge, the core of which lies in the fact that the study of stress transcends more completely than previous notions the "levels of analysis" signified by the terms biochemical, physiological, psychological, and sociocultural. The adequacy of future work in this area must be judged, in part at least, by the extent to which it reduces conceptual barriers between these "levels" to a minimum. As we have seen, present models of stress have successfully extended bridges between each of the aforementioned levels and the next level "up" and "down." As yet, however, there is no comprehensive set of concepts that can be extended to each level without undue distortion to the nature of the problem. Yet if we presume, as most medical and behavioral scientists do, that the human organism functions as an integrated system, such conceptualization must be possible, and is indeed necessary. This paper is an exploratory effort, aimed at reducing the conceptual barriers and distinctiveness of terminology found in studies of stress. We would like to make it clear that we—in no manner of speaking—regard the framework presented here as an ultimate exposition. Rather, it is regarded as an initial exploration, and we sincerely hope that others will participate in the work of reordering the conceptual wilderness that currently seems inadequate to meet the challenge presented by the need for a comprehensive model of human organism functioning. If this paper provokes others to develop a more satisfactory model, or if it stimulates some fruitful research that might not have otherwise been attempted, it will have served its purpose.

BASIC PREMISES AND UNDERLYING ASSUMPTIONS

Every theory of human behavior, or conceptual framework designed to explain it, involves some basic assumption about men and their actions. Either explicitly or implicitly, theorists have made certain assumptions about man's basic nature or about the forces that motivate him to behave. Thus, we find that man has been credited with basic instincts which serve as the "dynamos" of behavior (Freud, 1943), with a basic drive for superiority (Adler, 1927), or with a need for status (LaPiere, 1954), and with other attributes too numerous to mention herein. (For additional materials on this point, see Hall and Lindsey [1957, especially Chapters 1, 2, 3, 4, and 5]; and Monroe [1955].) Each of these views may hold some merit; the test of their value lies in their significance for explaining behavior. In the theoretical model outlined in this paper, human behavior is conceived as problem-solving phenomena. Before going any further, let us consider what is meant by the phrase "problem-solving."

The task of giving rigorous definitions to core conceptual terms is always a difficult one, but there are complications when these words are also used in everyday parlance, for with few exceptions such terms are fraught with value premises and vague connotations. Therefore, in order to reach a clear conceptual definition of the term "problem," it is necessary that we first consider the lay connotation of the term so that we can specify what is *not* meant by this

term when we use it. Laymen commonly speak of "the racial problem," "the housing problem," "the problem with a car," or "an arithmetic problem." Common to each of these usages is the implication of a cognitive awareness of a set of conditions that can be dealt with rationally. The more formal usages of the concept, too, emphasize this cognitive aspect. Thus, to logicians, a problem is the question involved in a syllogism, of which the conclusion is the solution or answer. In the syllogism, "All men are mortal; Socrates is a man; therefore Socrates is mortal," the first two statements constitute the problem and the final statement the solution. This usage of the term is highly specialized in that it is more rigorous than the laymen's conception, applying to a special circumstance within the structure of formal logic. In defining the term "problem" for use within our own general framework, we have found it necessary to be as specific as the logician, but unlike both the layman and logician, have found it expedient to extend the definition beyond cases involving cognitively perceived circumstances. In the context of this work *a problem is regarded as any condition which is posed to the organism for solution*. Such a condition may arise in the form of a threat to the organism's well-being, generated by stimuli from one or more of its environmental fields; or it may be posed by the organism to itself, in which case, the element of external threat may be absent. We shall now discuss some of the assumptions underlying the premise that man is a problem-solving animal.

Our first assumption is that the human organism is most comfortable when it has been able to reduce environmental and self-induced threats to a minimum. Described in somewhat different terms, a threat-free state may be said to constitute a condition of dynamic equilibrium.

A second assumption is that a disturbance from any part of its environment motivates the organism to respond; more specifically, when the human organism is subjected to threats from one or more of its environmental fields, it is motivated to reduce those threats. This will lead the organism to attempt either to reestablish the former condition of homeostatic balance or to establish a new condition of equilibrium. Examples of pressures to establish equilibrium with the environment after threats have been introduced are: (a) the biochemical response of the organism to invasion by parasitic agents; (b) the tendency to establish a condition of cognitive consonance when a state of cognitive dissonance is encountered (Festinger, 1957); and (c) the variety of defensive and aggressive responses characteristic of individuals whose integrity is under attack.

To summarize, an organism may be considered in equilibrium with a particular environmental field if that field is problem-free, i.e., it poses no threat to the well-being of the organism. Disequilibrium implies a problem situation, to which the organism can be expected to respond in such a manner so as to reduce threats.

But while it is assumed that organisms are motivated to reduce threats, we do not mean to imply that all human motivation can be subsumed under this heading. An allowance is made for the chronic habit most humans have of creating problems where none exist; hence our equilibrium model should not be equated with those based upon a simple tension reduction hypothesis. We would postulate that human beings receive gratification not only by reducing threats, but also from exercising their problem-solving ability. They can thus be expected to introduce disequilibrium into certain environmental areas provided the anticipation of resolution is present.

It should be made clear that no organism ever attains a state in which all its problems are solved. Rather, every person exists under conditions in which some problems are under control, others are being dealt with, and still others may be temporarily ignored. The overall intensity of problem demands, as well as demands in specific areas, constantly changes with short and long range alterations in an organism's environmental fields. Correspondingly, changes continually take place in the organism's focus of concern, but the organism never reaches the point when all of its problems are eliminated. Even during sleep demands are being made upon bodily resources. The implication of this is that

equilibrium, conceptually, is merely a postulated state toward which the organism may tend, but which is never fully attained.

A second factor which complicates the equilibrium model lies in the fact that relative equilibrium in any given environmental field can be appreciated only if we view it with respect to equilibrium in other environmental fields. It is not sufficient to note that a person enjoys some measure of equilibrium with respect to his sociocultural environment; we must also consider the effect (or price) of success in this area upon his efficiency in the physiological and psychological areas. Thus it is often the case that sociocultural equilibrium is maintained at the expense of physical or psychological disequilibrium. This point is well-documented by both Hinkle (mimeo, b) and Dubos (1959, pp. 41–44).

