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Political Psychology and Social Neuroscience: Strange Bedfellows or Comrades in Arms?

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A special issue on neuroscientific contributions to political psychology may strike some as an odd choice. Neuroscientists, or so the stereotype goes, are concerned about the basic building blocks of life and behavior, whereas political psychologists are more likely to be concerned about voter sophistication, international conflict, and Armageddon. Neuroscientists are reductionistic, dismissive of behavioral scientists and ecological contexts, and prefer invertebrates to primates as subjects of investigation. Political psychologists, on the other hand, study everyday events in complex human societies to understand political choices, actions, and consequences in the real world.

Despite these stereotypes, neuroscientists and behavioral scientists are more similar than dissimilar on core questions, epistemology, and values. Neuroscientists are increasingly appreciative of the powerful role that social, political, and cultural factors can play in the development, selection, or maintenance of basic neurobehavioral mechanisms, whereas social scientists are discovering that neuroscientific principles and techniques can contribute to more realistic models of the diversity of mechanisms underlying social behaviors, empirical tests of conflicting theoretical accounts of social behavior, and more comprehensive understanding of social and political behavior (Cacioppo, in press).

If neuroscientists and political psychologists are not strange bedfellows, neither are they comrades in arms. The purpose of this special issue is to move ever so slightly toward the latter endpoint. Research in behavioral, cognitive, and social neuroscience has advanced our understanding of what and how people perceive, feel, and remember, and it is illuminating what and how people think, decide, and act. Together, this work and the theory and methods behind it have provocative if not yet important implications for theory and research on political behavior. The contributors to this special issue review relevant developments in the neurosciences, discuss representative research that features multilevel integrative analyses, and examine some of the challenges, perils, and opportunities

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that lie ahead. No single set of articles and commentaries can do justice to an interdisciplinary perspective that spans biological, cognitive, sociocultural, and political levels of analysis, so readers should view this special issue as a sampler, designed to excite with possibilities and incite further inquiry rather than to leave one intellectually sated.

Our purpose in this introductory paper is not to review specific theories or experiments—we have left those tasks in the able hands of our contributors. Instead, our purpose is to consider why readers might want to venture beyond their favored level of analysis, and how one might productively think about investigations that span multiple levels. We begin with a discussion of just what is meant by multiple levels, after which we discuss three general principles of multilevel analyses of complex behaviors.

Levels of Analysis

The term "level of analysis" has been used in various ways, including in reference to levels of structural organization, explanation, and processing. *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 to the cellular to the tissue to the organ to the body system to the individual to the dyad to the group to the sociopolitical 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 behavioral, social, or political phenomenon. A simple rule of thumb is that the levels of organization map reasonably well into university departments in the social, biological, and physical sciences.

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 voters, for instance, might specify a goal (e.g., minimizing losses and threats), the main components involved in the computation (e.g., outcome expectations), and the logic underlying the computation (e.g., rational choice). The *algorithmic level* encompasses questions about the predetermined procedure or ordered sequence of finite instructions used to achieve the correct output from a designated input. Finally, the *implementation level* refers to questions about the physical instantiation of the behavioral function and 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 (Churchland & Sejnowski, 1988) and to the depth of semantic analyses of words (e.g., Craik & Lockhart, 1972). Within social psychology, the term has typically been used to mean the extent of semantic or analytic reasoning underlying a judgment or decision. Thus, whether a voter is influenced by the merits of the arguments for a position or candidate, or is instead influenced by superfluous cues associated with or heuristic processes applied to the position/candidate, has been shown to be a function of the level of message processing (Petty & Cacioppo, 1981, 1986). In a more general sense, 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 low, relative to the level of processing underlying a deliberate vote for a candidate.

