

*The Principles of Multiple,  
Nonadditive, and  
Reciprocal Determinism:  
Implications for  
Social Psychological Research  
and Levels of Analysis*

JOHN T. CACIOPPO and GARY G. BERNTSON

The vast range of problems addressed by social psychologists is illustrated by the preceding chapters in this book. Social psychologists study the foundations, antecedents, and consequences of people's beliefs, attitudes, and behaviors, as well as how individuals and groups are influenced by social and societal factors such as mass media, government, peer and work groups, family, friends, and neighbors. Paralleling this basic research is evidence that many of the most pressing current mental, social, and economic problems (and likely problems of the next century) stem in large part from social processes such as modifiable attitudes and behavioral choices (see Lorion, 1991; McClelland, 1989; Seeman, 1989). For example, more young people in the United States die or become disabled from self-destructive behavioral choices (e.g., accidents, drug abuse, violence) than from any disease, and many of those who survive their youth have, by their own actions (e.g., teenage pregnancy, smoking, cholesterol-laden diets, dropping out of high school), laid the foundation for significant problems in later life. Given the savings that can be achieved through social interventions (e.g., Price, Cowen, Lorion, & Ramos-McKay, 1988; U.S. Department of Health, Education, and Welfare, 1979), it is surprising that the level of resources and support for basic social

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psychological research has remained low compared, for instance, to cardiovascular research or the neurosciences.

Among the reasons for the relative emphasis on and support for medical research are historical precedent, the apparent tractability and lawfulness of physiochemical processes within simple systems and controlled assessments contexts, and misperceptions of basic social psychological research. However, this emphasis may also stem in part from a provincialism in basic social psychological theory and research. The thesis of this chapter, therefore, is twofold: (1) social psychology is in a preeminent position to contribute to the understanding and solution of practical problems of individuals and of society; and (2) these contributions will be unnecessarily limited in theoretical scope and practical utility if a parochial level of analysis is adopted. We begin by reviewing briefly the major ways in which the term "level of analysis" has been used in psychology. We then define how we will be using the term here and outline three basic principles in which the construct of levels is fundamental. In so doing, we also illustrate how a multilevel approach to the study of social psychological phenomena can highlight the synergistic relationship between theoretical and clinically relevant research and foster the transition from microtheories in social psychology to general psychological theories.

### LEVEL OF ANALYSIS

The term "level of analysis" has been used in various ways, including in reference to the levels of structural organization (e.g., Tolman, 1959; Weiss, 1941), explanation (e.g., Shaw & Turvey, 1981), and processing (e.g., Churchland & Sejnowski, 1988; Craik & Lockhart, 1972). "Level of organization" in psychology refers to the different scales on which the brain or behavior can be represented. The level of organization of psychological phenomena can vary, for instance, from the molecular (e.g., transmitters/receptors) to the cellular to the tissue to the organ to the body system to the human organism to the environmental to the sociocultural context. What constitutes a level of organization, at least at the lower levels of structure, is often guided by knowledge of anatomy or physiology, but the ultimate criterion is the usefulness of the posited organization in shedding light on some designated psychological or behavioral phenomenon.

For example, anencephalic infants display expressions and

actions reminiscent of pleasure following exposure to sweet gustatory stimuli, fear following exposure to abrupt, loud sounds or bright lights, and distress upon a needle puncture. However, the role of one's view of the self is a substantially more important determinant of emotion in the normal adult. Because the self is defined within a sociocultural context, culture can play a rather dramatic role in shaping emotional experience in the adult (Markus & Kitayama, 1991). Accordingly, organizing the data in terms of the cultural context is informative in studies of normal emotions in the adult, whereas this organization becomes superfluous when examining the emotions in the anencephalic infant (Steiner, 1979).

"Level of explanation" refers to the representation of a psychological phenomenon in terms of the classes of questions that can be asked about it—or as Marr (1982) observed, "the different levels at which an information processing device must be understood before one can be said to have understood it completely" (p. 24). The computational level encompasses questions about the main constituents of the task or phenomenon, including the goal of the computation, the representations on which the computations operate, and the logic of the strategy by which the computation can be performed. A computational analysis of decision making by highly anxious individuals, for instance, might specify a goal (e.g., to minimize failures or losses), the main components involved in the computation (e.g., efficacy expectations, outcome expectations), and the logic underlying the computation (e.g., efficacy and outcome expectations for each behavioral option are multiplied and their products compared). The level of the algorithm encompasses questions about the predetermined procedure or ordered sequence of finite instructions used to achieve the correct output from a designated input. For instance, a common computer algorithm for the computation of  $1.0 \times 10^n$  is to move the decimal point of the multiplicand  $n$ -digits to the right. Finally, the level of implementation refers to questions about the physical instantiation of the behavioral function and the cognitive algorithm—the manner in which the algorithm is realized physically.