A core consideration in our framework is the assumption that disequilibrium motivates the organism to attempt to solve the problems which produce the imbalance, and hence to engage in problem-solving activity. This presumes that energy must be generated and expended. In order to avoid misunderstanding we must consider the concept of energy, and make explicit our assumptions regarding its disposition and use within the human organism.

The concept of energy, as it pertains to use within organic systems, has been endowed with different character when described by different theorists. Freud (1943), for example, assumed that the fundamental character of all human energy was libidinous. The concept plays a crucial role in theories of personality, particularly as formulated by such organismic theorists as Goldstein (1959), Angyal (1941), and Maslow (1954), each giving it his own interpretation. Our assumption is that energy has no fundamental character until it is expended; it assumes its character from the nature of its activation. We would therefore assert, for example, that energy expressed as aggression derives from the organism's response to frustration. Thus, energy is viewed as a potential of the organism which is activated by demands for maintenance and problem-solving.

Organisms differ in the degree to which they are capable of expending energy or producing it. We shall refer to the overall energy potential of any given organism as its *general energy level*. The amount of energy which an organism is capable of expending for any particular problem can be termed its *specific energy level*. Both general and specific energy levels depend to a considerable extent on constitutional factors, but also of importance are the effects of socialization. If, for example, a child is faced with few demands (few problem-solving situations) and is therefore encouraged to be passive, all things being equal, we could expect his general energy level to be lower than if he had been confronted with many demands. Likewise, if there are few demands for the control of aggression, an individual's capacity for expending energy for the control of aggression will be lower than if he had been required to control it frequently (Sears, Maccoby, & Levin, 1958). Therefore, energy capacities are influenced by the sociocultural environment and individual life experiences, as well as by genetic factors. This being the case, one would expect to find similarities in general and specific energy levels between persons whose problem-solving experiences during socialization were similar, and corresponding differences between persons whose problem-solving experiences during socialization were different. The same is true of physical (noncultural) experiences. An organism that has had continual demands upon it physically is likely to have its general energy level raised (provided the demands are such that they do not injure the energy-producing mechanisms within the organism); and an organism that has continually expended energy to check a specific type of infection is likely to be more capable of directing available energy to meet the problem than if the infection were to occur for the first time in adulthood (all things being equal). Building up one's muscles through exercise is a more specific example of the same phenomena. This process will be discussed further in relationship to success in problem-solving.

THE ORIGINS OF PROBLEMS

The initial stimuli which introduce problems to the organism can be conceived as falling into one or more of four separate

categories. These are: (a) problems posed to the organism from its internal organic (biochemical) environment; (b) problems posed to the organism from its external physical environment; (c) problems posed to the organism from its own psychological environment; and (d) problems posed to the organism from its sociocultural milieu. It will be noted that this classification involves two dimensions. First, there is the internal-external nature of the stimuli (a and c vs. b and d) and, second, there is the symbolic versus the nonsymbolic nature of the stimuli (a and b vs. c and d). The dimensions of each environment can be seen in Figure 1.

	Internal Stimuli	External Stimuli
Symbolic Stimuli	Psychological Environment	Sociocultural Environment
Nonsymbolic Stimuli	Biochemical Environment	Physical Environment

FIG. 1.

Let us consider each of these four categories briefly.

(a) Any alteration in an organism's internal organic system that disrupts its internal homeostatic balance creates a problem to be solved. Examples are cellular deterioration, biochemical imbalance, a reduction in the available supply of resources (e.g., food, water, air, vitamins, etc.), or an accumulation of waste materials.

(b) Conditions originating from the external physical environment may also create demands upon the organism. Examples are alterations in temperature, infectious bacteria, and land contours (which require an effort to traverse).

(c) The requirement that human beings maintain some form of psychological integration, if capacity for performance is to be maximized, is an important consideration. Any internal message such as a spontaneous thought or fantasy, or an external stimulus which provokes thoughts or imagery, is a problem until it is satisfactorily interpreted and integrated.

(d) Sociocultural problems are those which stem from group living. Role demands and pressures toward conformity are examples.

As is true with most classifications of the order presented here, the categories are by no means mutually exclusive. The same event may have implications for more than one; for example, the death of a spouse may create both social and psychological problems, and physical ones as well if an economic dependency was involved.

THE STRUGGLE FOR MASTERY

In considering the processes by which problems are solved it is necessary to distinguish between efforts at problem-solving and the resolution of a problem. The mere investment of energy in problem-solving activities is no guarantee of solution. In addition to an adequate supply of available energy, other sets of factors are involved in successful problem-solving, or *mastery*, as we shall refer to it hereafter.

First, mastery requires resources which the organism can employ in working through a particular problem. A resource may be considered as anything which contributes to the resolution of problem situations. They are basically of two types: (a) general resources such as intelligence, an intact neuromusculature, and so on; and (b) specific resources such as specialized skills, pertinent knowledge of particular tools and materials, and the like. Both types of resources are necessary to successful problem-solving. As an example, for the sailor lost at sea, overall cognitive ability (including good eyesight) constitutes a general resource; knowing how to navigate by the stars is a specific one. Similarly, when an organism is exposed to infectious bacteria, adequate nourishment constitutes a general resource; the ability to produce appropriate antibodies is a specific one. Medicines, too, even though they are externally induced, constitute a resource for the organism into whose system they are introduced, just as a sextant would be a resource to the lost sailor.

A second set of factors involves the manner in which problems are formulated. If an organism is ultimately to attain mastery over a problem, the problem must be solvable. Some problems may preclude mastery by the very nature of their formulation.

There are three ways in which this may occur.

1. A problem may be open to possible solution, but resolution may involve demands beyond the organism's capacity, i.e., the organism may lack sufficient energy or resources. A severe bacterial infection that exhausts its host, battle fatigue, and the desire for eminence by a person without the requisite abilities are all examples.

2. A problem may be unsolvable. It may be formulated in such a way as to make failure inevitable. Damage to nerve tissue (being irreparable), the desire to avoid death, and the desire to eliminate world tensions (at a given point of time) are examples.