When the term *level of analysis* appears in the social or political psychological literature, it typically refers to the unique level of organization represented by a focus on the individual in a sociocultural context or on the reciprocal impact of individuals on one another and on society. Such analyses emphasize the influence of collections of individuals (e.g., groups, institutions, political parties, governing bodies, cultures)—past, present, and anticipated—on an individual's cognitive, affective, and behavioral responses. Although the output of a social system is enacted by individuals whose actions are controlled by the brain and nervous system, a complex system of any kind can rarely be understood as a simple extrapolation from the properties of its elementary components (Fodor & Pylyshyn, 1988; Marr, 1982). 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 other levels of the system (Cacioppo & Berntson, 1992).

In addition, each level of organization constitutes a particular kind of representation with which to examine human information processing 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 calls for multilevel integrative analyses of complex human behaviors and social phenomena (Cacioppo, Berntson, Sheridan, & McClintock, 2000). That is, 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 (for examples, see Adolphs, 1999; Cacioppo & Berntson, 1992; Cacioppo et al., 2003; Klein & Kihlstrom, 1998; Ochsner & Lieberman, 2001).

A confusion that sometimes emerges in multilevel integrative analysis is the belief that it is somehow incompatible with monism (e.g., Caldwell, 1994). All

human behavior is at some level 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 (Cacioppo et al., 2000). 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. Chemists who work with the periodic table on a daily basis nonetheless use recipes rather than the periodic table to cook, not because food preparation cannot be reduced to chemical expressions but because it is not cognitively efficient to do so. The scientist who uses sociopolitical, cognitive, and biological levels of analysis to understand behavior is no more a dualist than a chemist who uses both culinary and chemical levels of analysis to understand cuisine (Cacioppo, in press).

A second error sometimes made in multilevel analyses is what is termed the *category error* (see Cacioppo et al., 2002; Sarter, Berntson, & Cacioppo, 1996). The category error in cognitive neuroscience refers to the intuitively appealing notion that the organization of cognitive phenomena maps in a 1 : 1 fashion onto the organization of the underlying neural substrates. Memories, emotions, and beliefs, for instance, were each once thought to be localized in a single site in the brain. Current evidence, however, now suggests that most complex psychological or behavioral concepts do not map onto a single "center" in the brain. What appears at one point in time to be a singular construct (e.g., memory), when examined in conjunction with evidence from the brain (e.g., studies involving lesions), reveals a more complex and interesting organization at both levels (e.g., declarative vs. procedural memory processes). Even if there is localization, it will likely be elusive until there are coherent links between psychological/behavioral constructs and neural operations. Multilevel integrative analyses are therefore needed to foster appropriate revisions to our understanding of the targets of study at each level of analysis (Sarter et al., 1996).

To summarize, by multilevel we mean analyses of phenomena from various structural scales or perspectives, such as the neuroscientific, cognitive, social, and political. By integrative, we mean that observations at one level of organization are used to inform, refine, or constrain inferences based on observations at another level of organization. With these various clarifications in mind, we can turn to a review of three principles that underscore the potential importance of multilevel integrative analyses to the study of political behavior.

Organizing Principles

The three principles reviewed briefly here have served as general heuristics for organizing research in the field of social neuroscience (Cacioppo & Berntson, 1992; Cacioppo et al., 2003) and health (Anderson, 1998). The principle of

multiple determinism specifies that a target event at one level of organization, but especially at increasingly molar (e.g., social) levels of organization, can have multiple antecedents within or across levels of organization. Eating, for instance, is influenced by both hunger and social cues (Cornell, Rodin, & Weingarten, 1989). 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/or overcrowding, maternal defense, or territoriality at a sociopolitical level.

The implications of this principle are perhaps less obvious. Basic psychological research, with its emphasis on experimental control, has been criticized for yielding statistically reliable but trivial effects. Allport (1968) was among those who acknowledged that noteworthy scientific gains result from this hardnosed 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).