The term "level of processing" has been used to refer to the number of neural units underlying a particular behavior (e.g., Churchland & Sejnowski, 1988) and to the depth of semantic analyses of words (e.g., Craik & Lockhart, 1972). Within social psychology, the term "level of processing" (or "level of analysis") has been used to mean the extent of systematic or analytic reasoning underlying a judgment or decision. Thus, whether an individual is influenced by the merits of the arguments for a recommendation

or by superfluous cues associated with the recommendation has been shown to be a function of the level of message processing (see review by Petty & Cacioppo, 1986). In a general sense, therefore, the level of processing refers to the number of information-processing units separating the input and the output of interest. The level of processing in a monosynaptic reflex is quite low, relative to the level of processing underlying deliberate movements. Similarly, the level of processing in a social institution is low when inquiries are handled with pretaped phone messages and high when actions are adopted only after multiple options have been scrutinized by various groups within the organization.

When the term "level of analysis" appears in social psychology, it typically refers to the unique level of organization represented by a focus on the individual in a sociocultural context. Thus, a social psychological analysis focuses on the reciprocal impact of individuals on one another and on society; it focuses on the behavior and influence of collections of individuals (e.g., groups, institutions, governments, cultures), past, present, and future. The output of a social system is enacted by individuals whose actions are controlled by the brain and nervous system, but as Marr (1982) noted, "[A]lmost never can a complex system of any kind be understood as a simple extrapolation from the properties of its elementary components" (p. 19). Thus, to the extent that the properties of the system are not isomorphic with those of the system's elementary components, a situation that rarely obtains with biological much less social systems, a focus on elementary components contributes to an explanation only when considered in conjunction with events occurring at different levels of the system.

Consider, for instance, the phenomenon of alcoholic consumption. An understanding of osmoreceptive mechanism and volume detectors, which monitor body water balance, can offer an eloquent account of facilitated digestive reflexes and water (or alcohol) consumption. These mechanisms, however, offer only a partial account of an animal's bar pressing for alcohol, for which the principles of learning and psychopharmacology must be invoked. Moreover, they tell us little about the drinking behavior of alcoholics in bars. Conversely, even extensive studies limited to operant performance or barroom behavior would be relatively uninformative about the fundamental mechanisms of thirst if conceptualized in isolation from the physiological underpinnings. Therefore, integrative research that specifies the conditions under which each of a set of factors or processes is operative, or that

specifies the relationship between empirical observations at differing levels of analysis, can be especially illuminating in efforts to understand the systems or mechanisms underlying a complex mental or social problem.

In addition, each level of organization constitutes a particular kind of representation with which to examine human mentation and behavior. Any particular representation makes certain information explicit at the expense of other information and, hence, renders some operations or insights easy and others quite difficult. The specialized utility of analyses at different levels of organization was exemplified in our earlier reference to biological versus cultural determinants of emotion in anencephalic infants and normal adults (see also Marr's, 1982, discussion of the multiplication of Arabic versus Roman numerals). The important point here is that no single level of behavioral organization is best for all psychological questions. Hence, analyzing a mental or social problem from various levels can reveal quite different insights into the mechanisms underlying the phenomenon, and, together, these insights can foster more comprehensive theories.

To the extent that explanations of mental disorders in terms of a particular level of organization have few implications for ethical forms of treatment or control (e.g., genetic engineering, psychosurgery), the explanations may have less immediate practical interest. Indeed, when genetic and neurophysiological levels of analysis have been eschewed by social psychologists, it has tended to be this feature that was objectionable (see Allport, 1947; McGuire, 1968). McGuire (1968), for instance, suggested with acknowledged trepidation that genetic factors might be a determinant of a person's attitudes:

Any deviation from a radical environmentalism raises the specter of a laissez-faire political program which countenanced by perpetuation of the *status quo* with all its social and economic inequities. . . . The genetic doctrine is especially dismal when applied to attitude formation, because it seems to imply that "bad" attitudes like racial prejudice will be hard to change . . . it becomes understandable that even theorists who agree on little else are in complete accord on the extreme and undemonstrated notion that all attitudes are developed through experience. (p. 161)

McGuire, of course, recognized that collective denial does not change the determinants of a psychological phenomenon but only

hinders accurate modeling of the phenomenon. Furthermore, analyses across levels of organization are yielding data that answer some of these earlier objections. Research in behavioral genetics, for instance, suggests that genetic and environmental factors are not as separable in their effects as was once thought. Social and environmental factors can inhibit or trigger the expression of genetic influences; conversely, genetic factors can lead individuals to seek or remain in particular social environments. Thus, monozygotic twins reared apart not only express similar levels of satisfaction with their jobs but also hold jobs that are similar in terms of complexity, motor skills, and physical demands (e.g., Arvey, Bouchard, Segal, & Abraham, 1989).

