

I Introduction



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1 Prolegomena to Cognitive Social Sciences

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1.1 Something Missing

On a chilly autumn day in 2001, I walked through the broad sidewalks of the strangely quiet streets of Chicago in the early morning, a then unfamiliar city to me, to get to a meeting on “new approaches to the social sciences.” With an eager anticipation of being enlightened, I rushed through the ten-minute walk and arrived early at the grand and equally strangely quiet granite-clad University of Chicago Business School building in downtown Chicago for the meeting.

Sitting in the audience with the full expectation of being intellectually stimulated, I soon discovered that something important was missing. The longer I sat there, the more I felt that way. This idea was gnawing at me.

What I was feeling missing from this otherwise interesting meeting was a particular type of explanation of social processes and phenomena—what I considered to be a fundamental type of explanation for social processes and phenomena. We might term this type of explanation *psychological explanation* or *cognitive explanation* (in the broadest sense of the word *cognitive*). I prefer to refer to it as *cognitive explanation*, in recognition of the fact that many disciplines concerned with the human mind have come to be known, collectively, as the *cognitive sciences* (notice the plural form here). (I often would use *cognition-psychology* as a single term to highlight the inseparable nature of these two terms.)

In the evening, back in my hotel room, I continued my rumination. Looking out onto a 180-degree view from the floor-to-ceiling, wrap-around window of the corner room in the high-rise hotel, I could see a panorama of the city with its neon signs and flickering lights. I wondered whether it was indeed possible to explain a substantial part of social processes and phenomena from a cognitive-psychological point of view, whether correspondingly agent-based social simulation could be made more

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psychologically realistic, and whether the social sciences could thus be put on a more solid footing that was more “scientific” (but not necessarily more mathematical) in some way.

Evolutionary explanations have been popular in many segments of the scientific community, but they tend sometimes to provide only unverifiable “just so” stories. Mathematical models such as game theory are useful and well respected, but they are often too normative and fail to take into account real-world complexity. The social sciences are incredibly broad-ranging, varied, interesting, and stimulating, but they are also often chaotic and confusing. How do we make sense out of this chaotic, exciting scene?

1.2 Why Cognitive Sciences Are Needed

By any measure, the cognitive sciences (including computational psychology, experimental psychology, linguistics, cognitive neuroscience, and so on) have made tremendous strides in recent decades. In particular, computational cognitive modeling (i.e., computational psychology; see, e.g., Sun, 2008) has changed the ways in which cognition-psychology is explored and understood in many profound respects.

For example, there have been many detailed models of cognition-psychology proposed in the cognitive sciences (broadly defined, as mentioned above), leading to more in-depth, more mechanistic, and more process-based understanding of cognitive-psychological domains and functionalities. Empirical psychological research has also progressed to provide us with a better understanding of many phenomena, from “pure” cognition to social cognition and beyond.

Given such advances in the cognitive sciences, the question now is: can we leverage these successes for the sake of better understanding social processes and phenomena? More fundamentally, can the cognitive sciences provide a better foundation for important disciplines of the social sciences (e.g., sociology, anthropology, economics, political science, communication, as well as some more “humanity” related fields such as history, ethics, religion, law, literature, and so on)?

Thus far, although very much a neglected topic, there nevertheless have been various efforts at exploring this topic. Some of the efforts were computationally motivated; see, for example, *Cognition and Multi-Agent Interaction* (Sun, 2006). Other efforts were more empirical or theoretical in nature; see, for example, *Cognitive Dimensions of Social Science* (Turner, 2001).

Evidently, there are both theoretical and practical rationales for the establishment and development of “cognitive social sciences.” Any social

process occurs through the actions and therefore the minds of the individuals involved (DiMaggio, 1997; Turner, 2001; Sun, 2001, 2006). Whether in a specific context it is a deciding factor or not, taking cognition-psychology into serious consideration would be a reasonable step in trying to reach an in-depth, fundamental understanding of social phenomena. Some cognitive-psychological process details may turn out to be unimportant for a particular phenomenon, but this possibility cannot and should not be determined and declared a priori. Instead, it needs to be ascertained through empirical and theoretical work examining all factors involved, cognitive-psychological factors included.

To look at the issue in another way: the cognitive sciences may serve as a basis for the social sciences, in much the same way that physics provides grounding for chemistry or quantum mechanics provides grounding for classical mechanics. Social, political, and cultural forces, although perhaps “emergent” (as often claimed), act both *upon* individual minds and *through* individual minds. In that sense, minds, however complex or simple one conceives them to be, are the basis of social processes and phenomena. Macro-micro (social-psychological) interactions thus do exist and need to be understood. These two types of forces (macro and micro) interact with each other, giving rise to complex sociocultural and cognitive-psychological phenomena (e.g., Tetlock & Goldgeier, 2000; Sun, 2006).

The social sciences are facing their share of challenges, in terms of making significant breakthroughs, becoming more rigorous, connecting better with the physical sciences, and so on (see, e.g., chapter 14 by Mathew McCubbins and Mark Turner in this book). I would contend that the social sciences might find their future in the cognitive sciences, at least in part, which may well lead to a powerful, productive, and unified intellectual enterprise. Such a unification, or grounding as I called it (Sun, 2006, 2010), may provide the social sciences with imaginative research programs, novel paradigms and frameworks, new syntheses, hybridization, and integration, and so on, in addition to providing the cognitive sciences with new data sources and problems to account for.

Some sociologists (such as cognitive sociologists) and anthropologists (such as psychological and cognitive anthropologists), as well as social and cultural psychologists have been interested in socioculturally shaped cognition. That is, they are interested in how culture and social processes shape individuals’ minds (see, e.g., Zerubavel, 1997; Cerulo, 2002; D’Andrade & Strauss, 1992). The other side of this equation—how cognition (human psychology) shapes, substantiates, and grounds social institutions, social structures, social processes, and culture—is largely underexplored

(of course, with exceptions as always; see, e.g., Sperber, 1996). The fact that this issue has been underexplored makes it even more important a candidate for serious examination, in both theoretical and empirical ways.

Looking into the future, one can easily see how the understanding of human cognition-psychology and its relation to sociocultural processes may lead to better understanding of a wide range of important issues in the social sciences, ranging from religion and international relations to politics and economics (e.g., see the various chapters on these topics in the current volume). These issues are important not only for academics, but also for policy makers and practitioners in many different fields. There have been some promising signs already from the nascent field of cognitive social sciences, as described by various chapters in this book. I will get back to the topics discussed in these chapters a little later. For now, let us look into a broad framework first, which justifies the aforementioned “grounding” (integration/unification).