3. A problem complex involving contradictory solutions may arise. Under such circumstances the solution to one problem precludes the solution of another. A physiological example would be a case in which an organism is exposed to two or more bodily threats, such as tissue damage suffered during an operation and bacterial infection, at the same time. Each problem may be resolvable by itself, but the drain of resources created by one may leave too great a shortage for adequate solution of the other. Psychological and sociological examples are covered by the various approach-avoidance conflicts, or by what Bateson has termed the "double-bind" (Bateson, Jackson, Haley, & Weakland, 1956). The adolescent girl who poses for herself the problem, "How can I have sexual intercourse and remain a virgin?" has placed herself in such a circumstance.

We have thus far isolated three conditions which are relevant to attaining mastery over problems. First, an adequate source of energy must be available and capable of activation. Second, appropriate resources must be available; and finally, the problem must be solvable. The relative importance of each of these factors (that is, the degree of variance they can explain) is an empirical rather than a theoretical question. They are interdependent, not only in the sense that they each affect the organism's efficiency in solving particular problems, but also in the sense that they are each conditioned by the organism's experience with his total environment (i.e., internal, external, nonsymbolic, and symbolic). Moreover, their relative saliency varies from one problem situation to another.

A fourth consideration is the nature of the response made by an organism when confronted with a problem. The kinds of responses can be divided into three categories: assertive, divergent, and inert.

An assertive response is one in which the organism meets the problem directly and attempts a solution. It involves a mobilization of resources and an attempt on the organism's part to select those which are most appropriate for solution. It also implies that when obstacles are encountered as a given solution is attempted, energies will be channelled into attempts to reach alternative solutions. This approach, while it is the only one by which mastery can genuinely be achieved, does not guarantee it. Limitations in available resources and energy, or the manner in which the problem is formulated, may lead to ultimate failure.

A divergent response is one in which the organism diverts his energies and resources away from the confronting problem. One possibility is for the organism to withdraw. Physiologically, this may involve an inability to sustain a particular deployment of energy and resources, and an eventual retraction of them from the problem at hand. Psychologically, withdrawal may take numerous different forms, among which are denial of the problem's importance, the formulation of a substitute problem, or simple retreat. An example of a withdrawal response is presented by the student who, when confronted with the problem of gaining a good grade in an exam, copes with it by dropping the course or leaving school. Another divergent response is aggression towards frustrating objects, rather than focusing on the problem itself. A third type of divergent response includes those which can be termed irrelevant to the problem. The bizarre behavior often manifested in times of panic is an example.

An inert response involves a failure on the organism's part to mobilize its resources and to behave actively, either toward solving the problem or avoiding it. Paralysis, in which the organism is incapable of translat-

ing energy into appropriate muscular behavior, is one example. The student who, when faced with an examination, refuses to study but takes the exam anyway is another.

It should be readily evident that only the assertive response can lead to genuine mastery of problems. Divergent and inert responses may lead to adjustments of sorts, but not to mastery.

In understanding the processes of successful problem-solving, it is useful to employ a distinction suggested by Barnard (1938, Ch. 5) in a different context. He distinguishes between organizational efficiency and organizational effectiveness. The former term refers to an organization's ability to mobilize the resources at hand in order to solve the problems with which it is confronted. Effectiveness, on the other hand, refers to the organization's ability to achieve its ends. Problem-solving effectiveness refers to the organism's ability to actually achieve its end; namely, to effect adequate solutions to its problems. It is useful to keep this distinction in mind when considering the process of problem-solving and the conditions necessary to that end. It is of particular importance in understanding failure when the organism mobilizes its resources efficiently, but in the face of an unsolvable problem.

We shall now consider more specifically the quest for mastery of problems stemming from each of the four environments within which the human organism functions.

Mastery of problems induced by internal organic changes may require appropriate reactions of a biochemical nature. There are numerous examples of this: metabolic and glandular changes, alterations in blood chemistry, and so on. All those responses to a disrupted homeostatic condition which Cannon (1932) so appropriately termed "the wisdom of the human body" are included. Perhaps the most appropriate example involves the mechanics of sleep, which is the body's assertive response to repetitive internal needs. In other cases, internally stimulated organic needs may require activity carried out within the external environment. The needs to eat, drink, or eliminate waste products are examples. These latter also involve complicated behaviors that are highly patterned culturally. (For an excellent discussion of socially patterned deviance arising from unsolvable problems, see Merton [1957].)

Mastery of problems induced by the physical environment similarly requires the successful employment of energy and resources by the organism in an appropriate reaction. If the threat comes from a bacterial infection, the body must be able to mobilize for combat. To achieve mastery, resources must be deployed in such a manner *as to* overcome the stimuli, creating conditions so that the internal environment is rendered inhospitable to the infectious organisms without otherwise injuring the host. If the initial threat comes from extreme temperature changes, the body must invest energy in the appropriate metabolic changes, or, if the problem is a physical barrier, muscular energy must be expended to achieve mastery. Man's relationship with his physical environment is well-documented, since this has been the central focus of medicine throughout its history.

Mastery of problems which are aroused by internal symbolic stimuli such as aggressive or sexual arousals, or learned fears, also requires a mobilization of resources, though the resources that are appropriate may differ considerably from those employed by the organism to deal with physically induced threats. The significant capacity involves the ability to integrate the symbolic stimulus and resultant effects into an effective behavior sequence (i.e., a solution to the problem). This may involve a variety of mechanisms, including the ability to invest energy in controls and accurate cognitive evaluation. In some cases, cultural patterns may aid the organism in achieving mastery over such threats by providing comforting beliefs, approved forms of ritual, or other institutionalized techniques.

Mastery over problems induced from the sociocultural environment most usually requires possession of valued symbolic resources (e.g., money, status, power, magic formulas) and/or the development of essential skills (e.g., oratorical, hunting, fighting, mechanical). Each society postulates some kind of social image, or set of social images, that are regarded as desirable,

or at least socially acceptable. Failure to live up to such an image constitutes a threat to the extent that social pressures are brought to bear. In extreme cases, deviation may imply the threat of execution or banishment; in milder cases, restrictions upon freedom, levies on property, or retribution to an injured party (LaPiere, 1954, Chs. 9, 10, 11). Acquiring mastery within the sociocultural environment therefore involves such capacities as adequate role performance and skill in interpersonal relations. It is important to recognize that other threats, psychological or even physiological in nature, may be associated with the social image. Failure in role performance may be disruptive to an individual's self-image, even though the particular behavior may not activate social sanctions; and failure to acquire necessary resources or skills may result in an inability to gratify hunger needs. This fact merely emphasizes the artificiality of the separation between "levels of analysis."