Unless explicitly stated otherwise, we use the term "levels" here to refer to levels of organization. In the following section, we review three principles that underscore the importance of multi-level integrative analyses to the study of complex mental, behavioral, and social problems. As should now be clear, a multilevel analysis refers to the study of a phenomenon from various structural scales or perspectives, ranging from the molecular ("microscopic") to the sociocultural ("macroscopic"). By integrative, we mean that observations at one level of analysis are used to inform, refine, or constrain inferences based on observations at another level of analysis.

### **THE PRINCIPLES OF MULTIPLE, NONADDITIVE, AND RECIPROCAL DETERMINISM**

In this section, we review and elaborate on three principles that were developed in previous conferences of the Behavioral Sciences Basic Research Branch of the National Institute of Mental Health (NIMH)<sup>1</sup> (see also Cacioppo, Petty, & Tassinari, 1989; Cacioppo & Tassinari, 1990a). These principles were derived from a problem-oriented, in contrast to a method-oriented, approach to science (Platt, 1964). Thus, these principles reflect generalizations derived from a wide variety of inquiries of the functions of and mechanisms underlying psychological phenomena. We believe these principles and their implications for psychological theory and research are worth examining, not because they are uniquely applicable to a specific content area or to the interface between social and clinical research but rather because they can inform the design and interpretation of social psychological research, or as

Morton (1991) observed about psychological experimentation: "The correct generalizations will be at the level of mechanisms, not data. This will require thought, not observation" (p. 33).

### **The Principle of Multiple Determinism**

This principle specifies that a target event at one level of organization (e.g., neuroeffector response, emotion) may have multiple antecedents within or across levels of organization. William James's (1894) views on emotion exemplify this point. James is well-known, and has been roundly criticized, for his assertion that emotion is the perception of the somatovisceral reactions that follow the exciting fact. Yet, by 1894, James did not regard all emotions as deriving from somatovisceral reactions but instead agreed with Baldwin (1894) that associative processes could also govern the emotions (or at least the "subtler" emotions). Thus, James suggested, there is more than one means by which an emotion could be stimulated. Similarly, aggressive behavior is multiply determined both within and across levels. Thus, aggressive behavior could result from hormonal, neurochemical, or neuropathological events at a biological level; instrumental contingencies, frustration, or paranoid delusions at a psychological level; and overcrowding, maternal defense, or territoriality at a social level.<sup>2</sup> Indeed, considerable evidence has amassed over the past several decades demonstrating that elements in the physiological domain and elements in the psychological domain can be influenced by a multiplicity of factors within and across levels of organization (New Frontiers in the Behavioral Sciences and Health, 1989).

The implications of this principle for theory and research are perhaps less obvious. For instance, basic social psychological research, with its emphasis on experimental control, has been criticized for yielding statistically reliable but trivial effects (e.g., Appley, 1990; Staats, 1989). Allport (1968) acknowledged that noteworthy scientific gains result from this hard-nosed approach, but he lamented the lack of generalizing power of many neat and elegant experiments: "It is for this reason that some current investigations seem to end up in elegantly polished triviality—snippets of empiricism, but nothing more" (p. 68).

However, what Allport viewed as an adversity—the generalizing problem—is transformed to an advantage and a theoretical challenge by the principle of multiple determinism. Specifically, a certain lack of generalizing power in studies of the role of single

factors is a fundamental property of multiply determined phenomena. This is easy to show.

Let  $\Psi$  represent a psychological phenomenon, and let  $\tau$  represent a factor (e.g., treatment) whose effect on  $\Psi$  is of some interest (Cacioppo & Tassinary, 1990b). Carefully conceived and controlled experimentation on the role of  $\tau$  in producing  $\Psi$  can be denoted as  $P(\Psi/\tau)$ . We know the following:

$$P(\Psi/\tau) = 1 \text{ if } \tau \text{ is a sufficient cause of } \Psi. \quad (1)$$

Equation 1 specifies that if the manipulated factor or treatment ( $\tau$ ) is a *sufficient* cause of  $\Psi$ , then evidence of the psychological phenomenon should be observed whenever  $\tau$  has occurred.

$$P(\Psi/\text{not-}\tau) = 0 \text{ if } \tau \text{ is a necessary cause of } \Psi. \quad (2)$$

Equation 2 states simply that if the manipulated factor or treatment ( $\tau$ ) is a necessary cause of  $\Psi$ , then evidence of the psychological phenomenon should not be found if  $\tau$  has not occurred.

$$P(\Psi/\tau) = 1 \text{ and } P(\Psi/\text{not-}\tau) = 0 \text{ if } \tau \text{ is a necessary and sufficient cause of } \Psi. \quad (3)$$

Equation 3 follows directly from Equations 1 and 2. If the manipulated factor or treatment ( $\tau$ ) is a necessary and sufficient cause of  $\Psi$ , then evidence of the psychological phenomenon should be observed if and only if  $\tau$  has occurred.