1.3 Levels of Analysis and Links across Levels

As discussed in Sun (2006), one interesting but unfortunate characteristic of the current social and cognitive sciences is a relative lack of interaction and integration among disciplines (the kinds of collaboration reported in this volume are rare). Each discipline tends to consider a particular aspect and more or less ignore the rest. They generally do not work together (although there have been calls for cooperation; see, e.g., chapter 15 by Herbert Gintis).

Instead of adhering to this relative isolation of disciplines from one another, we may adopt a broader perspective. For one thing, we may take a look at multiple levels of analysis. As we will see, these levels of analysis in the social sciences can be cast as a set of related disciplines, from the most macroscopic to the most microscopic. These different levels include the *sociological*, *psychological*, *componential*, and *physiological* levels. In other words, as has been argued in Sun, Coward, and Zenzen (2005) and Sun (2006), we may view certain different disciplines as different levels of abstraction for exploring essentially the same broad set of theoretical questions (with different emphases, of course).

The *sociological level* includes sociocultural processes, social institutions, structures, organizations, and inter-agent interactions, as well as interactions between agents and their sociocultural environments. These issues have been studied by sociology, anthropology, political science, and economics.

Next is the *psychological level*, which covers individual behaviors as well as concepts, beliefs, knowledge, and skills employed by individuals. Between this and the sociological level, the relationship of individual concepts, beliefs, knowledge, and skills with those of the society and culture, and the processes of change of these, independent of or in relation to those of society and culture, may be investigated.¹ This level examines human behavioral data, comparing them with models and with insights and constraints from the sociological level and more detailed information from the lower levels.

The third level is the *componential level*. This level attempts to understand the mind in terms of its components, applying the language of a particular theoretical paradigm. This level may involve conceptual, computational, and/or mathematical structural specifications, such as specifying computationally an overall architecture of the mind and the components therein (e.g., Newell, 1990; Sun, 2002). Essential processes within each component as well as essential connections among components may also be specified. Constructs and data from the psychological level—that is, the psychological constraints from above, which bear on the division of components and the processes within components—are among the considerations. This level may also incorporate biological and physiological notions regarding divisions; that is, it can incorporate constraints and ideas from the level below. This level results in mechanisms, though they may be computational-mathematical and thus somewhat abstract compared with the physiological level.

Although the componential level is essentially about intra-agent processes, conceptual, computational, or mathematical models developed therein may be used to capture processes occurring at higher levels, including interactions at the sociological level that involve multiple individuals (Sun, 2006). That is, we may construct agent models from a sub-agent level (the componential level), but go up from there to the psychological and sociological levels. For example, the CLARION “cognitive architecture” model specifies component mechanisms and processes and their interactions, and then moves up to higher levels to account for psychological and sociological data (Sun, 2002).²

The lowest level of analysis is the *physiological level*, which refers to the biological substrate (the biological implementation) of the mind’s computation. This level has been the focus of a range of disciplines. Biological substrates may provide useful inputs as to what kind of computation is likely at a higher level and what a plausible architecture at a higher level should be like. Thus the utility of this level includes facilitating analysis

at higher levels, using lower-level information to narrow down choices in determining the overall architecture as well as choices in describing componential processes.

Although analysis in theoretical or empirical work is often limited to within a particular level, this need not be the case: cross-level and mixed-level theoretical analysis and modeling could be enlightening, and might even be crucial (Sun, Coward, and Zenzen, 2005; Sun, 2006). These levels, as proposed above, do interact with each other (e.g., by constraining each other or grounding each other; more on this below) and may not be easily isolated and tackled alone. Moreover, their respective territories often lack clear-cut boundaries.

Normally, theories begin with the specification of units of analysis within a specific level, such as the sociological level. Theories that cross or mix levels subdivide such units and therefore may prompt deeper explorations (e.g., cognitive analysis of sociological issues). In relation to the theme of the present book, crossing and mixing levels of analysis constitutes the meta-theoretical foundation of cognitive social sciences, the integration of the cognitive and social sciences, which will be explicated in more detail below.

A key theoretical issue in this regard is the micro-macro link between society and individuals (see, e.g., Alexander, Giesen, Munch, & Smelser, 1987; Sawyer, 2003; Sun, 2001) or, more specifically, the micro-macro link between the social and the cognitive-psychological, crossing the first two levels (or more). The general questions regarding the micro-macro link are as follows: how do individuals affect collective processes and phenomena, and how do collective processes in turn affect individuals? In order to explore the questions at sufficient depth, it is necessary to delve into individual cognition-psychology, because the cognitive-psychological processes of individuals are presumably the most important factors at the micro level. (Of course, one may choose to believe that individuals are just puppets of inescapable social forces, but in that case there is, practically speaking, no longer a question of the micro-macro link.) Hence crossing and mixing the sociological and psychological levels (as well as possibly other levels) is the prerequisite for a better understanding of social processes and phenomena (from the standpoint of the micro-macro link), as argued in the previous section.

Another key theoretical issue in this regard is downward versus upward causation across levels. This issue has been controversial (see, e.g., Wimsatt, 1997). In the present context, upward causation refers to influences from the micro to the macro (from individuals to society), and downward causa-

tion refers to influences from the macro to the micro (society to individuals). The precise nature of these two directions of causation, however, may be murky. For example, it is unclear whether downward causation from a macro state is supervenient on causation within micro states and, if so, whether it is meaningful to separate out downward causation (see, e.g., Kim, 2006; Craver & Bechtel, 2007). I will discuss this issue later in relation to the nature of cognition-psychology specifically (as opposed to pure philosophical argumentation).

The following sections look into specific cases of crossing and mixing levels with regard to analyzing sociocultural and psychological phenomena, while keeping in mind both upward and downward causation.

1.4 Grounding of Culture in Psychological Processes

We may first examine the relationship between culture and individual. In particular, the influence from culture to the cognitive-psychological, an instance of downward causation, has been emphasized in the literature in recent decades (e.g., Zerubavel, 1997; Shore, 1998; see also chapter 4 by Bradd Shore in this volume). However, in this relationship, besides downward causation, we also need to examine the importance of the cognitive-psychological to culture. Geertz (1973) claimed, "We are, in sum, incomplete or unfinished animals who finish or complete ourselves through culture." But, apparently—at least to some extent, and possibly to a very large extent—culture must function *through* the cognitive-psychological.

