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Mining the intersections of cognitive sociology and neuroscience

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Abstract

Over the past 50 years, cognitive neuroscience has emerged as the dominant player in research on thought. In an effort to keep their voices heard, social psychologists, anthropologists, political scientists and even economists have joined cognitive neuroscientists in lively dialog. But many sociologists are stubbornly clinging to the sidelines, honoring – and in some cases strengthening – rigid intellectual boundaries. Triggered by DiMaggio's (1997) well sounded call to action, a distinct group of sociologists are challenging such boundaries and pursuing a new path. In this essay, I discuss several recent works that constitute a new and powerful page in cognitive sociology, and more broadly, in the study of culture and cognition.
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1. Introduction

Have you ever wondered why you buy some things and not others? Why you make the moral judgments that you do? How you seem to know when people are lying to you? Or why you crave chocolate or cigarettes? Journalists at the *New York Times*, *Newsweek*, and *Science*, media icons like Bill Moyers, Robert Winston – even Oprah, believe they have found the answers to such questions. These sources queried cognitive neuroscience on the matter, and they were told quite definitively that the "hows" and "whys" of what we do are all in the brain.

The brain is hot . . . and cognitive neuroscientists have it. These specialists want to teach us about it – even help us tour the brain via fMRIs, PET scans, and other "tangible" images. Who are these cognitive neuroscientists? They come from an exploding discipline that resulted from a long resisted intellectual marriage – a marriage between neuroscientists (who typically focus only on the physical mechanisms of the brain) and psychologists (who generally prefer to study the functions of the mind). It took quite some time, but they are together now – neuroscientists and psychologists listening to subjects, gazing at their fMRIs, and happily probing the "mindful"

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aspects of the brain such as attention, perception, classification, decision making, reasoning, remembering, morality, and emotion.

What's wrong with this picture? Attention, perception, classification, decision making, reasoning, remembering, morality, and emotion – these are topics that cultural and cognitive sociologists have been studying for years as well. So why are not sociological explanations of these processes part of this burgeoning discourse? Were sociologists painfully rejected by the bride or the groom of the cognitive neuroscience marriage? Or did they choose not to enter the courtship?

1.1. Sociology and cognition

Cognition has been a persistent theme in sociological theory. Manheim, for example, wrote quite prolifically on cognition, urging us to study it as a relational phenomenon – a product of multiple perspectives that traverse space and time. Decades later, Berger and Luckmann made cognition the centerpiece of their social constructionist theory, arguing that cognition – consciousness in particular – was the very engine of society. Aaron Cicourel, too, worked for years to bring ideas on cognition into the study of micro interaction, for he believed that such patterned exchange was best studied and understood by attending to cognitive elements – especially linguistic principles. And in recent years, Eviatar Zerubavel has emphasized the cultural aspects of cognition, examining thought processes relative to the broad cultural contexts in which they occur. Of course, some suggest that Pierre Bourdieu supercharged a "cognitive turn" in contemporary sociology, considering cognition as both "dependent" and "independent" variable. On the one hand, Bourdieu focused intently on the development of cognition via the "habitus". But he was equally enthusiastic about the contribution of habitus to the formation of broader social systems or "fields".

These scholars, and others like them, can be credited with establishing a sociology of the mind – a distinctive approach to understanding the sociocultural aspects of thought. To be sure, we have learned much from these ideas and the projects they have generated. At the same time, I suggest that this literature has produced an unintended consequence. The sociology of cognition has become overly insulated–a "gated" intellectual community. Many attempt to explain this insulation (DiMaggio, 1997; Cerulo, 2002; Bergesen, 2004a,b); others to justify it (see e.g. Zerubavel, 1997; Button, 2008; Coulter, 2008). But justified or not, the effects of this insulation are clear. While psychologists, anthropologists, neuroscientists, political scientists and even economists have joined in lively dialog, sociologists seem to be clinging to the sidelines, honoring – and in some cases strengthening – rigid intellectual boundaries.