Let us now consider the consequences for the organism when mastery is achieved. Presumably what has happened is that a problem has arisen; the organism has mobilized appropriate resources and generated sufficient energy to reach a satisfactory solution. It is our postulation that *when genuine mastery has been achieved, the state of the organism will be superior to its state prior to the time it was confronted with the problem, and that should the same problem arise again (after the organism has had an opportunity to replenish its resources) it will be dealt with more efficiently than before.* This process is implied in the development of immunity following mastery over certain types of infections, in the benefits of physical exercise (i.e., muscular development), and in what is called "learning" in academic psychology. All of these examples rely upon the general process known as "conditioning." In other words, successful problem-solving not only reduces the initial threat posed to the organism; it also increases its capacity to master the same problem, or a similar one, should it arise in the future. This relates to our previous discussion involving energy levels, and we can now formulate our descriptive proposition more completely: *An organism's efficiency in solving problems is related to the degree that strong demands, which have been successfully mastered, have been made upon it.*

Another quality which is important for the organism's success in problem-solving can be termed adaptability. In the context of the present paper, this concept refers to the capacity of an organism to deploy its energies and resources in a flexible manner; in other words, to be able to avoid overspecialization of energy and resource use, so that they may be used in a variety of ways to meet a variety of different problems. Adaptability is also a matter of conditioning in that it results from a history of mastery over a wide variety of problem situations. Contrarily, an organism that has attained mastery over a particular kind of environment may be at a loss if the environment is substantially altered.

Failure at mastery

Thus far, we have focused our attention on the conditions leading to, and the results of, successful problem-solving. We shall now consider the question of unsolved problems, or failure at mastery.

To begin with, it should be pointed out that even when problem-solving ventures are successful, a time gap exists between the initial provocation and the ultimate resolution. During the time in which the problem is being dealt with, the organism is in a state of greater or lesser mobilization, a state in which energy and resources are bound up in what can be called *tension*. In cases of successful problem-solving, tensions are eventually dissipated and the disequilibrium which produced them eliminated. In instances where problems are left unsolved, however, tensions persist until mechanisms are found to cope with them. Thus, the failure to solve problems gives rise to a second order problem; namely, that of dealing with unresolved tensions.

It is obvious even on the basis of superficial observation that a good many of the problem situations which confront individuals, particularly in modern urban society, are not easily resolved. Many problems are only partially solvable, while others are simply beyond resolution. The problem of death in American culture is an example. In America, where mastery over nature is a

stereotyped belief and underlying premise, the inevitability of death constitutes an unsolvable problem, and is hence the basis of considerable anxiety (Howard & Scott, in press). In other societies, the presence of infectious bacteria may be equally ubiquitous and beyond control constituting an unsolvable problem, although in this case stemming from the physical rather than sociocultural environment. (This is assuming the absence of external medical controls.)

Let us now examine the consequences of failure of problem-solving in each of our four environmental areas.

If cellular deterioration takes place within the body at a more rapid rate than the organism can produce resources for repair, a failure in mastery is implied. If the rate of decay is too rapid, death results, but, as in old age, the rate may only slightly exceed repair mechanisms. The consequence is that the body must invest an increasingly higher proportion of its available energy and resources in maintenance activity.

The same is true when the problem source is an infectious invasion of the body. As is often the case with malaria, for example, the organism may be unable to achieve a total victory over infectious agents, but must be content to hold them in check. To do this, the organism must put a certain portion of its energy and resources into this maintenance activity.

Failure in mastery of psychological problems also increases the necessity to commit resources and energy to maintenance activities. If a threat to an individual's self-image cannot be overcome, as might be the case if one's spouse is continually derogatory, self-defensive measures are necessary to make the threat tolerable. The degree to which a person must invest in such defensive measures is the degree to which his energy and resources are being used beyond what would be demanded had mastery been achieved.

Failure to master sociocultural demands, too, increases the maintenance commitment of the organism. Thus, when an individual behaves in a socially unacceptable manner, social pressures brought to bear upon him constitute new problems with which he must deal; problems which he would not have had to face had initial mastery been achieved. An obvious example is the necessity of engaging in court procedures after one has been indicted for a criminal offense.

On the basis of the foregoing, we suggest the following proposition: *Failure in mastery requires the organism to use an excess of energy and resources in maintenance activities over what would have been required had mastery been achieved.* Furthermore, the necessity of excessive maintenance activity involves the organism in a state of continuous mobilization, or tension. *To the extent that excess maintenance tension exists, the organism can be said to be experiencing stress.*

The consequences of stress constitute a prime research problem on which a great deal of work still needs to be done. An initial survey indicates that there are several possible alternative ways in which an organism may respond to a high tension level. One possibility is simply for the organism to attempt to live with the tension. In some cases, especially those involving organic disruptions, there may be no alternative response available. If the tension is great, however, and persists over a long period of time, it tends to rob the organism of its resources and energy. An effect of this may be that the afflicted person withdraws energy from the areas of voluntary control, particularly the area of cognition, resulting in a state of malaise. In other cases, abnormal biochemical changes may be induced by symbolic stimuli, motivating the organism to seek relief in various ways. A certain amount of excess tension may be discharged through sexual channels or other kinds of physical activity. Drinking behavior, including cocktail parties and "beer busts," which often permit behavioral license not otherwise sanctioned, are culturally institutionalized examples of tension-releasing techniques. Where culturally sanctioned mechanisms such as these are unavailable to, or inadequate for, a given individual, deviant (in the sense of socially disapproved) techniques may be resorted to, including sexual perversion, criminal aggression, etc. These latter responses are likely to compound the individual's problems, however, by inducing social sanctions and producing further threats to his self-image. Regardless of the legitimacy of the behavior, it should be

clear that most tension-releasing mechanisms are, by their very nature, divergent responses. In other words, although they may offer some relief from tension, they do not aim at solving the tension-producing problems. Thus, the individual may become involved in a cycle of tension production, tension release, and a return to tension-producing circumstances. This is particularly apt to be the case where problem formulation depends upon cognition, as it does in the case of a business executive's work. Even under the best circumstances, relief from tension is likely to be temporary, and if the tension-releasing activities are of a nature to compound problems, the tension–tension-release cycle may become a spiral involving increasing stress. A simple illustration may help to clarify this. In the past, many doctors were fond of recommending that executives under extreme tension should engage in physical activities such as golf in their spare time as a means of tension release. This would have been a sound suggestion if the executive were to approach golf simply as a form of physical exercise, but if, instead, getting a low golf score becomes a problem, it may actually increase his tension. Instead of having the desired effect of leaving his business problems in the office, the result may be that he brings his golf worries home in addition.