It seems fairly straightforward that culture is, at least in part, based on our innate cognitive-psychological capabilities and tendencies. As Richerson and Boyd (2005) argued:

Culture causes people to do many weird and wonderful things. Nonetheless, the equipment in human brains, the hormone-producing glands, and the nature of our bodies play a fundamental role in how we learn and why we prefer some [cultural] ideas to others. Culture is taught by motivated human teachers, acquired by motivated learners, and stored and manipulated in human brains. Culture is an evolving product of populations of human brains, brains that have been shaped by natural selection to learn and manage culture.

Chapter 10 (by Harvey Whitehouse) in the present book makes similar points about evolved psychology and culture.

As an example of this point, naive sociological classification reveals the relationship between cognitive capabilities and cultural categories (Sperber & Hirschfeld, 1999). Children tend to attend to surface differences in forming categories and interpret these categories in terms of these

superficial features. For example, children sort people by gender before they sort them by political party affiliation. That is, children learn to pick out social groups that are visibly distinct earlier than they learn about other, less visually marked, groups (although exceptions exist). Those categories based on surface differences are more culturally salient as a result of this cognitive tendency.

Cultural tools or artifacts and their relationship to corresponding cognitive processes are another example. Lévi-Strauss (1971) suggested that the structure of oral narratives might reflect an optimal form for memory (a cognitive process) unaided by external inscriptions. Boyer (2001) suggested that counterintuitiveness of religious beliefs might serve mnemonic purposes (a cognitive process) as well.

Culture, furthermore, may even be defined in many ways by individual cognition, although on a collective scale. For example, if people of a particular culture collectively recognize that social castes are genuine social categories, they become genuine social categories. The formation and recognition of social groups relies heavily on verbal labels, communication (verbal and nonverbal), stereotyping (embedded in communication and action), and other cognitive processes. Furthermore, the supplement, or even displacement, of “natural” features of social group membership (or category membership in general) by cultural features makes possible the construction of novel social groupings (or novel categories in general). That is, the cognitive ability to construct abstract or otherwise less “natural” features leads to cognitive changes in individuals and then to cultural changes on a collective scale, which may in turn effect cognitive changes in additional individuals. This process goes from the individual mind to the sociocultural, and then back to the individual mind.

The stability and transmission of culture are also critically dependent on cognitive-psychological processes and their characteristics. Sperber (1996) argued for an “epidemiological” approach to culture. According to this view, culture is the distribution of ideas, concepts, representations, and artifacts among a population. Specifically, social interactions may distribute similar mental representations and public productions (behaviors and artifacts) throughout a population; mental representations and public productions stabilized through such processes constitute the cultural.

However, cultural contents transmitted through a chain of individuals (through their cognitive-psychological processes) undergo changes, distortion, and decay. For one thing, imitation is not very reliable (e.g., one cannot imitate internal mental states, such as implicit skills, implicit memory, and so on; Sun, 2002). Research on memory and communication

shows that both memory and communication often involve reconstruction rather than mere copying. So, what makes stable cultural contents possible? There are two types of explanations (see Sperber & Hirschfeld, 2004; see also chapter 9 by Ilkka Pyysiäinen in this volume): (1) the stabilizing role of psychological learning biases in transmission (favoring, for instance, prestige or conformity), (2) the stabilizing role of the predisposition to acquire knowledge structured in domain-specific ways (within domain-specific modules that embody biases). Both approaches recognize the importance of the psychological in explaining the macro-level phenomenon of culture.

At this point, it seems that we are focusing on telling only half the story (an often neglected half). Just as social processes must be understood in relation to cognitive-psychological processes (although they may not be fully determined by such processes), it seems that cognitive-psychological processes need to be understood in relation to sociocultural processes (e.g., Nisbett & Norenzayan, 2002). It goes both ways, it appears. Besides, we do not always know exactly what constitutes cognitive-psychological universals (as opposed to cultural specifics) in every case. For example, research has shown the importance of specific cultural models for individual cognitive and motivational processes (see, e.g., D'Andrade & Strauss, 1992 and Shore, 1998; see also chapter 4 by Bradd Shore in this volume).

In this regard, currently scientific research points to two fundamental ideas about the human mind: (1) the mind is the product of evolution (thus cognitive-psychological universals are likely; Carruthers, Laurence, & Stich, 2005); and (2) the mind is shaped by culture (even specific forms of culture; e.g., Shore, 1998). These two views of the mind are not mutually incompatible (Richerson & Boyd, 2005; Schaller, Norenzayan, Heine, Yamagishi et al., 2009). Furthermore, they are not incompatible with the idea of grounding social phenomena in psychology in the quest to better understand social processes and phenomena. This is because cognitive-psychological universals resulting from evolution likely exist, and they likely affect culture and social processes (as variously argued by, e.g., Sun, 2001; Sperber & Hirschfeld, 2004; Carruthers et al., 2005; Semin & Echterhoff, 2010), so understanding social phenomena through cognition-psychology is useful.³ It is likely that the mind may be "fine-tuned" by different cultures, but cognitive-psychological universals may not be completely displaced or eliminated (at least in most cases; Nisbett & Norenzayan, 2002; Carruthers et al., 2005; Semin & Echterhoff, 2010). Therefore, grounding sociocultural phenomena in cognition-psychology is theoretically possible despite the existence of cultural differences.

Furthermore, it is possible that culture, the collective phenomenon, is enacted at the individual level, at least in part, through shaping and fine-tuning innate cognitive-psychological capacities (cognitive-psychological universals) in individuals (Sun, 2001; Sperber & Hirschfeld, 2004), so that cultural influence on cognition-psychology may in fact be an instance of social phenomena enabled through psychology. The enactment of culture through shaping and fine-tuning innate cognitive-psychological mechanisms and processes (cognitive-psychological universals) of individuals may be understood in this way: culture is the distribution of ideas, representations, and so on in a population (e.g., according to Sperber, 1996), and culture-specific cognitive, motivational, and other representations are made possible on the basis of tapping into and fine-tuning innate psychological mechanisms and processes (Sun, 2001; Carruthers et al., 2005; Sun, 2009; Semin & Echterhoff, 2010).

Moreover, it is understood that cognitive-psychological universals may have evolved in specific historical sociocultural contexts (e.g., in hunter-gatherer societies) and hence take on characteristics of these contexts, which is another sense in which culture might be grounded—that is, in this case, engraved—in individual cognition-psychology.