Happily, there have been exceptions to this pattern. In his classic 1997 essay "Culture and Cognition", Paul DiMaggio urged sociologists to take a fresh look at cognitive neuroscience (cognitive, social, and experimental psychologists in particular), arguing that new and important developments have occurred in these fields. "Cognitivists," wrote DiMaggio, "have developed ingenious empirical techniques that permit strong inferences about mental structures, going far toward closing the observability gap between external and subjective aspects of culture." (1997:266). Others joined DiMaggio in making impassioned pleas for disciplinary cross talk (see e.g. Cerulo, 1995a,b, 1998, 2002, 2006; Massey, 2002; Howard and Renfrow, 2003; Bergesen, 2004a,b; Brubaker et al., 2004; Wuthnow, 2007). The result has been an exciting line of research that brings sociologists in full dialog with other scholars of the mind. In this essay, I discuss several recent works in this growing perspective – works that constitute a new page in cognitive sociology, and more broadly, in the study of culture and cognition.

2. ''Continuing'' the story of the mind

Cognitive neuroscientists have presented us with a number of ''stories'' regarding the brain's role in thought: stories about neural paths and connections, the sites of addiction, emotion, and morality, the veracity of memories, etc. In many circles, these stories have been adopted as finished products. But I argue that such research is merely the first chapter of a broader, richer narrative – a narrative that sociologists are well suited to extend and, in some cases, complete.

2.1. Continuing the story of neural mechanisms and processes

Cognitive neuroscience work on neural mechanisms and processes provides a case in point: fMRIs and the like have elucidated the ways in which the brain acquires, organizes and stores information. But in recent years, sociologists have elaborated these findings in promising and exciting ways.

2.1.1. Automatic versus deliberate cognition

Consider the story of automatic versus deliberate cognition, two cognitive styles studied extensively by cognitive neuroscientists. Automatic cognition involves rapid, effortless, unintentional thought; it allows us to quickly process information without extended review. Automatic cognition is tied to the existence of ''schemas'' (or more formally schemata) – knowledge structures such as stereotypes, scripts, etc. that, with broad strokes, represent the characteristics of people, places, objects or events and allow us to infer what these entities do, where they fit, and what to expect of them. (I will elaborate on the sociological aspects of schemas later in this article; but note that schemas are central building block for the processes discussed here.) Deliberate cognition involves a different neural experience; it refers to slow, considered, and measured thought. When engaged in deliberate thought, individuals may reject or override their schemas, and actively search for characteristics, connections, relations, and expectations rather than assuming them.

Cognitive neuroscientists have explored some of the conditions under which automatic cognition might dominate deliberate cognition and vice-versa. For example, automatic cognition can occur outside of consciousness while deliberate thought demands consciousness; automatic cognition is more likely to occur when we are under stress; deliberate cognition can be triggered by the disruption of well established routines.[1] But such findings simply begin the story of automatic and deliberate cognition – a story that sociologists are well positioned to continue.

DiMaggio (1997:272) suggested one possible trajectory here. He argued that including these cognitive variations in our studies of cultural patterns and practices could help us better understand the ways in which culture enables or constrains, and the ways in which social action is simultaneously institutionalized and agentic. Acting directly on DiMaggio's suggestion, Danna-Lynch (2007, 2009, 2010) incorporates automatic verses deliberate cognition in her analysis of social roles – specifically, the area of multiple role enactments. Danna-Lynch sets out to better understand what she calls the ''chameleon factor'' – i.e. peoples' ability to accommodate multiple social roles, and continually switch between them, without becoming incapacitated by a sense of confusion or a feeling of role conflict. While prior answers to this puzzle have focused primarily on behavior, Danna-Lynch brings cognition into the mix. In doing so, she re-creates the meaning of role performance to include four ideal types of role states – types based on the

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[1] Solso et al. (2005) offer a good review of such work.

interaction of cognition (automatic versus deliberate) and behavior (automatic versus deliberate). Using data from 60 in-depth interviews with working parents in a variety of occupations, Danna-Lynch itemizes the cultural practices that (a) help people establish themselves in these role positions, and (b) allow them to continually switch between them. This merger of cognitive research and sociological theory provides a new approach to role theory, one that presents roles as a product of both physical and mental space.

