

PART 3

Bridges With Biology, Neuroscience, and Cognitive Science



INTRODUCTION

Throughout the history of social psychology, we can witness continuity and change in the degree to which various bridges are being crossed. Changes are especially pronounced for bridges with biology and neuroscience. Although social psychology has been strongly connected to the study of biological systems, to animal research, and to the brain research, the popularity of these linkages fluctuated quite dramatically. However, in the past decade—sometimes referred to as “the decade of the brain”—we witness a remarkable increase in empirical studies that link socially shaped cognitions and emotions to the biological or neurological system, often using magnetic resonance imaging (MRI) or functional MRI (fMRI) techniques or physiological measures such as blood pressure or heart-rate variability. As a result of these studies, there is increasing consensus that various biological and neurological processes influence social processes and that various social processes influence biological and neurological processes. Such empirical efforts may touch on important scientific problems, such as the mind–body problem or the nature versus nurture controversy. Bridges with animal research hold promise but could be reenergized, because important questions that are hard to study with humans could perhaps be explored in animal studies. Bridges of social psy-



chology and cognitive psychology have received particular emphasis in the 1980s, with the emergence of social cognition as a new area of theory and research. Twenty years later we see that social cognition is not only a central area within social psychology, but also increasingly integrated with most areas of research in social psychology. As the various essays show, social psychology is essential to cognition and biology (“mind and body”) just as cognition and biology are essential to social psychology.

A Bridge Linking Social Psychology and the Neurosciences

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SOCIAL NEUROSCIENCE

Social psychology is the scientific study of social behavior, with an emphasis on understanding the individual in a social context. Accordingly, social psychologists study a diverse range of topics ranging from *intrapersonal processes* shaped by or in response to others, such as the self, attitudes, emotions, social identity, normative beliefs, social perception, social cognition, and interpersonal attraction; to *interpersonal processes* such as persuasion and social influence, verbal and nonverbal communication, interpersonal relationships, altruism, and aggression; to group processes such as social facilitation, cooperation and competition, equity, leadership, outgroup biases, group decision making, and organizational behavior. The dominant dependent measure in social psychology has been verbal reports, an approach that placed an emphasis on clever experimental design and inductive inference (Reis & Judd, 2000). With the advent of social cognition several decades ago, chronometric measures, often used in conjunction with experimental techniques such as priming, were added to the methodological armamentarium. Importantly, social cognition also brought with it a conceptual framework for asking questions about the representation of and information processing components underlying social psychological phenomena.

Over the past decade, yet another approach, conceptual framework for asking questions, and family of measures which collectively fall under the

heading of social neuroscience, have been added to the repertoire (Cacioppo & Berntson, 1992; Cacioppo et al., 2002; Ochsner & Lieberman, 2001). The emergence of social neuroscience is interesting in light of the fact that biological and social psychological approaches to human behavior began as allied areas at their outset. All human behavior, at some level, is biological, but this is not to say that biological reductionism yields a simple, singular, or satisfactory explanation for complex behaviors, or that molecular forms of representation provide the only or best level of analysis for understanding human behavior. Molar constructs such as those developed by the social sciences provide a means of understanding highly complex activity without needing to specify each individual action of the simplest components, thereby providing an efficient means of describing the behavior of a complex system (Cacioppo, Berntson, Sheridan, & McClintock, 2000). The vacuous application of overly simplistic and untestable biological causes (e.g., instincts) to explain every social behavior led, by the middle of the 20th century, to a deep schism and enduring suspicion (see review by Berntson & Cacioppo, 2000). Biopsychology began to emphasize cellular processes, neural substrates, and production mechanisms for behavior, largely ignoring or rejecting mentalist and functionalist theories, whereas social psychology emphasized multivariate systems, situational influences, and practical applications (see Allport, 1947). These divergences resulted in very different subject samples, research traditions, and technical demands, leaving what some regard as an impassable abyss between social and biological approaches (Scott, 1991).

Although autonomic and electromyographic measures appeared in the social psychological literature, they generally were used either as interchangeable indices of arousal or as a way of validating self-report measures. About half a century ago, for instance, Rankin and Campbell (1955) measured the electrodermal response of Caucasian participants to a Caucasian or African American experimenter as an index of arousal and thus, in this context, racial prejudice. Autonomic assessments of arousal in normal states is based on a theory in which autonomic activity ranges in a unitary fashion from low to high levels—a theory of autonomic organization and function that has been disconfirmed (Berntson, Cacioppo, & Quigley, 1991). On the other hand, when autonomic measures validated simpler social psychological measurements, the more difficult and costly autonomic assessments could be discarded in favor of the simpler, less expensive verbal assessments. Although somatovisceral measures occasionally were identified that provided information not easily available using self-reports (e.g., Cacioppo & Petty, 1981; Tomaka, Blascovich, Kelsey, & Leitten, 1993), outdated concepts of arousal remained the dominant biological constructs in social psychology, as is evident from a perusal of the subject indexes of the *Handbook of Social Psychology* (Gilbert, Fiske, & Lindzey, 1998; Lindzey & Aronson, 1985).