It is rare, however, for a single factor or determinant to assume a necessary and sufficient relationship with a complex psychological phenomenon, at least in a contextually generalized fashion. Rather, psychological phenomena are often subject to multiple determinants. This multiple determinism may assume one or both of two general forms. The first we term "parallel determinism," in which any of a number of factors are sufficient to evoke the psychological phenomenon. Thus,

$$P(\Psi/\tau) = 1 \text{ and } P(\Psi/\text{not-}\tau) > 0 \text{ if } \tau \text{ is a sufficient but not a necessary cause of } \Psi. \quad (4)$$

Equation 4 specifies that if the manipulated factor or treatment ( $\tau$ ) is a sufficient but not a necessary cause of  $\Psi$ , then evidence of the psychological phenomenon should be observed whenever  $\tau$  has occurred and may be observed even when  $\tau$  has not occurred.

From Equations (1), (3), and (4) and Bayes theorem, we also know that when  $\tau$  is a sufficient cause:

$$P(\Psi/\tau) = P(\Psi,\tau) / [P(\Psi,\tau) + P(\text{not-}\Psi,\tau)] = 1. \quad (5)$$

Therefore,

$$P(\Psi,\tau) = 1 \text{ and } P(\text{not-}\Psi,\tau) = 0.$$

That is, if  $\tau$  is a sufficient cause for  $\Psi$ , then it should always be followed or accompanied by  $\Psi$ . Of course,  $\Psi$  may appear reliably when  $\tau$  occurs, but the presence of  $\Psi$  does not necessarily imply  $\tau$ .

In a second form of multiple determinism, termed "convergent determinism," the convergence of a number of factors (or one or more factors in a specific context) is required to evoke the psychological phenomenon. Thus,

$$P(\Psi/\tau) < 1 \text{ and } P(\Psi/\text{not-}\tau) = 0 \text{ if } \tau \text{ is a necessary but not a sufficient cause of } \Psi. \quad (6)$$

That is, Equation 6 specifies that if the manipulated factor or treatment ( $\tau$ ) is a necessary but not a sufficient cause of  $\Psi$ , then evidence of the psychological phenomenon should not be observed if  $\tau$  has not occurred, and  $\Psi$  may or may not be observed if  $\tau$  has occurred. Equations (4) and (6) denote multiple determinism but represent complementing perspectives. Equation (4) implies that there are multiple independent causes for  $\Psi$ , whereas Equation (6) implies there are multiple synergistic variables which interact to produce  $\Psi$ .

From Equations (2), (3), and (6) and Bayes theorem, we also know that  $P(\Psi,\text{not-}\tau) = 0$  if and only if  $\tau$  is a necessary cause for  $\Psi$ . That is, if  $\tau$  is a necessary cause for  $\Psi$ , then  $\Psi$  should always be preceded or accompanied by  $\tau$ , although  $\tau$  could occur in the absence of  $\Psi$ .

It follows from the preceding analysis that if  $\tau$  is a sufficient cause for  $\Psi$ , then the  $P(\Psi/\tau) = 1$  and the effects documented in the experimentation will be *replicable*. Moreover, if  $\tau$  is *also* a necessary cause of  $\Psi$ , then the  $P(\Psi,\tau) = 1$  and the  $P(\Psi,\text{not-}\tau) = 0$  and the effects documented in the experimentation will be *generalizable*. If, however,  $\tau$  is a sufficient but not a necessary cause for  $\Psi$  (i.e.,  $\Psi$  is multiply determined by independent events), then the  $P(\Psi,\text{not-}\tau)$  may equal or approach zero (and  $P(\tau/\Psi)$  approaches 1) only because the other sufficient causes of  $\Psi$  have been controlled in a

particular experimental paradigm or assessment context. That is,  $P(\Psi, \text{not-}\tau) = 0$  in a given experimental context by virtue of experimental control: All other determinants of  $\Psi$  have been eliminated or held constant in the experimental setting. Because  $\Psi$  is multiply determined, however, the  $P(\Psi, \text{not-}\tau) > 0$  in natural (e.g., clinical) settings or populations. Thus, the "generalizing problem" need not reflect a methodological quagmire but rather can represent a theoretical challenge.

To summarize thus far, the fact that effects documented in carefully controlled experimentation lack generalizing power may not reflect any dubious feature of experimentation but simply the multiply determined nature of the phenomenon of interest.<sup>3</sup> By this reasoning, boundary conditions for theories can be identified, and new theoretical organizations can be discovered, when a "generalizing problem" arises, for instance, from the application of a basic social psychological theory to a clinical population or problem.