At this point let us reconsider our initial assumptions regarding motivation. It was stated in an earlier section that problems were either generated by stimuli from one or more of the organism's environmental fields, or that they were posed to the organism by itself. It was correspondingly asserted that both the reduction of threat and gratifications received from exercising problem-solving ability are significant for motivation. The former motivating circumstances, based upon the reduction of threat, are clear enough, but the latter require further explanation. Two kinds of circumstances underlie the tendency of human beings to pose problems where none exist otherwise, or to seek problem situations. The first is a consequence of the reassurance an organism receives from its ability to master problems that may have previously been threatening, or that would be threatening if they were to occur were the organism ill-prepared. In this case, gratification may be regarded as related to the mastery of problems in a particular environmental area. It therefore tends to be associated with specific activities, such as sports, craft, science, or art, in which success depends upon particular abilities or skills (i.e., the capacity to mobilize specific energy and resources). The second circumstance is a consequence of overmobilization in response to threatening circumstances, leaving the organism in a state of tension either after the problem has been resolved or removed from the environmental field. In this case the postulation of a problem by an organism to itself is a form of divergent response, and gratification depends upon tension reduction. Activity based on these conditions tends to be more generalized in scope, involving such behavioral phenomena as play, exploration of the environment, and erotic activity. During an individual's life history, these two types of motivation may crystalize into an activity pattern that yields gratification on both accounts, acting as a release of generalized tension and as a reassurance of problem-solving capability. The indigenous hunter who practices spear throwing would constitute only one example of such fusion.

NORMALITY, ABNORMALITY, AND THE CONCEPT OF ORGANISM HEALTH

Every system has its utopian condition, and the model we are presenting here is no exception. Before we describe the ideal state, however, it is imperative that we discuss the concepts of normality and health. Normality, in its most usual sense, is a statistical concept. When applied to hehavior it has traditionally referred to patterns that fall within an acceptable range in a given context. It was in this sense that Benedict (1934, Ch. 3) used the term, with the insistence that behavior can only be regarded as normal or abnormal when its cultural context is taken into account. The disadvantage of this usage is obvious; it eliminates the possibility of a universally applicable standard for measuring the adequacy of human performance. Furthermore, the concept loses considerable significance in complex cultures, where a variety of norms, many contradic-

tory to one another, exist, or where norms are undergoing change. Still another criticism is that the concepts of normal and abnormal, when used in this way, can only be meaningfully applied to overt behavior, not to internal dynamics. An alternate definition of normality refers to a system that is functioning without obstruction. Thus, whereas in the statistical sense normality includes a range of variation, in the latter sense it constitutes a point with a resulting continuum. To the extent that phenomena depart from this point they may be regarded as abnormal. As a result of such alternate usage the concepts of normality and abnormality have often been more confusing than useful in the study of human behavior. To avoid such confusion we have found it expedient to use the concept of *deviance* as a substitute for the statistical usage of abnormality, and to use the concept of *health* as a substitute for normality in the latter sense.

Our concept of *deviance* is similar to definitions offered by numerous behavioral scientists (Lemert, 1951, Ch. 2), and refers to phenomena which fall outside the range of a normative pattern. To some extent the concept can be applied to organic phenomena (e.g., albinism), but even here the question of determining norms requires cognitive activity, and it is in the realm of social behavior that the concept is most clearly applicable. Within any environmental field deviance may be either an asset or a hindrance, or both. It is an asset to the extent that it enhances an organism's resources or ability to mobilize effectively; it is a hindrance to the extent that it creates additional problems and makes further maintenance demands on the individual. The concept of health is, of course, standard in medicine, and to a lesser degree, in psychiatry. Traditionally, physical and mental health have been discussed and analyzed separately, but in view of our attempt to present an integrated approach, we believe it desirable to formulate a concept of *total organism health*, encompassing all the organism's environmental fields. By total organism health we mean a state in which the organism has achieved mastery over the totality of its environment, so that it uses a minimum of energy and resources for maintenance, allowing a maximum of energy and resources for use in confronting new or recurring problems. To the extent that an organism must utilize its energy and resources for maintenance beyond minimum requirements, thereby limiting its problem-solving capacity, it may be considered as experiencing stress.

IMPLICATIONS AND SUGGESTIONS FOR RESEARCH

A theoretical model is subject to judgment on several counts, among the most important of which are: (1) the degree to which conceptual clarity and consistency are maintained; (2) the degree to which the model can be given general applicability, hence reducing the number of separate theories required to explain seemingly diverse phenomena; (3) its utility for formulating testable hypotheses (and correspondingly, the degree to which the data confirm them); and (4) the degree to which it generates new questions and thereby stimulates research. In this section we will try to demonstrate that on all four counts the framework that has been presented shows promise.

While the overall clarity and consistency of our theoretical model must be left to others to judge, there is one point on which we feel the framework is successful—it lowers the conceptual barriers between phenomena that are part of the same system. Perhaps of prime significance is that it reduces the dichotomy between *somata* and *psyche* to a minimum. An implication of causation is inherent in the arbitrary split between mind and body, constituting a situation which must be regarded as unfortunate in the light of contemporary views in the philosophy of science. We believe that the model which has been presented eliminates these misleading presumptions of causation, and therefore paves the way for a more realistic view of the way in which the organism functions as a total system.

In a similar vein, the framework obviates the necessity of considering the human organism as though it operates on several distinct "levels." Instead of using the concept of levels, which has the unfortunate implication of a hierarchy of functions, we have substituted the concept of "environmental fields," which have no rank order but which

encompass the total potential of human experience.