In another venue, Auyero and Swistun (2008, 2009a,b) examined automatic versus deliberate cognition among individuals dealing with uncertainty and risk – specifically, the residents of an Argentine shantytown who were facing high levels of environmental pollutants. Auyero and Swistun addressed the processes and practices that sustained peoples' uncertainty as well as those that resulted in people's mis-assessments of environmentally driven risks. Of particular interest here are the authors' reflections on the links between cultural routines and cognitive styles. Auyero and Swistun argue that when polluters take care to avoid major disruptions to residents' daily routines (i.e. getting to work, getting their children to school, preparing meals, etc.), the routines themselves encourage individuals to adopt an ''automatic pilot'' approach to their surroundings. In essence, familiar routines combine with automatic cognition to restrict the deliberate attention to surrounding dangers; this process, in turn, suspends any initiatives toward organized actions against such dangers.

It is worth noting however, that *levels* of routinization must be considered when linking routines to cognitive styles. Heimer's (2001) work illustrates the point. Heimer approaches routines as existing on what we might think of as a density continuum – i.e. situations vary from being abundantly or over-routinized to being scarcely or under routinized. Heimer examines the conditions represented on this continuum, arguing that over or under routinization beckons deliberate cognition while moderate routinization is more strongly associated with automatic cognition. According to Heimer, over routinization triggers deliberate cognition because ''people are so overloaded with routines that routines become noise rather than signal and cease to focus attention'' (2001:72). In under routinized contexts, thought must be inductive, as people examine and re-examine the evidence of novel scenarios.

Attending to the differences between automatic and deliberate cognition may also contribute to our understanding of people's cultural beliefs. Martin and Desmond (2009) explored this issue in the realm of politics. The authors argued that political beliefs are formed with reference to people's self-placement on the conservative-to-liberal ideological spectrum. Moreover, they argue that the strength of one's ideological beliefs can influence one's cognitive style. Martin and Desmond suggest that those with strong ideologies have ''pre-organized the world so as to make effortless, efficient associations.'' These individuals hold more available schematic information than those with weak ideologies, and thus, are more likely to engage in automatic cognition and *avoid* deliberate cognition. Those with weak ideologies, in contrast, need to seek information from their social field in developing political positions. This action necessarily demands more deliberate styles of thought. (See Martin, 2000, 2002; for related work, see Vaisey, 2008a, 2008b, forthcoming.)

Concerns for automatic and deliberate cognition have also surfaced in works devoted to culturally situated communication tools. These scholars focus on the way communication tools trigger one style of cognition over the other. Massengill (2008), for example, compared the world views generated by right to life versus faith based labor movements. Her research paid special attention to the strategic use of everyday metaphors. According to Massengill, movement leaders use everyday metaphors to generate automatic cognitions on moral worldviews. They do so because automatic cognition can direct the actions of individuals in ways that expedite leaders'

goals. What makes this work sociologically important is Massengill's placement of the process in cultural context. She notes that the moral worldviews of those engaged in both right to life and faith based labor movements are more varied and more powerfully linked to sociocultural context than many have assumed. This means that "not all metaphors can be invoked for particular instrumental uses with equal potency" (2008:354). Rather, a metaphor's power to motivate behavior must be carefully situated in the cultural milieu of action. Easter (2008) makes a similar point in studying the political use of descriptive terms such as "freedom" and "liberty".

Rydgren (2007) examines another communication tool – analogies – and documents the ways in which they can trigger automatic memories. Rydgren is particularly interested in the cultural analogies that appear in discourse on ethnic conflict. Using the 1990s conflict between Croatians and Serbs as his research site, Rydgren argues that analogies, while often incorrect, were frequently used to explain and assess the conflict. The problem, argues Rydgren, is that such analogies typically triggered automatic memory biases. So, for example, when Croatians or Serbs witnessed elements reminiscent of past conflict, they engaged in analogic reasoning, assuming that past outcomes would simply repeat themselves. These automatic memory biases led people to overestimate the potential for future conflict. Such overestimations, in turn, precluded constructive peacemaking. Rydgren suggests that successful conflict resolution demands the injection of communication tools more actively associated with deliberate thought. (Kane, 1997 offers more on analogies and cognition.)