The number of processing elements, transforms, and steps necessary to account for a phenomenon tends to increase rather than decrease as the level of organization decreases. Thus, reductionistic studies are probably more, not less, subject to this generalizing problem. The illusion of generality can be achieved by the study of the behavior of simple systems rather than complex phenomena, however. Thus, documenting the  $P(\Psi/\tau) = 1$ , where  $\tau$  is a manipulation of events within a specific neurophysiological system, demonstrates lawfulness and may create the impression of generality, but it is subject to the same objection Allport (1968) raised about social psychological experimentation. Reductionistic studies demonstrating the sufficiency of  $\tau$  as a cause of  $\Psi$  are immensely important, but only because they guide and constrain more general theories of  $\Psi$ . The same holds when  $\tau$  is a molar treatment investigated by social psychologists within a carefully controlled experimental paradigm.

The realization that complex psychological processes and problems are multiply determined can also foster the transition from microtheories to general psychological theories. To the extent that a phenomenon is multiply determined, it is important to document and explain each of the determinants, for only in this way can a comprehensive understanding of a psychological phenomenon be achieved. Accordingly, basic research, even when conducted within contrived experimental paradigms, can provide important information about the determinants and moderating variables underlying complex psychological phenomena.

It should be recognized, however, that the cultivation of a carefully manicured experimental paradigm is valuable only as a way station en route to a comprehensive, unified, and behaviorally relevant body of scientific knowledge. Arriving at this final destination is fostered by treating generalization not as a threat to a theory or a nuisance to an investigator but as an important theoretical tool that can clarify the reasons and conditions under which specific causal factors and processes are operative. Thus, realization that a psychological phenomenon is multiply determined has important implications for psychological theory and for our understanding of mental disorders and mental health.

In an interesting Monte Carlo study, Ahadi and Diener (1989; see also Strube, 1991) investigated the magnitude of the relations among behaviors and traits when two behaviors were modeled as being determined by three traits, only one of which was a determinant of both behaviors. The average absolute value intercorrelation among the traits was nonsignificant, verifying the initial condition of the model in which each of the traits were set up as parallel determinants. Results also revealed that the upper bound for the correlation between the two behaviors was approximately 0.30, and the upper bound for the correlation between the common trait and the behaviors was about 0.50. When four rather than two traits were modeled as determinants of each of the two behaviors, with both behaviors being determined by one trait, the upper bound of the correlation between the two behaviors dropped to 0.25, and between the common trait and behaviors dipped to 0.45. Thus, the correlations between the personality traits and behaviors (i.e.,  $\tau$  &  $\Psi$ , respectively) in Ahadi and Diener's (1989) simulation study ranged from small to moderate even though the behaviors were modeled to be completely determined by a small number of traits. As Ahadi and Diener (1989) noted:

Given the wealth of literature in psychology concerning temperaments, attitudes, motivations, emotions, and so on, it appears much more reasonable to assume far greater than three or four determinants of behavior. The effect of adding any number of variables to the determination of behavior results in further decreases in the upper bound correlations that one can expect both among behaviors and between the determinants of the specific behaviors. (p. 403)

In sum, the predictable yield from isolated research on discrete determinants of a multiply determined psychological or be-

havioral outcome are low intercorrelations among the behaviors, low intercorrelations between the determinants of the behaviors, and a portfolio of disparate microtheories. These microtheories, each of which provides a limited account for the phenomenon of interest, are at best pieces of a larger conceptual puzzle that can foster theoretical integration and at worst imperialistic accounts that can hinder theoretical insight. This holds regardless of the level of analysis. Therefore, integrative research that specifies the conditions under which each of a set of factors or processes is operative, or that specifies the relationship between empirical observations at differing levels of analysis, constitutes an especially important theoretical advance.

A corollary of the principle of multiple determinism is the *corollary of proximity*, which states that the mapping between elements across levels of organization becomes more complex (e.g., many to many) as the number of intervening levels of organization increases. This is because an event at one level of organization (e.g., depressive behavior) can have a multiplicity of determinants at an adjacent level of organization (e.g., cognitive), which in turn may have a multiplicity of implementations at the next level of organization (e.g., neurophysiological), and so forth. The implication is not to avoid venturing across the abyss separating the macroscopic and the microscopic levels of organization but to proceed incrementally across levels of analysis. Understanding a behavioral problem at multiple levels of organization can be important in optimizing the selection and application of clinical interventions. Linking physiological functions to clinical progress and outcomes via intervening psychological and social processes may improve predictions of these outcomes and, more important, differentiate similar outcomes that were achieved by different means (e.g., see Cacioppo & Petty, 1986). Adoption of this approach could therefore prove useful ultimately in answering questions about what interventions and therapist behaviors are best for what problems in which individuals.

### **The Principle of Nonadditive Determinism**

This second principle also implies that the understanding of complex mental processes and behavior can be advanced by multilevel integrative analyses. According to this principle, properties of the collective whole are not always predictable from the properties of the parts until the properties of the whole have been clearly

documented and studied across levels. Thus, the principle of non-additive determinism builds on the preceding principle in underscoring the potential interactions among the determinants.