A more specific test of conceptual utility concerns the degree to which a given model can successfully substitute for a variety of alternative models. For example, in the introduction to this paper, reference was made to existent models of stress. These ranged from those designed to conceptualize sociocultural and social psychological stress to those which deal with stress as biochemical and physiological phenomena. As useful as these models may be, however, none of them are suitable for analyzing stress as a generalized phenomena. We do not mean to imply that the models are either inadequate or incomplete for the purposes of their originators; on the contrary, in most cases they explain specific data with considerable cogency. Their "inadequacy" stems from questions which were not the concerns of the researchers involved. Indeed, it is only because previous models have shown so much theoretical cogency that the present endeavor is possible. In the following section we shall attempt to demonstrate that a number of seemingly quite distinct stress models can be translated into our terms without undue distortion to their meaning.

In a study concerning the social psychology of adaptation, Mechanic (1962, p. 7) defines stress as the "discomforting response of persons in particular situations." According to his model, whether or not a situation, event, or happening will lead to a discomforting response in dependent upon a number of factors, particularly the ability and capacity of a person, the skills and limitations provided by group practices and tradition, the means provided to individuals by the social environment, and the norms which define where and how an individual may utilize these means. The successful mastery of a situation, and the feelings aroused by doing so, is termed reversibility. Reversibility is contingent upon adaptive devices, defined as thoughts or behavior that are relevant to one's situation or to feelings about it. If behavior is relevant to situational demands, it is called coping behavior. If it is aimed at managing feelings evoked by the situation and the coping behavior, it is termed defense (pp. 7–9).

The situations which Mechanic describes as capable of evoking discomforting responses in individuals are, in our terminology, problem situations, since they constitute threats to the organism's integrity. Such attributes as the person's ability, the skills provided by group tradition, and so on, are what we have termed resources. It should be noted, however, that our model provides not only for the recognition of resources in the quest for mastery, but also the deployment of energy, the nature of the stimulus or problem situation, and the character of the organism's response to the provocation. The concept of reversibility, as used by Mechanic, is comparable to our term mastery, or successful problem-solving behavior. Coping behavior is the equivalent of an assertive response aimed at the direct solution of a problem. Defense is synonymous with behavior aimed at solving the secondary problems which arise as a result of failure to master a provoking situation. Finally, stress, as defined by Mechanic, has two referents in our system. Thus, whereas he uses the term as applicable to both the initial response to provocative stimuli and subsequent discomforts resulting from the failure to master them, we have distinguished the former as tension and the latter as stress.

A second model is that developed by Basowitz and his associates (1955, p. 54) for a study of men in combat. The central concepts in their model are anxiety, stress, and stress situations. Anxiety, as used by Basowitz, is defined as the conscious and reportable experience of intense dread and foreboding. Any condition which threatens the integrity of an organism may lead to anxiety, but some stimuli are more likely than others to produce disturbances. Stress refers to this latter class of stimuli. According to Basowitz, stimuli form a continuum, based on differential meaning to the organism and on the anxiety producing potential they have. At one end are stimuli which have meaning only to a single person or only a few, but which often appear innocuous or trivial to the observer. At the other end of the scale are stimuli which, by their explicit threat to vital functions and their intensity, are likely to overload the capacity of most organisms. Basowitz argues that this idea may be ex-

tended to designate as stressful certain kinds of stimuli without regard to response. Such stimuli are regarded as stressful because of their assumed or potential effect, even though it is recognized that they may provoke differential responses. By virtue of their presumed generality, these are referred to as stress situations.

The continuum of which Basowitz speaks may be interpreted in two ways within the problem-solving framework. First, it concerns the probability that a given stimulus will or will not require resolution by a specified number of people in a specified situation. Certain stimuli, by virtue of their unique meaning to particular individuals, may pose problems only to them, while other stimuli, by virtue of their commonly shared meaning, are likely to pose problems to a large number of persons. If we confine ourselves to the terminology which Basowitz suggests, however, it is only possible to deal with the stress evoked by symbolic stimuli. Alternatively, when viewed in a problem-solving framework these notions can be extended to other areas of functioning as well. Thus, in the physiological sphere, only a few people in a given group may find the presence of dust or pollen to be a condition requiring resolution, whereas an epidemic of flu constitutes a problem for many more persons and an outbreak of typhoid in an unimmunized population is a problem for a still wider range of people. A second interpretation of the Basowitz continuum focuses on the resolvability of problems. Thus, stimuli may pose problems to a wide range of people but there may be an equally wide distribution of knowledge, skills, and tools for solving them, while in other cases the stimuli may be such as to preclude resolution because of a lack of available means or because the problems they pose are unsolvable. In the former instance the probability that stress will occur is minimal, whereas in the latter case it is quite high.

The concept of anxiety, too, is easily translated into our terms. From this point of view, anxiety may be considered as the response of an organism to a circumstance that threatens its sense of mastery. It may be specific, in response to a particular situation, or generalized (free-floating), in response to an overall feeling of inadequacy. Such a response is to be expected when an individual is confronted with an unsolvable problem, or set of problems, or when he lacks confidence in the resources available.

Thus if anxiety, stress, and stress situations are viewed within a problem-solving framework, the applicability of these terms is considerably extended without sacrificing their original meaning.

A third stress model has received widespread currency among researchers interested in "psychosomatic" disturbances, including Alexander (1950), Dunbar (1947), and Grinker and Spiegel (1945). These persons adopt the view that tensions or stress occurring in one system of the body may have consequences in other systems, as part of the organism's total response to a tension-producing stimulus. Therefore, the anxiety or fear generated by the significant conflicts in a person's life may be expressed not only through subjective feelings of intense dread or discomfort, but also through organic processes such as increased acid secretion in the stomach, alterations in blood sugar, or an increased secretion of phlegm and mucous in the nasal cavity. Such reactions generally occur when the organism responds inappropriately to provoking circumstances. Thus, according to this model, conflicts handled directly, or in an overtly assertive fashion, provided they are resolvable, will be less likely to result in significant alterations in organic processes, since tension generated by the initial stimulus is dissipated externally and not internally. If conflicts are not confronted directly, the predicted result is that the tension will be internally dissipated, flowing from one system to another and bringing about the characteristic organic changes.