Communication sequences have also been linked to variable cognitive styles. In studying visual and verbal depictions of violence, Cerulo (1988) discusses the role of message sequences in triggering automatic versus deliberate thought. Her work identifies four distinct temporal sequences that drive narrators' accounts of violence: victim sequences, performer sequences, contextual sequences, and doublecasting. She shows that the narrators' sequence selections reflect institutionalized communication conventions based on assumptions of audience morality. But more importantly, Cerulo documents that certain sequences seem to trigger automatic cognitive responses that lead readers and viewers to systematically judge the morality of violence. To be sure, this pattern was not universal, but therein rests the sociocultural dimension of the issue. Indeed, Cerulo identifies several substantive and contextual elements that temper the decision-making process. (Altheide, 2002, 2006 offers more on formats and their connection to cognitive styles.)

One can identify other works on this general topic. Ganz (2000), for example, writes on strategic capacity, social movements and deliberate cognition; Both Chiu et al. (2000) and Kosic et al. (2004) write of the interaction between cultural traditions, individuals' need for closure, and the triggering of automatic cognition. And in the present issue, Harvey (2010) takes discussion of automatic and deliberate cognition in a promising new direction. Specifically, Harvey explores the links between the configuration of social spaces and the ways in which these configurations trigger cognitive styles. He suggests that structured spaces tend to facilitate deliberative cognition while unstructured spaces promote automatic cognition. Harvey's development of these connections has important implications for how and, perhaps, why we use culture in the process of thought.

All of these studies represent exciting ways of developing cognitive neuroscience research on cognitive styles. The challenge for sociologists is to make the link between the firing synapses, neural paths, and the organization of the sociocultural contexts in which those processes occur.

2.1.2. Hot and cold cognition

Cognitive neuroscientists also attend to a set of processes called hot and cold cognition. Hot cognition involves a heightened response to stimuli, one that is driven largely by emotion. In contrast, cold cognition refers to unemotional, painstaking thought that involves rational

analysis. (Considerations of emotions make the hot–cold continuum somewhat different from the automatic-deliberate continuum. See Abelson and Rosenberg, 1958.)

Technological advances play a major role in cognitive neuroscientists' increasing emphasis on emotions. Using fMRI technology (magnetic resonance imaging scanners), these scholars believe they can ''see'' thoughts and emotions as they develop in the brain. Researchers get these pictures by presenting people with images or situations and then tracking the areas of the brain that seem most active in information processing. In this regard, Cohen and co-workers (e.g. Greene et al., 2001; Cohen, 2005) have published widely on the links between moral dilemmas, emotions, and cognition. Subjects in these studies react to descriptions of two moral dilemmas. In the ''trolley dilemma'' – what Cohen calls an impersonal dilemma – a runaway trolley speeds directly toward five people. To save the group, a subject must agree to hit a switch, diverting the trolley to a side track where it will kill only one person. Contrast this scenario with the ''footbridge dilemma'' – what Cohen calls a more personal dilemma. Here too, a trolley threatens to kill five people. But in this scenario, the quintet can be saved only if the subject agrees to push an adjacent stranger into the trolley's path. While the stranger is killed, his body will prevent the train from reaching the larger group.

In presenting the two dilemmas, researchers want to know: are subjects willing to flip the switch, to push a stranger, and how do they arrive at their decisions?'' While subjects are making their decisions, researchers are watching fMRIs hoping to discover what goes on when people think, emote, and decide. Findings reveal that subjects seem agreeable to ''sacrifice'' when it means flipping a switch. But they are less likely to entertain pushing another human being onto the tracks. Further, subjects' reactions to each scenario activate a different part of their brains. The impersonal ''switch flipping'' elicits activity in the dorsolateral areas of the prefrontal cortex – areas associated with cold cognitive processes such as working memory, abstract reasoning and problem solving. In contrast, the personal ''pushing'' activates the medial frontal cortex, an area associated with emotional processing.