Analyses have traditionally focused on a given level of organization (e.g., behavioral, social psychological) with generally good success. Theories of emotion within social psychology, for instance, have been derived largely from verbal analyses, and the resulting knowledge regarding people's conceptual organization of emotion has contributed to our understanding of the cognitive antecedents and consequences of emotion (e.g., priming, cognitive appraisal, mood congruence effects). Analyses of a phenomenon when restricted to a given level of organization can also mask the underlying order in data, however. That is, certain properties of, or the order underlying, a mental or behavioral phenomenon may emerge only when examined across levels of organization. In an illustrative study cited by Markus and Kitayama (1991), Bontempo, Lobel, and Triandis (1989) compared the public and private responses of individuals from a collective culture to those from an individualist culture. They asked these individuals to indicate how enjoyable it would be to engage in a time-consuming behavior (e.g., visiting a friend in the hospital). Cultural context did not affect what individuals reported in the public condition; all subjects indicated their self-sacrificial behaviors would be enjoyable. However, only individuals from the collective culture reported that these behaviors would be enjoyable in the private condition. The "failure to replicate" the results of the public conditions in the private conditions does not imply that the mechanisms underlying emotions lack generality, but rather they suggest that self-construals derived from the sociocultural context can be a powerful theoretical element (e.g., see Markus & Kitayama, 1991). Note, however, that this theoretical insight was served by thinking about the evocation of emotion across levels of organization. Indeed, as Markus and Kitayama (1991) observe, were one to have limited the analysis of emotions to a cultural level of analysis, then one might have underestimated the generality of fundamental psychological processes or erroneously concluded that "culturally divergent individuals inhabit incomparably different worlds."

A conceptually similar illustration in a different venue is provided by Haber and Barchas (1983), who found that the administration of amphetamine had no reliable effect on primate emotional behavior until the primate's position in the social hierarchy was considered. Specifically, amphetamine administration increased dominant behaviors in primates high in the social

hierarchy but increased submissive behaviors in primates low in the social hierarchy. Although this result can be explained in terms of Hull-Spence drive theory, it is interesting because it demonstrates how the effects of the physiological changes on behavior can *appear* unreliable (or chaotic) until analysis is extended across multiple levels of organization. A physiological analysis, regardless of the sophistication of the measurement technology, may not have unraveled the orderly relationship that existed between the physiological manipulation and behavior. There are, of course, physiological mechanisms underlying these phenomena, but the identification and understanding of these mechanisms are often better served by systematic investigations within and across multiple levels of organization rather than by a reductionistic or a macroscopic focus alone.

Interestingly, although not cast within a formal analytic framework or psychological principle, Lorion (1991) recently summarized succinctly the implication of this (and the following) principle:

Psychology's potential contributions to improving the nation's health will be limited . . . if its diverse fields merely combine their respective findings. Instead, the discipline must engage in heuristic challenges presented by issues related to health promotion and disease prevention with truly collaborative exchanges across its multiple fields. To do so, psychologists must develop mechanisms to share their insights with each other and, in doing so, broaden their vision of psychological processes. (pp. 518-519)

### **The Principle of Reciprocal Determinism**

This third principle specifies that there can be a reciprocal influence between microscopic (e.g., biological) and macroscopic (e.g., social, cultural) factors in determining brain and behavioral processes. As suggested above, research in behavior genetics has revealed that there are a wide variety of genetic influences that are repressed unless or until certain environmental factors are introduced—that is, brain and behavioral processes are a function of particular genetic factors, the expression of which is governed by environmental agents (Plomin, 1989). Within social psychology, Zillmann (1984) has demonstrated that violent and erotic material influences the level of physiological arousal in males, and that the level of physiological arousal has a reciprocal influence on the perceptions of and tendencies toward sex and aggression. If

the social psychological level of analysis were ignored, the mapping between physiological reactions and behavior would appear more haphazard. Were the biological level of analysis to be ignored, our understanding of the determinants of the behavior would be incomplete.

Reciprocal determinism has also contributed to the explosion of interest in the burgeoning field of psychoneuroimmunology. Immune functions were traditionally considered to reflect specific and nonspecific physiological responses to pathogens or tissue damage (Roitt, Brostoff, & Male, 1985). It is now clear, however, that immune response are heavily influenced by central nervous processes that are shaped by psychological factors (see reviews by Ader, 1981; Kennedy, Glaser, & Kiecolt-Glaser, 1990). Indeed, effects of psychological context now appear to be among the most powerful determinants of the expression of immune reactions. Thus, an understanding of immunocompetence will be inadequate in the absence of considerations of psychosocial factors. Research on these interactions were activated by studies demonstrating the direct and moderating effects of psychosocial factors (e.g., conditioned stimuli, bereavement, social support, major life events) on immune competence (e.g., see Kennedy et al., 1990). However, few would question that significant decrements in immune function also exert at least indirect (and perhaps more direct) influences on psychosocial factors such as mood and stress. Thus, a complete understanding of psychoneuroimmunological processes may be inadequate in the absence of the analysis of reciprocal influences.