This version of the stress concept, too, can be interpreted within the framework of a problem-solving model without serious distortion to its meaning. In our terms, when a problem remains unsolved, for whatever reason (i.e., when mastery is not achieved), then the organism can be expected to experience tension in the form of continued mobilization. This gives rise to the second order problem we have described, that of dissipating tension. As we pointed out, tension

may be discharged in a variety of ways, in any of the environmental areas. Increased organic activity is one form that is likely to occur when various other possibilities within the symbolic environments are inadequate or have been blocked. If we conceive of the organism as a whole system, however, the psychosomatic model can be expanded. Thus, by considering tension as a result of over-mobilization, we can assert the plausibility of the reverse process—the production of tension from stimuli originating in nonsymbolic environment subsequently being discharged through symbolic channels. Here, too, then, the generality of a useful model is enhanced by translating it into problem-solving terms.

Another theoretical scheme, focusing upon the same type of phenomena as the psychosomatic model, has been developed by Wolff and his associates (1953). The key concept in their model is described as the "protective reaction pattern." According to this view, when the body is confronted with insults to its physical integrity, it calls forth a complex reaction aimed at sealing off and ridding the body of its threat. This is illustrated by the nasal adaptive reactions brought about when an individual inhales a noxious fume. The reaction usually takes the from of intense mucous secretion and tearing, aimed at flushing out the nose and eyes, and thereby ridding the body of the noxious agent. This same reaction may be set in motion by symbolic threats as well as by physical ones, and the reactions induced by the former correspond to those induced by the latter. The scheme differs from the psychosomatic model in that the protective reaction pattern is not seen as a chain reaction from feeling state to altered bodily function to organic abnormality. Altered feelings, bodily adjustments, and behavior are considered to occur simultaneously and in varying degrees.

The protective reaction pattern corresponds in our framework to the process of mobilizing resources. What Wolff has pointed out is that while certain kinds of resources are effective for solving certain kinds of problems, the mobilization of these same resources are irrelevant (i.e., divergent responses) when the organism faces other kinds of problems. They have effectively demonstrated that the human organism characteristically over-mobilizes its physical resources when confronted with problems originating in the symbolic environments, and that to the extent that these problems remain unsolved, a state of inappropriate mobilization is perpetuated, or in other cases recurs when the problem is brought to the awareness of an individual.

The apparent conflict between this model and the psychosomatic one is easily resolved when put into these terms. That is, while Wolff's model focuses upon the response pattern to an unsolvable problem, and particularly the relationship of resources to the nature of the problem, the psychosomatic model focuses upon the failure in mastery itself and the resultant problem of dissipating tension. Both models are consistent with our postulations, and the degree to which one would seem to "fit" particular data better than the other can be formulated in empirical rather than theoretical terms.

Still another model, one that has been widely adopted in biological circles, is that developed by Hans Selye (1956). It is basically oriented toward an analysis of stress in physiological and biochemical terms. Stress, as defined by Selye, is "a state manifested by a specific syndrome which consists of all of the nonspecifically induced changes within a biologic system" (p. 54). A nonspecifically induced change is one that effects all, or most, parts of a system without selectivity. Nonspecifically induced changes are described in terms of the "General Adaptation Syndrome," or a three-stage process brought about by a specific stressor, or stress producing stimulus. The first stage is characterized by an alarm reaction, during which a general mobilization occurs. This phase leads to a stage of resistance, which is characterized by a set of internal responses that stimulate tissue defense. If the stressor continues to affect the organism despite these responses, the third stage, that of exhaustion, is eventually reached.

The sequence Selye postulates corresponds to: (1) the organism's mobilization of its general resources in response to a problem situation; (2) the mobilization of specific resources in response to the secondary problem of tension when the initial problem goes

unsolved; and (3) the depletion of energy and resources resulting from increased maintenance needs. When put in these general terms the applicability of the model to behavioral as well as nonbehavioral phenomena is facilitated.

We could go on to discuss other models, but space does not permit us to be exhaustive. Nevertheless, we believe the general applicability of the problem-solving framework has been amply demonstrated by the previous discussion.

Testing hypotheses

The utility of the problem-solving framework for formulating testable hypotheses cannot be fully estimated until it has been "played with" by researchers in various fields. It might be pointed out, however, that the results achieved by investigators using the previously discussed models are consistent with hypotheses that might have been drawn from our postulations. But additional tests are necessary. One possibility is to examine research results that have not been satisfactorily explained by other models, to see if they make sense in terms of ours. Again we cannot be exhaustive, but instead will present data from one well-documented case —a study concerned with the "mastery of stress," conducted by Funkenstein and his associates (1957).

One hundred and twenty-five "healthy" college students were studied under laboratory conditions in order to determine their emotional and physiological reactions in a sequence of three experimentally created stress situations. The primary objects of interest were to study the nature of the emergency reactions of each subject when first confronted with a stressful situation, and to determine the ability of each subject to master stress over a course of time. In the first area of concern, three characteristic responses to exposure were defined. These were: anger directed outward, anger directed inward, and anxiety. Associated with each type of response was a characteristic physiological reaction. The manner in which the subjects handled stress on a time continuum fell into four broad patterns, two of which resulted in mastery and two of which resulted in failure at mastery. The first successful group comprised those who mastered stress quickly and without difficulty. The second group, termed the "delayed mastery group," evidenced success only after considerable difficulty and long periods of time. Those who failed to master the situation were divided into an "unchanged" group, or those whose reactions were the same in each of the three situations; and the "deteriorated" group, or those whose reactions indicated marked anxiety and great difficulty in handling situations.