What Allport viewed as a problem of generalizability is cast as a theoretical challenge from the perspective of the principle of multiple determinism. A certain lack of generalizing power in studies of the role of single factors is a fundamental property of multiply determined phenomena (Berntson & Cacioppo, in press; Cacioppo & Berntson, 1992). This is because it is rare for a single factor or determinant to assume a necessary *and* sufficient relationship with a complex behavioral phenomenon, at least in a contextually generalized fashion. Rather, behavioral phenomena are often subject to multiple determinants, in the form of either parallel determinism (i.e., more than one factor is sufficient to evoke an effect) or convergent determinism (i.e., two or more factors in a specific context are necessary to evoke an effect). It follows that if a factor is a sufficient cause for an effect, then such an effect will be replicable if the conditions of the initial observation are also replicated. If the factor is *also* a necessary cause for an effect, then such an effect will also be generalizable. When an effect is multiply determined, the generalizing problem need not reflect a methodological quagmire but rather can represent a theoretical challenge. Accordingly, the fact that effects documented in carefully controlled experimentation lack generalizing power may reflect not any dubious feature of experimentation, but simply the multiply determined nature of the effect of interest. By this reasoning, boundary conditions for theories can be identified, and new theoretical organizations can be discovered, when a "generalizing problem" arises (Cacioppo & Berntson, 1992).

Small effect sizes are also less alarming in this context. To the extent that a phenomenon is multiply determined, it is important to document and explain each of the determinants—even if they each account for only small portions of the total variance, for only in this way can a comprehensive understanding of the phenomenon be achieved. Accordingly, basic research, even when conducted within contrived experimental paradigms, can provide important information about the

determinants and moderating variables contributing to complex behavioral phenomena. It also follows, 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 destination is fostered by treating generalization not as a threat to a given methodology 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. The realization that complex behavioral phenomena are multiply determined, therefore, may foster the transition from microtheories to general psychological theories.

A corollary to this principle (the *corollary of proximity*) is 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 (Cacioppo & Berntson, 1992). This is because spanning levels of organization increments linearly, whereas the complexity of the many-to-many mappings between these levels increases exponentially. The likelihood of complex and potentially obscure mappings therefore increases as one skips levels of organization. Contrasting metabolic brain images when individuals are thinking about a Democrat or a Republican, for instance, may produce pictorial clarity but is unlikely to produce theoretical clarity unless more specific information-processing components are also delineated and experimental conditions to test these intervening operations are also included (Cacioppo et al., 2002). Cognitive neuroscience, therefore, is an important companion to social neuroscience because it bridges 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. Analyses have traditionally focused on a given level of organization, as this typically defines scientific disciplines. Although such analyses are essential (see discussion above of the category error), they can also mask the underlying order in data and, hence, the properties of or mechanisms underlying a complex behavior. A study by Haber and Barchas (1983) illustrates this principle. They investigated the effects of amphetamine on nonhuman primate behavior. The behavior of the primates was examined after administration of amphetamine or placebo. No clear pattern emerged between the drug and placebo conditions until each primate's position in the social hierarchy was considered. When this social factor was taken into account, amphetamine was found to increase dominant behavior in primates high in the social hierarchy and to increase submissive behavior in primates low in the social hierarchy. Thus, this study demonstrates how the effects of physiological changes on social behavior may *appear* unreliable until the analysis is extended across levels of organization. A strictly physiological (or social) analysis, regardless of the sophistication of the measurement technology, may not have revealed the orderly relationship that existed (see also Hariri et al., 2002).

In a second 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 action (e.g., visiting a friend in the hospital). Cultural context did not affect what individuals reported in the public condition; all participants indicated that 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 condition in the private condition does not imply that the mechanisms underlying emotions lack generality, but rather that self-construals derived from the sociocultural context can be a powerful theoretical element (i.e., moderating variable). This theoretical insight was served by thinking about the evocation of emotion across levels of organization. As Markus and Kitayama (1991) observed, were one to have limited the analysis of emotion to a cultural level of organization, one would underestimate the generality of the fundamental psychological processes or erroneously conclude that culturally divergent individuals inhabit incomparably different worlds.