Similar findings appear in studies addressing fear and self protection. Ohman and Mineka (2001) find that when faced with dangerous objects, individuals process the images in very different ways. For example, ''natural'' dangers as depicted by pictures of spiders, snakes, or crocodiles activate the brain's emotional centers, while ''modern'' dangers such as guns or electrical outlets activate the decision-making areas of the brain. How do cognitive scientists explain these differences and why should sociologists care? Cohen explains the cognitive neuroscience position this way:

> Perhaps emotional aversion to harming other humans evolved as an adaptation that allowed early humans to aggregate more effectively into stable social structures, conferring upon them a competitive advantage ... However, this adaptation would have arisen at a time when the scope of aggression was limited literally to a stone's throw; that is, there would not have been strong pressure to develop an emotional aversion to harming other humans at greater distances since this was simply not possible. ... The evolution of our emotional apparatus did not anticipate a world in which aggression can be expressed impersonally over large distances (2005:12).

Here, as in much of cognitive neuroscience, evolution seems critical to understanding of neural activity. But therein rests sociologists' opportunity to tell the rest of the story. I am afraid of the snake, but not the gun. I can flip the switch but not push another human. The differential reactions to these scenarios maybe just as powerfully explained by situating these objects in social interaction.

Consider the snake versus the gun. When it comes to a snake, I am likely to see the encounter in terms of a simple dyadic exchange. The two of us meet, options for attack are limited, and I

will be the victor, the victim, or one who cleverly (or luckily) escapes the confrontation. The gun, however, presents a far more complicated story. Is it my gun or someone else's? Am I aiming it or is it aimed at me? How skilled is the shooter . . . how willing . . . how far away? Is the gun in good working order? Is it real or a good facsimile? Will the shot be heard by someone nearby? If so, how will that affect the shooter's willingness to use the gun? In essence, the gun is part of a broader interactive scenario. Indeed, actor-network theorists such as Bruno Latour (2005) would say that the gun is an equal participant in social interaction – an ''actant'' that can make things happen. But a full understanding of this actant's role demands cold cognition – careful, painstaking thought that considers all of the nuances and options present in the interactive situation in which the gun is embedded.[2]

To fully understanding thoughts and emotions, one must attend to interactive patterns and contexts. Several social movement scholars have demonstrated the point, studying hot and cold cognition as it occurs in the interactive history of a collective action (see e.g. Gamson, 1992; Jasper, 1998; Hercus, 1999; Taylor, 2000; Goodwin et al., 2001a; Taylor and Rupp, 2002; Robnett, 2004). One important contribution of these works rests in delineating the path from hot cognition to action. For while certain cultural events or arrangements may initially trigger hot cognition, successful movement organizers must create the organizational strategies and processes that will transform feeling into action, (see e.g. Goodwin et al., 2001b; Reger, 2004). Often, this involves re-directing the attention of movement participants' from hot or emotional triggers to cold or deliberative triggers, as emotionally hot cognitions can escalate rather than overcome social conflict (Harcourt, 2002).

Beyond social movements, those studying decision making are increasingly attending to hot and cold cognition, exploring its role in evaluation and subsequent action. In this regard, some researchers find that entities which trigger hot cognition are better remembered, and thus, more readily applied than those that trigger cold cognition. This finding proves important to those constructing surveys and questionnaires, as cognitive styles may significantly influence subjects' evaluative responses (Veld and Saris, 2004). It also proves important to our understanding of the judgments and evaluations people make with regard to social justice (Kunda, 1999; Stapel, 2003), organizational sense making (Weick, 2005), management decisions (Kennedy and Vining, 2007), and mathematical calculations (Roth, 2007).