At an individual level, mechanistically, it has been hypothesized that culture may manifest in individual minds as *schemas* (see Fiske & Linville, 1980; DiMaggio, 1997; etc.). However, schemas can exist and be accessed (and thus affect behavior) only through innate cognitive capacities such as memory, reasoning, and decision making. This point seems to have been well established in the cognitive sciences, especially in computational psychology. Hence the importance of cognitive-psychological universals.

However, culture need not be understood as simply the vague notion of schemas, whatever that notion means in practice. It should be, and can be, more specifically pinned down in a mechanistic, process-based way, as computational cognitive modeling (computational psychology) would provide.

In the cognitive sciences, schemas are hypothesized slot-filler structures employed in the interpretation of input, guiding of action, and storage of knowledge in memory. Connectionist models, however, view them as resulting from excitatory and inhibitory connections among many simple processing units. Connectionist models posit that memory consists of a connected network of units, each of which can have a certain activation. Knowledge is distributed over the units and connections (with weights) between them.

Furthermore, the more recent development of *cognitive architectures* leads to a more comprehensive, yet more detailed, understanding of the mind. The notion of (computational) cognitive architecture denotes generic, comprehensive computational models of the mind (Newell, 1990; Sun, 2002). These models capture mechanistic and process details of generic psychological functions, thereby producing realistic computational simulations in a qualitative or quantitative way (e.g., Sun, Slusarz, & Terry, 2005; Helie & Sun, 2010). For example, CLARION is such a cognitive architecture, one that notably centers on the distinction between implicit and explicit processes, as well as the interaction of multiple subsystems (modules; Sun, 2002).

With the cognitive architectures in mind, it is possible to take a broader view and make more general points about the mind, while at the same time being more specific and detailed. It may be claimed, in accordance with the ideas above, that culture (at the individual level) is the complex and specific patterns of interaction of an individual with its social and physical environments. In particular, in accordance with the CLARION cognitive architecture, it involves the implicit psychological processes underlying such interactions, as well as explicit beliefs and knowledge that may result from and impinge on such interactions (Sun, 2002).

Implicit (unconscious) processes that govern interaction with the world may, in some sense, be described as *schemas*. They often consist of relatively fixed patterns of interaction—specific actions for specific situations, similar situations leading to similar actions, and so on (in a statistical sense; that is, with certain variability and flexibility). However, such interactions are often rather direct—unmediated by explicit processes and unreflective (Heidegger, 1927/1962; Dreyfus, 1992; Sun, 2002).

Beyond immediate, unreflective direct interactions, explicit thinking (explicit reasoning, explicit reflection, and so on) in the human mind also affects an individual's interaction with the world. Explicit conceptual representations and processes are abundant in human cognition (Carey, 2009) and may, directly or indirectly, guide an individual's interaction with the world. They are actually more akin to the traditional notion of schema discussed earlier. The interplay and balance of implicit and explicit "schemas" (or, more generally, psychological processes) are yet to be fully understood (see, e.g., Sun, Slusarz, & Terry, 2005 and Reber, 1989).

When discussing culture and schemas, it is also important to take into consideration the role of essential, intrinsic motivation in human beings (a crucial psychological aspect; Sun, 2009; Dai & Sun, 2011; Murray, 1938). At least in part, culture may be determined by essential human motivation.

For example, a culture may suppress a certain aspect of human motivation and highlight some others, but it nevertheless has to be in accord with essential human motivation as a whole in some way. Therefore, in a sense, culture may be (in part) viewed as a manifestation of essential human motivation (e.g., as discussed in Sun, 2009). Different cultures, then, may represent different manifestations of essential human motivation. I would argue that, to fully understand culture, it is important to understand essential human motives and take them into consideration when theorizing about culture. It is not enough merely to look at cognition in the narrow sense (learning, memory, concepts, skills, and so on); cognition in a broader sense—all psychological processes and mechanisms—must be considered.

Armed with these conceptual tools, we may address issues and problems related to culture in terms of the psychological. For example, issues of culture fragmentation, schema aggregation, and other related phenomena—identified by DiMaggio (1997) as some of the most puzzling conceptual problems—may be examined with the perspective above, as discussed in depth in Sun (in press). In general, cultural studies seem to have taken a cognitive turn in exploring a wide range of topics.

To reiterate the points discussed thus far regarding the psychological underpinning of culture: first, as argued thus far, cognition-psychology is important to culture. Second, culture may consist of more than schemas psychologically. The notion of schema, although useful as a first approximation, seems inadequate for capturing the full complexity of culture. Third, both implicit and explicit psychological processes need to be taken into consideration. Fourth, the relation of culture to human motivation also needs to be taken into consideration, which moves us further away from the simple notion of schema as well as cognition in the narrow sense.

Finally, although psychological aspects of culture are only one part of the sociology of culture, it is impossible to ignore them and still have a good understanding of how culture works. Any understanding of the impact of culture on daily practice has to be based on an understanding of the psychology of culture (Sun, 2001). Understanding of culture needs to be connected with the understanding of psychology, because culture is grounded in actual human psychology. Work in cognitive psychology, social psychology, computational psychology, and so on provides useful tools for pursuing such understanding.

1.5 Collective Ramification of Psychological Particulars

Upward causation from individuals to society may be revealed, in part, through demonstrating how cognitive-psychological factors and

parameters affect macro-level social processes and phenomena. This can be done through computational simulation, as well as through empirical work. Using such explorations, it is possible to discern the importance of the psychological to the social.

First, the significance of cognitive factors in the formation, adaptation, and maintenance of social institutions should not be underestimated (although some social phenomena may be cognition-independent, as some would plausibly argue). Some work has been done on this often-neglected issue.

One example along this line is an application of the CLARION cognitive model mentioned above to simulating survival strategies of tribal societies under various environmental conditions (Sun & Naveh, 2007). These simulations dealt with a world with randomly distributed food items and agents. There were harsh, medium, and benign environmental conditions, distinguished by the agent-to-food ratios. Agents had a limited life span that varied depending on energy. Agents looked for and consumed food in an effort to prolong life.

A tribe in which each agent relied on only its own resources was said to have adopted an individual survival strategy. A tribe in which resources were transferred from one individual to another adopted a social survival strategy. For example, the “central store” was a mechanism to which all agents in a tribe transferred part of their resources. The resources collected by the central store could be redistributed to members of the tribe (according to some formula).

The agents in this simulation were cognitively realistic. The CLARION cognitive architecture from which these agents were constructed captured a variety of cognitive processes in a psychologically realistic way (Sun, 2002). Therefore, simulating social survival strategies using CLARION could shed more light on the role of cognition and its interaction with social institutions and processes. The major objective, in fact, was to investigate that interaction (that is, the micro-macro link) through varying cognitive parameters of the agents.