Before going on to discuss some of the findings of this study, it will be helpful to consider, in our terms, the nature of the experimental situation which Funkenstein created, and the types of reactions which are described. As designed, the study concerns the reactions of individuals to unsolvable problems, since each experimental situation was constructed so as to preclude resolution. This being the case, the reactions which are described illustrate in the first place responses to unsolvable problems, and in the second place the manner in which the subjects handled unresolved tensions. The reactions of the subjects to exposure fell into two of the three response categories which we described—anger outward and anger inward are both divergent responses, while the anxiety response falls into our inert category. These followed assertive responses that were frustrated by the unsolvable nature of the problems faced. In describing the overall long term ability to master stress, Funkenstein is concerned with, in our terms, the ability to come to grips with tensions generated by an unresolved problem. Mastery as he uses it therefore refers to the management of stress, rather than to the solution of the problem which gave rise to it. As defined operationally by Funkenstein, mastery of stress refers to a subject's movement from an emotional response of any kind following initial failure, to a nonemotional response. Thus the group that rapidly mastered the situation was defined as that group which quickly showed no emotional response in the face of a succession of unsolvable problems, and the delayed mastery group were those who took a longer time to do the same thing. Failure at mastery was defined in terms of repeated emotional responses in the face of

frustrating situations. Mastery, in this sense, thus involved the ability of a subject to minimize the significance of a stressful stimulus, or problem. In other words, it would appear that those who had achieved mastery were persons who were able to redefine the experimental situation as irrelevant or unimportant, and therefore not a problem requiring resolution. Those who continued to perceive the situation as important (i.e., as a problem to be solved) were unable to achieve mastery and in our terms were experiencing stress.

The prediction made by Funkenstein was that there would be a diminished response on the part of the persons who mastered the situations, but that an increased physiological response would be evident only in the "deteriorate" group. He hypothesized that there would be no physiological changes manifest among those whose responses to all stress situations remained the same. These are not the predictions that we would have made on the basis of the problem-solving model. Rather, among those who eventually refused to define the experimental circumstances as problems, we would expect to find a distinct change in their physiological response as the tensions which were generated by the frustrating stimuli were dissipated, i.e., when the subject no longer took the stimuli seriously, the source of tension would be eliminated and this should correlate with a decreased intensity of physiological reaction. For those who continued to attempt to solve the problems, the reverse should be true. We would expect them to manifest a continual increase in the intensity of their physiological reactions as long as they responded to the experimental situation as though it were an important problem. As their tensions increased, the demand for maintenance activity would be enhanced, and this should result in an increased intensity of physiological response.

Funkenstein's findings in fact supported the hypotheses we would have made. He found that as the subjects in the mastery groups were confronted with new experimental circumstances, they manifested a decrease in their intensity of physiological response, while the subjects who failed in mastering stress manifested an increase in the intensity of their physiological responses, whether or not they were in the "deteriorate" group or the group whose responses remained the same in all situations. These data illustrate the utility of a problem-solving model of stress and suggest that additional studies using this framework are warranted.

Formulating hypotheses

Ultimately, however, it is the formulation of new hypotheses that determines whether a theoretical model represents a substantial advance over previous ones. Here, too, we shall not attempt to be exhaustive, and since we have not yet had an opportunity to conduct research on the basis of the model presented, we can disclose no new research results. As a substitute we propose to offer two untested hypotheses that derive from our postulations. Since we believe the chief advantage of the framework is that it diminishes conceptual barriers, we have attempted to formulate hypotheses that cross disciplinary boundaries.

1. In a given population the degree of deviation (including illness and crime) will correlate directly with the degree to which the problems confronting the people remain unsolved and the degree to which legitimate means of relieving tension are blocked.
2. If, in a given population, an annual cycle of physical demands (e.g., bacterial count, climatic changes, etc.) coincides at a high point with severe demands in an annual sociocultural cycle, the incidence of illness will be highest at the point of coincidence.

Finally, we believe that the theoretical model presented here begs a number of significant research questions, which if studied carefully, would shed a good deal of light on the way in which the human organism functions. Possibly the most basic question concerns the nature of energy within the organism, particularly the mechanics of energy distribution as it relates to specific problem-solving ventures. What are the variables that regulate general energy levels, for example, and to what extent can general energy be transposed into various types of specific energy demands? One fruitful ap-

proach may be to study the differential disposition of energy during the individual's life cycle. It seems reasonable to assume that physiologically the life cycle can be divided into three parts: (a) the period of growth, during which a considerable amount of energy and resources is demanded by the growth process; (b) the period of maturity, during which energy and resources used for both growth and repair are at a minimum; and (c) the period of degeneration, during which a considerable amount of energy and resources goes into repairing tissues, etc. On the basis of our assumptions the periods of growth and degeneration should involve increased susceptibility to certain kinds of stress.

Leads are also suggested for psychological research. An obvious example lies in the field of perception. To be specific, the manner in which individuals perceive problems should have a great deal to do with whether they are formulated in a solvable manner or not. Following this lead, an examination might be made of responses which are formulated as unsolvable. Another psychological problem concerns the role of anticipation in stimulating or alleviating stress. It is apparent that an organism can remain mobilized over a long period of time without undue stress, as long as the anticipation of mastery is present.

Stimulus toward research in the sociocultural milieu is likewise provided by the model. The sociocultural environment has a double significance for the study of stress. First, it confronts each individual with ready-made problems, and second, it offers mechanisms by which problems may be solved. The kinds of problems a sociocultural environment confronts its component members with is a consequence of its values, social controls, restrictions on interpersonal relations, and the like. Examples of problem-solving mechanisms inherent in a cultural tradition include knowledge of all kinds which is culturally transmitted, such as ways of making artifacts, useful medicines, prayer and ritual, etc. A prime research problem would involve an evaluation of the "fit" between the problems inherent in any given society and the mechanisms available for solving them. In a utopian society all problems would be capable of solution, and adequate problem-solving techniques would be available to everyone. There is, of course, no such society, but an examination of a variety of sociocultural systems should yield important insights into the degree and kinds of stress, and the effects, produced by the various gaps between problem demands and techniques of resolution. Comparative linguistics could even be brought into the research picture, i.e., is it possible that the grammatical and categorical structures of different languages affect the degree to which cognitive problems are formulated in solvable or unsolvable terms?

In the opinion of the authors, howeer , the most exciting research possibilities suggested by the framework cross environmental, and hence disciplinary, boundaries. We would like to emphasize once more that our categories describing environments and types of problems are only for the sake of conceptual clarity, and that the essence of the model is that stress may be only properly understood in terms of the total organism responding to its total environment. It is therefore the interrelationship of internal-external and symbolic-nonsymbolic environments, and of kinds of energy and resources, that begs understanding most. It is our conviction that only when conceptual barriers between research students of diverse training and interests are broken down, and cooperative research on the human organism as a total system is extensively undertaken, that the full significance of stress will become clear.

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