In an interesting treatment of hot and cold cognition, DiMaggio (2002:277–278) suggests that sociologists think about these forms of thought in conjunction with the automatic-deliberate continuum. DiMaggio proposed we treat the hot/cold and automatic/deliberate continua as ''two correlated but analytically distinct dimensions, one having to do with degree of affect, the other having to do with degree of planfulness and deliberation.'' Doing so provides four distinct orientations to action. Automatic cognition paired with cool affect corresponds to scripted, routine action such as that studied by ethnomethodologists. The coupling of automatic cognition with hot affect directs us to impulsive, stereotyped action such as mob behavior. The pairing of deliberate cognition with cool affect corresponds to the kind of thoughtful deliberation so central to Habermas' theories. And deliberate cognition that occurs with hot affect bespeaks competitive, strategic action that is so central to rational choice theory. DiMaggio argues that this typology captures forms of action that are distinct both psychologically and sociologically. Further, the model beckons a uniquely sociological research platform – namely identifying the social and cultural conditions that either enable or constrain actors from switching their action strategies.

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[2] Note that some social psychologists have been studying these assumptions in the lab, building a productive interface between fMRI technology and interaction theory. See e.g. Fiske (2005) and Wheeler and Fiske (2005).

The future of sociological studies in this area is ripe with possibility. Those studying hot and cold cognition with a sociological eye stand at the intersection of thought, emotion, and action. From this vantage point, one can imagine new ways of understanding social action and new policy approaches designed to steer or impede it.

2.1.3. Graded membership

Cognitive neuroscientists tell us that some of the brain's standard processes are characterized by asymmetry. This is especially true for conceptualization. (Concepts, of course, are tools used by the brain to identify and organize people, places, objects and events.) Many cognitive neuroscientists believe that concepts are built on a prototype or a ''best example'' premise. This means that, at their core, concepts amplify or exaggerate the critical features of a category; they focus our brains exclusively on a category's ''ideal''. When we encounter something, we use our mental concepts and perform a process called ''graded membership'' – i.e. we rank or place entities with reference to others in their class. For example, when you go shopping for a tomato, your brain compares every tomato you see to an ideal prototype, and it works from there. The more attributes the tomato-in-hand shares with the prototype that exists in your brain, the more likely you are to include what you see in the category tomato *and* the closer you will rank that observation to the category's core ideal.[3]

Graded membership has obvious results for the way in which we evaluate the world around us. The process quite forcefully establishes asymmetry as one of the brain's prominent modus operandi. Best-case examples of a concept are overemphasized and highly detailed; anything less than the ideal becomes increasingly nondescript, released or distanced by the brain from active consideration. But Cerulo (2006) argues that graded membership has social implications as well. The process has much to do with a sociocultural phenomenon she calls *positive asymmetry*. Positive asymmetry is a blind optimism – a tunnel-vision directed to best-case scenarios and an accompanying disregard for worst-case scenarios. Cerulo's work documents the widespread nature of this phenomenon, taking her readers to diverse realms of everyday experience: life's most intimate relationships, key events in the life cycle, the many sites of work and play, and the organizations and bureaucracies that structure social life. Using a variety of data – i.e. interviews, fictional accounts, survey data, media reports, journalistic commentaries, observations, and official records – she illustrates the frequency with which individuals, groups, and communities blatantly disregard worst-case scenarios. While definitions of best and worst change from time to time and place to place, Cerulo shows that the *tendency* to prioritize the best is rather constant.

One might ask: why is positive asymmetry connected to the brain? The brain has prototypes for bad things or worst cases too—i.e. the perfect storm, the prototypical murder. Knowing this, how can one argue that graded membership and the asymmetry it involves have anything to do with a cultural emphasis of best cases? Here is another case in which sociology allows us to continue and enhance the cognitive neuroscience story. We can map the ways in which society and culture transform and reconstruct the neural processes of the brain.

Cognition does not occur in a vacuum. The concepts and categories foregrounded in one's mental ''data banks'' differ with reference to the cultural repertoire of one's group or community. This foregrounding can be linked to a variety of factors, including a community's survival needs,

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[3] Of course, for purposes of illustration, I am simplifying the process. In fact, graded membership entails complex calculations which cognitive scientists continue to study. At this time, for example, there is some debate in the literature as to whether the brain compares observations and prototypes via an additive operation (referred to as the ''modal model'') or an averaging process (referred to as the average model). For more details, see Solso et al. (2005).