Through extensive simulation, relationship was identified between various cognitive parameters and social processes, indicating, for example, that the social institutions and norms adopted (such as survival strategies) might have something to do with the cognitive abilities, tendencies, and characteristics of the agents involved. This relationship, which may be termed *social-cognitive dependency*, could have significant theoretical and empirical implications (amid other types of dependencies in different directions; more on this later). For example, some forms of social systems and social institutions might be suitable for certain cognitive

characteristics, but unsuitable for others. Thus, one social system or institution might not be universally better or worse than another. Rather, a host of other factors—cognitive factors, in particular—might affect which social system or institution is best in each case. Sociocultural variability exists as the result of active human agency and human psychology, and not merely top-down inscription onto the minds of individuals. An earlier article, Sun (2001), contains a more substantial discussion of the close relationship between cognitive and social processes, and advocates the exploration of cognitive-psychological principles of sociocultural processes.

This work has since been extended into investigating motivational factors and their relevance to social institutions. Similar demonstrations via simulation of the role of psychological factors in social phenomena and processes have been described in domains ranging from organizational decision making (e.g., Sun & Naveh, 2004) to academic publishing (e.g., Naveh & Sun, 2006).

Aside from simulation studies, there have been other indications of upward causation in which psychology plays a crucial role. A case in point is the institution of religion, which has been shown to be shaped by cognitive-psychological factors.

In this regard, Atran and Norenzayan (2005) argued that “religion is not an evolutionary adaptation per se, but a recurring cultural byproduct of the complex evolutionary landscape that sets cognitive, emotional, and material conditions for ordinary human interactions.” In relation to the supernatural aspects of religious beliefs specifically, Boyer (2001) argued that “minimally” counterintuitive concepts that violated a small number of intuitive expectations, such as a talking tree or an invisible man, were better remembered than either intuitive concepts or maximally counterintuitive concepts that violated a larger number of intuitive expectations. A number of empirical studies have found some support for this cognitively based explanation. It has also been hypothesized that better recall for “minimally” counterintuitive concepts was a consequence of evolutionary processes that resulted in a cognitive architecture in which such concepts were better remembered. Hence, such concepts likely won the competition among ideas so that their representations became widespread and cultural (cf. the epidemiology of beliefs of Sperber, 1996, discussed earlier). See also chapters 8 and 10 by Scott Atran and Harvey Whitehouse, respectively, in this volume.

Beyond memory advantages (which are cognitive in the narrow sense of the term), there are also other psychological (e.g., perceptual, motivational, or emotional) factors underlying religion. For example, the

supernatural agent concept common to almost all religions involves the triggering of an innate agency detector (Atran & Norenzayan, 2005), the natural domain of which encompasses animate objects relevant to individual survival, such as predators, protectors, and prey, but may also extend to other things. Furthermore, in relation to essential human motivation (Sun, 2009), it has been argued that religion responds to some basic human needs and motives, such as the need for safety, the need for a superior authority, and so on, although some researchers dispute such arguments (Sperber & Hirschfeld, 2004). In particular, core religious beliefs often “minimally” violate ordinary notions about what the world is like, enabling individuals to imagine supernatural worlds (that are “minimally” impossible) that solve the most serious existential problems, including, in particular, the inevitability of death (Atran & Norenzayan, 2005). Here again, we see how large-scale social phenomena, including social institutions such as religion, may be explained, at least in part, by the cognitive-psychological particulars of individuals.

Culture, as discussed at length earlier, also heavily involves upward causation from cognitive-psychological characteristics to macro-level social phenomena, although the conventional wisdom has focused more on causation in the other direction. Because this has been discussed earlier, these points concerning how the psychological (at the micro level) affects culture (at the macro level) will not be repeated here.

It is also worth pointing out that some cultural input that are contrary to innate cognitive-psychological constraints and preferences may be rejected or transformed. An example is creole. When different linguistic communities are brought together, the linguistic consequence is the emergence of a pidgin (a cobbled language of which no individual is a native speaker). Sometimes, children are raised with a pidgin language. When pidgin utterances are input to the language-acquisition device in children, a creole, a natural and fully elaborated language, may be the output. Children transform an incomplete cultural form into a fully developed one. This can be attributed to the fact that they are equipped with an innate (evolved) cognitive device for acquiring language, which has its own preferences and constraints (Bickerton, 1990). This phenomenon, again, shows the importance of cognitive-psychological particulars for macro-level phenomena (such as language).

Despite the significance of individual psychological particulars, notably, people often overlook the importance of cognition-psychology when theorizing about social phenomena. For example, current work in social simulation tends to ignore the role of cognitive-psychological processes and to

adopt simplified models of agents instead. The social sciences (and “social engineering” in practice) ignore cognition-psychology at their own peril. In history, there have been many examples of failure of social theories, social institutions, or social practices, due to the failure to take into account important factors of human psychology. For example, some socioeconomic theories failed because they failed to take into account human psychology and human nature (especially motivation, emotion, and so on). For another example, some religious doctrines have rarely been strictly obeyed in the modern world. Although it is almost a necessity that certain counterintuitive beliefs as well as other anomalies are instituted in religion, many practices that go against essential human nature have not been strictly followed, at least since modernity (Sun, 2006).

1.6 Two-Way Interaction

At this point, it would be helpful to examine some scenarios of simultaneous occurrence of both upward and downward causation and their interaction. It helps to examine specific ways in which downward or upward causation actually takes place, instead of abstract descriptions. Again, I want to emphasize the importance of the cognitive-psychological in grounding the social in this discussion. The existence and the importance of simultaneous micro-to-macro and macro-to-micro influences have been identified, described, and argued for, including computational modeling and simulation of such influences.

For example, in Sun (2001), “power asymmetry” in the two-way interaction was discussed: “Although the relationship between an individual agent and society is complex and goes in both ways, it has been recognized that, fundamentally, it is the influence from the society on individuals that matters more. ... Individuals find themselves already ‘current in the community’ (Heidegger, 1927/1962). Their cognitive processes and thus their behaviors are shaped by their social environments” (see also Bourdieu & Wacquant, 1992). Macro-to-micro downward causation takes place in many ways. In this process, individual psychological processes serve as the basis and the constraints for such shaping to take place, thereby grounding social practices, norms, culture, institutions, and a variety of other aspects in individual cognition-psychology.