### **SOCIAL PSYCHOLOGY AS A HUB DISCIPLINE**

Thus far, we have reviewed principles of behavior that underscore the need to examine complex psychological phenomena and mental disorders from multiple levels of analysis and to work toward theoretical integrations of the empirical observations and micro-theories that emerge within and across these diverse levels of analysis. Although examining the processes underlying mental health from multiple points of view may be the look of the future, it is not entirely new to social psychology. As Gordon Allport (1968) noted:

An individual is a member of many publics, of many institutions, of many social systems. . . . It was Sapir who advised all social and

psychological scientists to form the habit of looking at their data both from the concrete individual point of view and from the abstract social point of view. It enriches research and theory to do so. (p. 55)

As we noted at the outset of this chapter, a variety of the most vexing and costly mental disorders today are social phenomena: the spread of AIDS, juvenile delinquency, child and spousal abuse, prejudice and stigmatization, family discord and divorce, worker dissatisfaction and productivity, drug abuse, and social anxieties and phobias are illustrative. Analyses of these problems across multiple levels of organization will likely contribute to the development of comprehensive theories and effective solutions. However, before one can effectively address the mechanism underlying some psychological disorder, one must have a clear description of that disorder. Because many of the problems in mental health arise from, relate to, or manifest behaviorally at a social psychological level of analysis, social psychology is in a unique position to furnish detailed descriptions of these phenomena and their sociocultural antecedents and consequences. Without carefully designed experiments on an agreed-on phenomenon, very expensive and misleading data are likely to result regardless of the level of analysis.

Second, research on a phenomenon from a different (e.g., physiological) level of analysis, particularly in the early stages, is served well by paradigms that allow the phenomenon of interest to be controlled by specific stimuli, conditions, or contexts in a temporally precise fashion. Recent advances in the neurophysiological substratums of learning and memory, for instance, owe a large debt to decades of basic research on classical conditioning because the paradigm for forming conditioned responses is so well developed (e.g., see Gormezano & Wasserman, *in press*). Similarly, social psychology has the potential to play a central role in the adaptation or development of paradigms within which to study disordered social processes.

Third, although social psychological theories of ordered and disordered social processes can be treated as autonomous from their structural or functional implementations, the documented relationships among variables can guide and constrain inquiries and inferences at other levels of analysis. For example, theory and research in social psychology have drawn attention to the likelihood that emotions in normal adults are not a function of actions *per se* but of some sort of monitoring system. Carver and Scheier

(1990) have further suggested that discrepancies between the expected and the perceived rate of progress toward goals are compared within this monitoring system, resulting in positive affect (if progress exceeds expectations) or negative affect (if expectations exceed progress) and action accommodations. The focus of theories such as Carver and Scheier's, with their emphasis on the self and expectancies, have important implications for analyses of affect and affect-disorders whether from a cross-cultural or neurophysiological perspective (e.g., see Markus & Kitayama, 1991).

Fourth, the specification of the social psychological basis of some health problems can be of immediate help in developing practical interventions. Consider the relative utility of specifying the sociocognitive versus the neurophysiological basis of patient delay following the onset of gynecological cancer. Women can now survive most gynecological cancers. Research on gynecological cancer further indicates that the prognosis for survival and for the quality of life following medical treatment is related to the stage of the cancer at diagnosis (Andersen, 1986). Women with advanced rather than early-stage disease at diagnosis, even if they survive, are more likely to suffer depression, to experience marital and family problems, and to require extended and expensive medical treatment. Hence, patient delay in seeking a diagnosis by women with cancer is a serious problem that carries large and long-term personal, family, and societal costs. The form of the representation provided, for example, by neuroscientific analyses of patient delay, while perhaps contributing to a more complete understanding of the phenomenon, is not optimal for identifying the determinants of patient delay or for developing effective interventions to minimize these delays. Substantial savings in resources and human suffering are there to be reaped, not through a specification of the brain circuits underlying patient delay but by well-conceived public health campaigns that identify the early signs of cancer and that minimize the material, emotional, and social costs of seeking diagnosis and treatment (Andersen, 1986).

Finally, support for social psychological research can be cost-effective due to the status of the field as a hub discipline. The applied areas of health, clinical, and counseling psychology rely heavily on basic theory and research developed in social psychology. Work in cognitive psychology, cognitive neuroscience, and artificial intelligence has benefited by examining the processes by which complex social decisions and choices are made. Social psychology is also a "hub" discipline in that it links to more departments in the social and behavioral sciences than any other.