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 brain and behavioral processes. For example, not only has the level of testosterone in nonhuman male primates been shown to promote sexual behavior, but the availability of receptive females has been shown to influence the level of testosterone in the male primates (Bernstein, Gordon, & Rose, 1983).

Drug abuse, a significant public health problem in the United States, is also subject to reciprocal determinism. Not all people who use cocaine will become addicted, but little is known about the biological substrates or environmental influences underlying this differential vulnerability (Morgan et al., 2002). Dysregulation of the dopaminergic neurotransmitter system in the brain, especially the D_2 family of dopaminergic receptors, has been linked to cocaine abusive potential. For instance, the greater the D_2 receptor binding potential, the greater the vulnerability to cocaine's abusive potential. Morgan et al. (2002) showed both that D_2 receptor binding potential contributes to differential vulnerability to cocaine addiction and that social factors influence D_2 receptor binding potential. In their investigation, monkeys were individually housed and socially housed in groups of four. After 3 months of social housing, stable dominance hierarchies emerged, with submissive monkeys receiving more aggression and less grooming, showing submissive behaviors more often, and spending more time alone than dominant monkeys.

The brains of the monkeys were scanned using positron emission tomography (PET) while the monkeys were individually housed and again after they were

placed in social housing and a stable hierarchy had been established. Results showed that the D_2 receptor distribution volume ratios in submissive monkeys remained low whether individually or socially housed, whereas the D_2 receptor distribution volume ratios in dominant monkeys increased 22% when socially rather than individually housed.[1] The behavioral assessment of cocaine self-administration further revealed that the submissive monkeys self-administered more cocaine and that the dominant monkeys showed resistance to the reinforcing effects of cocaine in socially housed conditions (Morgan et al., 2002). Thus, dysregulation of the dopaminergic system renders primates vulnerable to drug abuse; in natural settings, the result will be a disproportionate number of addicts living in isolated conditions. Isolated living conditions, in turn, produce a D_2 receptor binding potential that contributes to one's vulnerability to cocaine addiction.

Each of these principles implies that comprehensive theories of complex political behaviors are unlikely to be achieved if the biological or the social level of organization is considered unnecessary or irrelevant. But going beyond one's favored level of analysis does not ensure that illumination will follow. As with any new endeavor, there are more dead ends than central boulevards, more ways to do something wrong than right. Considering the extraordinarily complex materials that need to be mastered at each level of analysis, it is understandable why transdisciplinary collaborations of like-minded social, cognitive, and neuroscientists who share a set of core questions tend to be more productive than isolated social scientists who decide they are going to learn neuroscience and incorporate it into their work (and vice versa). It is no accident, therefore, that so many of the articles in this special issue are co-authored by scholars from different scientific backgrounds. Their example might well be worth considering (see Anderson, Kessel, & Rosenfeld, in press).

Conclusion

The notion of capitalizing on both experimental and field research and spanning levels of organization to develop more comprehensive theories of social phenomena is quite familiar to social and political psychologists. As Gordon Allport noted more than three decades ago:

> 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. (Allport, 1968, p. 55)

[1] Increased D_2 receptor distribution volume ratios may result from increased levels of D_2 receptors or decreases in the basal levels of synaptic dopamine (Morgan et al., 2002).

What may be less obvious is that many of the same epistemological principles and theoretical considerations in research spanning cognitive, social, and political levels of organization also apply when considering biological levels of organization. We have reviewed such a set of principles and considerations to set the stage for the remaining articles in this special issue. The contributors to this special issue, in turn, provide exemplary surveys and research examples of these principles in practice. Social neuroscience is itself a field just over a decade old, and the study of political processes using neuroscientific principles and paradigms—with a few exceptions—is younger still. One cannot yet expect the field to have produced more comprehensive theoretical accounts of political cognition, affect, or behavior. One should, however, expect the inclusion of neuroscientific foundations and techniques to build on rather than to substitute for the extant theory and methods in political psychology. The articles in this issue were selected with this expectation in mind.

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