Vygotskian “internalization,” in particular, is important in this regard. Vygotsky (1986) emphasized social interaction as a major determinant in the development of thinking in individuals. One aspect of internalization lies in the genesis of verbal thoughts. According to Vygotsky, speech

develops before the development of internal verbal thinking. It starts at the single-word level, which serves the function of labeling. Labeling itself is sociocultural, because it is based on the established convention of a sociocultural and linguistic community. However, when more complex speech develops, it directly serves a social function (e.g., to get someone to do something). When speech loses its social functions (e.g., when nobody responds to a child's request), it can be turned inward and thus become a request or command to oneself (in Vygotsky's term, an egocentric speech). Speech can thus be transformed from an interpersonal function to an intrapersonal function. Egocentric speech can be further turned inward and become internal verbal thoughts. Internal thinking, accomplished without overt utterances or actions, relies on internalized signs/symbols from sociocultural contexts. Internalized sociocultural signs/symbols enable individuals to develop rich representations, including those formed socioculturally and historically (Sun, 2001). However, internalized signs/symbols are not innocuous: they carry with them particular sociocultural perspectives and biases. Through internalization, the thinking of an individual may be thereby mediated by externally given signs/symbols, along with their associated perspectives and biases. Such internalization has implications for grounding the social in the psychological, because it is one specific way through which downward causation is made possible.

Based on this notion of internalization, detailed computational models may be developed. CLARION may be used as an example here. Internalization can be accomplished in CLARION through the "top-down" assimilation process (described in Sun, 2002), which matches well the phenomenological characterization of internalization. The direct acceptance of external symbols, rules, and so on into the explicit processes of CLARION captures the initial stage of internalization. The assimilation into the implicit processes, however, captures a deeper process by which external symbolic structures are meshed with implicit routines, reflexes, and behavioral propensities so that they can effectively affect an individual's comportment in the world. On the other hand, implicit learning also captures the internalization of sociocultural aspects through interacting with those aspects (Sun, 2002). Through internalization, according to CLARION, the behavior of an individual and the psychological processes underlying the behavior are mediated by the sociocultural world, including signs/symbols as well as associated perspectives and biases.

The other side of the coin is the process that gives rise to the sociocultural environment (from the interaction of individuals): although the

influence of society on individuals is overwhelming, the influence in the other direction is also important. As emphasized by phenomenological sociologists, social reality is an “ongoing accomplishment” actively constructed through organized practices of everyday life by individuals. Social reality is, in some ways, an aggregate product of the actions, routines, skills, knowledge, decisions, and thoughts of individuals, each of whom has a direct, meaningful interaction with his or her world (Sun, 2001). Evidently, in this process, the cognitive-psychological inner working of individuals matters, because it is such inner working that leads to thoughts and actions by individuals. So, as long as we acknowledge the existence of the influence in an upward direction—that is, as long as we reject the notion that individuals’ actions are completely, inescapably determined by external social forces—it is almost inevitable that we acknowledge the significance of individual cognition-psychology in affecting macro-level social processes, structures, and institutions (as demonstrated in the previous section by simulation examples and other illustrations). Even in internalization discussed earlier, individuals naturally gravitate toward those perspectives and biases provided by culture that strike a chord with their innate psychological propensities and prior learning and experiences. Individuals need not be consciously aware of this process; human instinct is often more powerful than conscious reasoning (see chapter 7 by Kristen Monroe).

Note that the micro-to-macro (individual-to-society) influence has been discussed, for example, by Schelling (1971), Axelrod (1984), and others. What has not been emphasized sufficiently is the role of individual cognitive-psychological processes in this influence. However, Sun (2001, 2006) emphasized this role, which went beyond the usual treatment of upward causation.

Going back to two-way (micro-to-macro and macro-to-micro) interaction, let us revisit the tribal society simulation discussed earlier. In that simulation, on the one hand, there is the *social-cognitive dependency* alluded to earlier, which indicates that the social institutions and norms adopted might have something to do with the cognitive abilities and characteristics of the agents involved. However, on the other hand, some cognitive attributes may have been selected through evolution to work with certain social systems and cultural environments, which may be termed the *cognitive-social dependency* (Sun & Naveh, 2007). There are, of course, other types of dependencies: cultural practice, social institution, human psychology and behavior, and physical environment influence each other; together, these dependencies form a complex dynamic system of interwoven interactions. In such a dynamic system, it is important to understand not only direct

effects of dependencies, but also indirect effects, which are not obviously related to their causes but are often crucial for discerning the functional structures of the system. A simulation of both upward and downward causation was described by Bravo (2009) in which micro-level processes influence macro-level institutions, which in turn influence micro-level processes.

Macro-level social structures often have demonstrable causal effects on individuals, even when those individuals are not consciously (explicitly) aware of them (Sun, 2001). However, individuals might, at least sometimes, come to explicitly recognize macro-level phenomena and explicitly alter their behaviors to take account of them. This may be termed *cognitive emergence* or *implicit-to-explicit explication* (Sun, 2002). This explicit recognition requires higher-level cognitive abilities with some understanding of wider social contexts. The importance of the cognitive-psychological to the social is evident in this process.

In CLARION, implicit perception, cognition, and action can be carried out, responding to environmental regularities and internal/external reward structures, taking (implicit) account of various types of macro-level structures and institutions. Explicit mental recognition of the macro-level structures may emerge through a variety of cognitive means, including “bottom-up learning” (explication) through turning implicit representations into explicit representations (Sun, 2001, 2002).

An illustrative case of both upward and downward causation (often used in the discussion of this topic) is as follows: individuals interact locally and move in a given spatial environment; they construct buildings that stand or fall depending on their usefulness to the individuals involved (upward causation). The space through which individuals move is defined by where buildings are. This is a macro-level structure that influences individual movements and the interactions among individuals (downward causation). The movements and the interactions of the individuals in turn influence the survival of the buildings, and therefore the structure of the space (upward causation).

In this case, the downward causal forces appear given and non-negotiable. That is, once a building is constructed, it seems to have an existence of its own, independent of the people who built it or are using it. It appears to exert causal influence on those who are using it, whether or not they are consciously (explicitly) aware of the exact nature of the structure or its impact on them. The theoretical question is whether there are non-physical social structures that operate like such a building; that is, whether there can be social structures as autonomous from individuals as a building can be once it has been built.