Fields such as psychiatry, education, nursing, preventive medicine, communication, political science, education, family science, public policy, economics, social work, dentistry, sociology, journalism, linguistics, and cognitive science draw on basic research and theory in social psychology. As implied by the diversity of these related fields, the status of social psychology as a hub discipline derives in large part from the myriad interesting psychological phenomena that manifest (though are not entirely explicable) at a social psychological level of analysis.

If comprehensive explanations for these phenomena are also to stem from the field of social psychology, then some modifications may be required in the training of the next generation of social psychologists. To begin, social psychology training programs might attempt to overcome the tension between reductionistic and social psychological perspectives that has existed for at least the past half century (e.g., see the inaugural presidential address to the Division of Personality and Social Psychology by Allport, 1947). Reductionism has contributed to the solution of some of the most perplexing scientific problems in human history (e.g., see Boorstin, 1983) and has much to contribute to our understanding of social and psychological phenomena. However, it is counterproductive to presume that reductionism will convert the abstractions of the psychological sciences to a set of physical essentials and invariants. To do so ignores (1) the distinction between levels of explanation, (2) the scientific breakthroughs that can result from research across levels of organization, (3) the rich theoretical insights about the nature and timing of the relationships among variables that can be derived from descriptions of phenomena from multiple scales or perspectives, and (4) the economy of thought to be reaped by capitalizing on the form of representation most appropriate for the task. In addition, scientific provincialism in which any single level of analysis (e.g., neuroscientific, social psychological) is thought to be the most appropriate for understanding complex mental and social problems undermines multilevel, integrative analyses, alienates scientists working at "unchosen" levels of organization who might otherwise contribute relevant data and theory, and renders it acceptable to ignore relevant theory and data on a phenomenon of interest simply because they were not born from one's own level of analysis.

Social psychology training curricula might also be designed to equip its graduates with the background and expertise required to deal conceptually and experimentally with the complexities of

multiply determined phenomena. For instance, Ahadi and Diener's (1989) simulation studies of the determination of behaviors by multiple traits demonstrate that the theoretical magnitude of an empirical result cannot be judged by effect sizes alone. Thus, training in methods, experimental design, and statistical analysis, which furnish important tools for the social psychologist, might be augmented by considering the implications of the principles of multiple, nonadditive, and reciprocal determinism.

Perhaps more important, however, is a bridling of the emphasis on academic specialization and publication counts to allow students to secure a broader background in psychology. It is conceivable that social psychological research might be facilitated, for instance, by (1) requiring predoctoral students to complete two minors in addition to the required work in social psychology; (2) including "affiliated" (e.g., clinical, counseling) faculty in social psychological training programs to expose students to the complexities and theoretical richness of mental and social problems; (3) promoting student participation in interdisciplinary programs; and, possibly, (4) increasing student exposure to courses such as history and systems, philosophy of science, research ethics, and theory construction.

Students perhaps learn best, however, by observing models and by observing the consequences of their own actions in research. Thus, a multilevel integrative analysis could be a particularly powerful research training component if it represented the approach taken successfully by the training faculty. Bootstrapping is not the only means of achieving this feature in a social psychology training program. For example, a training faculty may have active research programs on affect, attitudes, and social cognition or interests in personality processes and individual differences. The complementing perspectives that can be brought to bear on these elemental social processes can range, of course, from the biological and developmental to the sociological and political, from the theoretical to the applied, and from the cognitive/experimental to the clinical. While few social psychology programs have the number and kind of faculty required to staff such a training program themselves, most social psychology programs exist within a larger department of specialized faculty, some of whom perhaps have interests in phenomena that stem from or can be related to social psychological phenomena. Research discussions and collaborations among such faculty and their students might not only constitute a rich training environment but yield new insights into the determinants and functions of, and mech-

anisms underlying, social psychological phenomena and mental and social problems.

### NOTES

1. The NIMH Behavioral Sciences Assessment Panel met during 1987 and 1988 to develop a conceptual framework for the advancement of research in the behavioral sciences (New Frontiers in the Behavioral Sciences and Mental Health, 1989). The panel members included Marilyn Brewer, Glen Edler, Walter Kintsch, Lewis Lipsitt, Martha McClintock, Anne Petersen (chair), Robert Plomin, David Reiss, and Arnold Sameroff.

2. Of course, phenomena such as maternal defense and territoriality can be examined at multiple levels as well, consistent with the suggestion that multilevel integrative analyses can inform a wide variety of phenomena that manifest in a sociocultural context or level of analysis.

3. Similarly, if  $\Psi$  is multiply determined by synergistic variables (see Equation 5) that coexist in the laboratory but not typically in nonlaboratory settings, then a "generalizing problem" will again be encountered. The resolution of this generalizing problem will again rest on insight into the multiply determined nature of  $\Psi$ .

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