The past decade has seen something of a rapprochement between biological and social levels of analysis, in part because localized brain regions have been associated with social psychological processes (e.g., Cacioppo &

Berntson, 1992; Cacioppo et al., 2002; Klein & Kihlstrom, 1998; Ochsner & Lieberman, 2001). In past decades, studies of the neurophysiological structures and functions associated with psychological events were limited primarily to animal models, postmortem examinations, and observations of the occasional unfortunate individual who suffered trauma to or disorders of the brain. Developments in electrophysiological recording, brain imaging, and neurochemical techniques within the neurosciences have increasingly made it possible to investigate the role of neural structures and processes in normal and disordered thought in humans. Contemporary studies of racial prejudice, for instance, have utilized facial electromyography, event-related brain potentials, and functional magnetic resonance imaging (fMRI) to investigate specific, implicit cognitive and affective processing stages. Moreover, advances in ambulatory recording and its combination with experience sampling methodologies have removed the tether of the laboratory to permit in vivo investigations of biology and social behavior.

WHY TRY TO BRIDGE THE SOCIAL AND NEUROSCIENCES?

Contemporary work has demonstrated that theory and methods in the neurosciences can constrain and inspire social psychological hypotheses, foster experimental tests of otherwise indistinguishable theoretical explanations, and increase the comprehensiveness and relevance of social psychological theories. Several principles from social neuroscience further suggest that understanding social behavior requires the joint consideration of social, cognitive, and biological levels of analysis in an integrated fashion. The principle of *multiple determinism*, for instance, specifies that a target event specified at one level of organization, but especially at molar or abstract (e.g., social) levels of organization, can have multiple antecedents within or across levels of organization (Cacioppo & Berntson, 1992). At the biological level, for instance, we have identified the contribution of individual differences in cardiac sympathetic reactivity to people's susceptibility to illness, while on the social level, we have noted the important role of exposure to interpersonal stressors in daily life (Cacioppo et al., 1998). Both operate, and our understanding of immunity and health is incomplete if either a biological or a social perspective is excluded.

A corollary to this principle, termed the *corollary of proximity*, is that the mapping between elements specified across levels of organization becomes more complex (e.g., many-to-many) as the number of unspecified intervening levels of organization increases (Cacioppo & Berntson, 1992). An important implication of this corollary is that the likelihood of complex and potentially obscure mappings increases as one skips levels of organization. The effect of stress on health, for example, has been a heavily researched topic for over a century. Early studies were largely characterized by epidemiological approaches, and the outcomes correlational and probabilistic. This provided a somewhat fuzzy mapping at best, especially at the level of the indi-

vidual. That fuzziness was attributable to a number of then-unknown intervening variables associated with intermediate levels of organization lying between the psychological (stress) and the health outcome. These variables include an individual's diathesis (genetic or constitutional predisposition for particular maladies), as well as the neuroendocrine and immunological responses to the stress, which serve as important mediators of the relations between stress and health outcomes. Understanding the more proximal mappings between psychological stress and physiological (neuroendocrine and immunological) states and between physiological states and health outcomes can sharpen and inform the broader mapping between stress and health. Similarly, cognitive neuroscience is an important companion to social neuroscience for numerous reasons, among them that it helps bridge intervening levels of organization.

The principle of *nonadditive determinism* specifies that properties of the whole are not always readily predictable from the properties of the parts (Cacioppo & Bertson, 1992). Consider an illustrative study by Morgan et al. (2002). The dopamine D2 family of receptor binding potential is related to cocaine's reinforcing effects. Morgan et al. (2002) examined the D2 receptors in dominant and subordinate male cynomolgus monkeys when they were individually housed and, later, when they were socially housed. No differences were found in D2 family receptor binding potential in the monkeys when they were individually housed. After only 3 months of being socially housed, however, a dominance hierarchy emerged, and those at the top of the dominance hierarchy showed a significant increase in D2 family receptor binding potential, whereas the submissive animals showed no change in dopaminergic characteristics. More interestingly, behavioral testing further showed that dominant animals self-administered cocaine at levels comparable to saline—that is, the dominant animals acted as if cocaine had no reinforcing value—whereas subordinate monkeys reliably self-administered more cocaine at doses of 0.01 and 0.03 mg/kg than saline. The importance of this study derives from its demonstration of how the vulnerability to the abuse-related effects of cocaine is not predictable from dopaminergic characteristics of individual animals nor of dominance hierarchies alone, but rather they become apparent only after a dominance hierarchy emerged in socially housed groups. A strictly physiological (or social) analysis, regardless of the sophistication of the measurement technology, may not have revealed the orderly relationship that exists.

Finally, the principle of *reciprocal determinism* specifies that there can be mutual influences between microscopic (e.g., biological) and macroscopic (e.g., social) factors in determining behavior (Cacioppo & Bertson, 1992). For example, the handling of rat pups alters maternal behavior toward the pups and affects the structure and reactivity of the hypothalamic pituitary adrenocortical system (Meaney, Sapolsky, & McEwen, 1985). These early influences on the stress-hormone system, in turn, affect the pups' reactions to stressors and in later life and promote similar maternal behavior toward *their*

pups (Meaney et al., 1996). That is, the effects of social and biological processes can be reciprocal.

CONCLUSIONS

In the preceding paragraphs, we have discussed a few of the conceptual reasons for building bridges across the social and neurosciences. In many respects, we echo E. O. Wilson's (1998) argument that we are at a propitious moment in science where theoretical and empirical work to construct such bridges not only is possible but offers the possibility of more comprehensive theories of the human mind and behavior. In fact, the principles of multiple, nonadditive, and reciprocal determinism lead quite inextricably to the notion that interesting and complex aspects of the human mind and behavior may never be apparent by studying elements that are specified solely at the social (or biological) level of organization, as in scientific efforts that are limited to a single level of organization nonadditive and reciprocal effects slip away under the guise of error variance.

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