Some believe that there are. However, others (such as phenomenological sociologists or interpretive sociologists) disagree. Some theorists further argue that buildings are not completely autonomous either—what matters is how the buildings are perceived or interpreted (by architects, engineers, owners, occupants, caretakers, passersby, and so on). This argument not only leads to an individualist perspective (Sawyer, 2003; Sun, 2001), but also to a cognitive-psychological perspective, because individuals' psychological processes determine their perception, interpretation, and consequently action. Regardless of whether they are tangible or not (i.e., physical or non-physical), macro-level structures constrain individual behaviors only if individuals exist—macro-level structures are not independent of individuals in that sense. Furthermore, they matter only if individuals perceive, interpret, recognize, memorize, and react to them. So, *ultimately*, they exist in and through individuals and their cognition-psychology.

This point applies not only to macro-level structures such as political systems, norms, and other non-physical structures, but also to physical structures such as buildings, roads, bridges, and so on, because otherwise buildings and roads will not be buildings and roads, but piles of stones, bricks, concrete, steel, and so on. Any macro-level structure matters only if it exists in a perceivable and relevant way for individuals, which can then be taken into consideration in the actions of individuals. Macro-level structures matter only if they affect the actions of individuals. The upshot is that the cognitive-psychological perspective—that is, perspective from the viewpoint of individuals—is important in this matter, and moreover, that the issue cannot be fully understood without the cognitive-psychological perspective.

Furthermore, Craver and Bechtel (2007) argue that all causation actually takes place within levels, and therefore there is really no cross-level causation. Across levels, there are constitutive relationships. So, what is regarded as “downward causation” (e.g., from the social to the individual) does not involve top-down causes, but only within-level causation plus constitutive relationships across levels (see also chapter 9 by Ilkka Pyysiäinen). This view is consistent with the multilevel analysis framework outlined earlier, and argues for the importance of psychological understanding of the social.

Along this line, some social science researchers have focused on individuals' internal psychological representations of macro-level social aspects. For example, Fiske & Linville (1980) and DiMaggio (1997) claimed that the notion of schema was especially relevant to the individual internal representation of culture (as discussed earlier). The idea that social

structures exist simultaneously through individual internal mental representations and in concrete social relations was also central to Nadel's (1957) theory.

Regardless of whether there are "autonomous" macro-level structures, representations of macro-level structures (including their processes and mechanisms) need to be taken into consideration in theorizing and in agent-based social simulation (Sun, 2006). This is because such mechanisms, processes, and structures are pervasive in society (at least in the modern world), and their existence is readily felt from the perspective of individuals (such as a physical market, a currency note, a law, a bus route, a highway, and so on).

1.7 An Overview

The remainder of this book has been designed to capture issues in a wide selection of areas and fields in the social sciences. Chapters are divided into four major parts, focusing on culture, religion, politics, and economics, respectively, in addition to a final part that examines unifying perspectives in general.

Part II of this volume is concerned with culture and how it is related to cognition-psychology. The three chapters cover a range of issues, from psychological explanations of cultural differences to cognitive effects of cultural models. They cover the impact of cognition on culture, as well as the impact of culture on cognition. As discussed earlier, ultimately, culture may be instantiated through cognitive-psychological processes.

Chapter 2, by Paul Thagard, addresses methodological issues, including the relation between the cognitive and the social sciences. It rejects the view that the study of humanity must be a hermeneutic enterprise eschewing the concepts and methods of science such as psychology. But it also rejects the reductionist view that social phenomena should be directly derived from cognitive phenomena. The methods pursued in this chapter aim at providing explanations of social phenomena by drawing on models of human cognition.

Chapter 3, by Nibert Ross, asks the question of what the cognitive sciences can do for anthropology in studying different cultures. Multiple examples illustrate how methods and theories from the cognitive sciences can enrich anthropology in significant ways. It argues that the cognitive sciences and anthropology complement one another, and that together they can form new approaches for addressing important questions concerning the human mind and society.

Chapter 4, by Bradd Shore, focuses on the issue of perspective in cultural models, specifically the distinction between egocentric and allocentric cultural models. It takes this distinction, which has been studied in terms of spatial cognition, into other, less obvious areas of mental representation, and tries to take the discussion on culture and cognition a step further.

Part III is concerned with the cognitive-psychological basis of politics. The three chapters in this part together explore how politics may be better understood from a cognitive-psychological perspective. These chapters call for further work along this line to advance the understanding of the cognitive-psychological basis of political science.

Chapter 5, by Stanley Feldman, Leonie Huddy, and Erin Cassese, touches on an important issue. It argues for a fine-grained understanding of emotion in understanding political cognition. Different emotions may lead to different styles of cognition, which affect individual political opinions and the resulting political dynamics. To fully understand domestic political processes, international relations, and so on, a better understanding of the roles of emotion and motivation is needed (Lebow, 2008; Dai & Sun, 2011).

Chapter 6, by Peter Bull and Ofer Feldman, shows the relevance of a number of cognitive theories to understanding political discourse. The chapter does so in multiple cultural contexts. Contemporary politics is “mediated” politics: the communication skills of politicians play a crucial role. The cognitive theories discussed in this chapter lead to better understanding of political communication and political behavior, and are useful for framing future research.

Chapter 7, by Kristen Monroe, argues for a moral psychology that is appropriately constrained by the architecture of the human mind—its development, emotion, social psychology, and the limits of human capacity for rational deliberation. The chapter shows how details of human psychology help determine moral choices. This point has significant theoretical and practical implications for political science and beyond.

Part IV of this book includes three chapters on religion and the relationship between religion and psychology. These chapters show how religion may be understood (in part) through human cognition-psychology. All three chapters discuss the complex interaction between cognitive-psychological factors on the one hand and sociocultural factors on the other in the context of evolution.

Chapter 8, by Scott Atran, explores an array of factors leading to religion. It argues that religion, an interwoven complex of rituals, beliefs, and

norms, arises from a combination of the mnemonic power of counterintuitive representations, the evolved willingness to adopt culturally acquired beliefs (e.g., from commitment-inducing devotions and rituals), and the selective effect of competition among societies and institutions. None of these (many of which are cognitive-psychological) evolved for religion, *per se*, but they together, possibly along with other factors, give rise to the institution of religion.

Chapter 9, by Ilkka Pyysiäinen, specifically examines competing explanations of the persistence of religious beliefs. This persistence may be in part explained by various biases in cultural transmission; these biases include tendencies to do what the majority does, to imitate prestigious individuals, and to punish non-cooperators. But biases cannot operate in a cognitive vacuum; to fully account for them, cognitive considerations are required. This discussion points to multilevel explanations that do not necessarily entail reductionism.

Chapter 10 by Harvey Whitehouse explores how ritualized behavior may be rooted in psychology, linked to the natural human propensity to imitate trusted others. The role of ritual in the formation and regulation of human societies is discussed (e.g., rituals may benefit group building). Anthropological research, including case studies, field research, and large-scale ethnographic surveys, has been conducted. These studies lead to the development of theoretical models and agent-based computational simulations.

Part V explores the cognitive-psychological basis of economics, including the debates and controversies that it engenders. These chapters show that, in general, it is highly beneficial to study cognitive-psychological factors in investigating economic issues and problems.

Chapter 11, by Don Ross, begins with a broad sketch of views toward psychology in the history of economics. It reviews the current state of theoretical modeling of the economic agent; in particular, it addresses a specific phenomenon—intertemporal discounting of utility. It points out that the cognitive sciences have not yet become a significant supplier of variables or parameters to economic models. Future interdisciplinary collaboration likely depends on better integration of cognitive models and multi-agent models of social interaction.

Chapter 12, by Jon Kable, argues for the role of neuroeconomic research within the context of multiple levels of analysis (e.g., as discussed above in section 3). The field of neuroeconomics provides useful lessons regarding the promises and pitfalls of drawing links across the cognitive and the social sciences. This chapter highlights some of those lessons while

providing an overview of neuroeconomics. It argues that neuroeconomics provides examples of how the social sciences can be grounded in the cognitive sciences—not just in psychology, but also in cognitive neuroscience.

Chapter 13, by John McArdle and Robert Willis, discusses frameworks used by psychologists and economists for studying the development of ability, knowledge, and skills over the human life cycle. Economists were largely unaware of the theory of fluid and crystallized intelligence in psychology, while psychologists were equally ignorant of the theory of human capital in economics. The chapter shows the parallel between the two theories and ways in which they may be integrated for studying practical issues.

Part VI contains two chapters on broad issues across fields: culture, religion, politics, and economics. How can the social sciences be grounded in the cognitive sciences? How can the social and cognitive sciences be more unified? These are fundamental metatheoretical questions.

Chapter 14, by Mathew McCubbins and Mark Turner, discusses what are believed to be important ideas offered by the cognitive sciences to the social sciences. In the past, the cognitive sciences have undermined confidence in some apparently unobjectionable assumptions held by many social scientists. This chapter instead offers some positive suggestions for the social sciences from the cognitive sciences.

Chapter 15, by Herbert Gintis, identifies a number of components for a unified social science: gene-culture coevolution, game theory, the theory of norms, the rational actor model, and complexity theory. Evidently, cognition-psychology plays an important role here. But is it emphasized sufficiently and properly? An even more important question is: What else is needed as part of the foundation for the future social sciences? These questions are yet to be answered (cf. Camerer, 2003; Sun, 2001).

The contributors of these chapters were asked to provide (a) an overview of a field, (b) an in-depth discussion of a research program, and (c) a broader discussion addressing a set of issues concerning the cognitive social sciences. It is useful to achieve a proper balance between breadth and depth.

The contributors were asked to address, among others, the following questions in their chapters:

- What are the relevant major open issues in your (social sciences) field? How does cognitive-psychological understanding shed new light on these open issues?

- What are the future potentials and possibilities in shedding more light on your field through cognitive-psychological investigation (or “grounding”)?

Then, the contributors were asked to address the following broader questions:

- What general lessons have been learned in investigating cognitive-psychological factors in your field? What are the general benefits and pitfalls of such an investigation?
- Can such an investigation be generalized to other areas/fields within the social sciences? What are the possible ways of generalizing the approach to other areas/fields?

With these questions addressed to various extents in this book, I hope that the final product reasonably clearly, evenhandedly, and convincingly demonstrates the pros and cons, the general applicability, and the future prospect of the cognitive social sciences.

1.8 Final Remarks

To ground or not to ground the social sciences in the cognitive sciences: that is the fundamental question.

There have always been at least two schools of thought on this question: (1) cognition-psychology is an important factor in, or even the holy grail and the final frontier of, the social sciences; or, (2) cognition-psychology is largely irrelevant, in terms of being a major deciding factor, in social matters, compared to the strength of social forces. I have argued in favor of the first view all along. To add more support to this view, let me cite briefly some well-known authors and schools of thought (in the process, risking misrepresenting their views).

While an adequate account of historical precedents of the cognitive social sciences would take far too long, it is worth mentioning some particularly relevant ones. Max Weber, for example, pointed out that, unlike the physical sciences, the social sciences need to gain an “empathetic understanding” of the “inner states” of social actors, and thus gain an understanding at both the level of causation and the level of “meaning” (that is, cognition/motivation of social actors). Alfred Schutz, for another example, attempted to understand the construction of social reality from the point of view of the individual in terms of meaningful actions, motivations, and a variety of different kinds of social relationships.

In a related fashion, psychoanalytic anthropologists have conducted their fieldwork and then used psychoanalytic techniques to analyze the generated materials, thereby grounding the social in the psychological. More recently, cognitive anthropology has similarly drawn on insights from the contemporary cognitive sciences in its theories and analysis (such as applying the notion of schema, as discussed above).

Paul DiMaggio put it this way:

Cognitive aspects of culture are only one. ... part of the sociology of culture's domain. But it is a part that we cannot avoid if we are interested in how culture enters into people's lives, for any explanation of culture's impact on practice rests on assumptions about the role of culture in cognition. I have argued that we are better off if we make such models explicit than if we smuggle them in through the back door. (DiMaggio, 1997)

My epiphany from that cold autumn morning in Chicago seems to have been (at least partially) validated.

Finally, I shall add that the theme of the present book happens to be the "grounding" of the social in the cognitive-psychological, or to put it in another way, the importance of the cognitive-psychological to the social. However, this emphasis does not exclude influence in the other direction, nor other ways of unifying or structuring different disciplines, whether as different levels or not. Every discipline has its place (more or less). In particular, "once developed, a cognitive theory ... will not displace or dismiss social science, any more than the theory of evolution supplanted the local study of zoological phenomena in all their particularity" (Turner, 2001, p.12). It is impossible to emphasize everything under the sun in one volume; we have to be selective, emphasizing one aspect out of many. In this case, I have emphasized what I consider to be an important, even indispensable, aspect of unifying the cognitive and social disciplines.

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Notes

1. See Sun (2001) for a more detailed argument for the relevance of sociocultural processes to cognition-psychology and vice versa. More on this in the sections below.

2. The importance of this level has been argued for, for example, in Sun (2002) and Sun, Coward, & Zenzen (2005).
3. "Of course genetic elements of our evolved psychology shape culture—how could it be otherwise?" (Richerson & Boyd, 2005).

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