its goals and values, its relative station in the broader society, its internal power structure, etc. But regardless of the source, the priorities defined by a group or community's culture become institutionalized in the community members' shared stock of knowledge – or for Bourdieu, the habitus. Different communities prioritize and attend to different categories of people, places, objects and events. Indeed, in most communities, cultural practices are at work, practices that, in essence, background half of what is in our brain, (e.g. the materials dealing with worst case or negative concepts). These practices harness the brain's propensity toward asymmetrical thinking; they harness the mechanic – the *way* we think – and they encode that process into a much more targeted and specialized experiential bias. Asymmetry – the tendency to emphasize only *the best-case example* of *any concept*, is transformed to positive asymmetry – the tendency to emphasize *only examples of the best-quality cases*.

What are these cultural practices that so bias our perceptions? Cerulo unpacks three sets of practices that function in this regard: *eclipsing*, *clouding*, and *recasting*. She also identifies certain structural conditions under which these practices are more or less effective. Overall, Cerulo's work on graded membership illustrates one example of a productive cognitive science/ cognitive sociology merger. In step one, we learn something about how the brain operates. In step two we learn something about how social and cultural practices compliment, alter, or elaborate that neural process. (For related work, see Armstrong, 2003; Freudenberg and Alario, 2007; Senier, 2008; also consider works on commensuration, i.e. Purcell, 1996; Espeland and Stevens, 1998; Zuckerman, 2004).

2.2. Domains and schema

Domains and schemas are critical to cognitive neuroscientists as they work to understand the role of these entities in mental processes such as attention, perception, classification, and memory. Of course, these cognitive components are central to some of the processes discussed thus far. But each of these concepts holds independent promise for sociological research as well.

2.2.1. Domains

Cognitive neuroscientists define domains as tripartite knowledge structures in the brain. They consist of (1) a given set of principles, (2) the rules for applying those principles, and (3) the itemization of the entities to which these principles and rules apply.

Most cognitive scientists believe that domains are content specific. This means that every domain applies to a particular life situation: some allow us to reason about objects, others about cause and effect, still others about space, numbers, language, and so on. Domains are also assumed to be independent. Thus, the structure of knowledge prescribed by domains is homogeneous within domains and heterogeneous across domains. Finally, most cognitive neuroscientists argue that domains are innate structures; they exist because evolution equipped humans (and most other species) with specific adaptations designed to overcome persistent problems in the environment.

In recent discussions of domains and other knowledge structures, some cognitive neuroscientists have been willing to concede a small role to the "external world", particularly now that evolution is a topic of the distant past and symbolic communication systems are much more central to our intellectual focus. Pasqual Boyer, Gerald Edelman, Frank C. Keil and others suggest that domains and other knowledge structures may be enriched or altered in response to situational factors. One might say that certain situational conditions act as a switch that activates specific domains and de-activates others. DiMaggio urged cultural sociologists to capitalize on

this observation, suggesting that the study of culture may help us learn more about these switches and the ways in which they allow us to move from one domain to another (2002:278–279, see also Mische and White, 1998; Martin, 2000; Danna-Lynch, 2007, 2010).

Sociologists have been slow to explore these issues, but the story of domains beckons a sociological chapter. For example, sociologists are uniquely qualified to explore the strategies and practices that enable or constrain the transfer of domain knowledge. Similarly, we are well positioned to examine the sociocultural factors that foreground resonances between cognitive domains and aspects of real world structure. These factors may include certain physical cues, entrenched values, normative practices, structural configurations, etc. We might also explore the specific cultural tools that help individuals achieve resonance – i.e. analogy, metaphor, transfer – and the circumstances and situations that favor one tool over another.[4]

One domain related issue that sociologists are presently exploring involves domain expectations and their successful disruption. Rather than accepting the evolutionary source of domains, sociologists suggest that domain expectations are rooted in the sociocultural world. If this is true, it becomes important to study how amenable or resistant these expectations are to change. When does culture enable or constrain domain violations, and what are the cognitive and sociocultural consequences of violating domain expectations?

Sociologists of religion have been actively pursuing these issues. This, of course, makes perfect sense. Wuthnow (2007:345) notes, ''Religion is rooted in cognitive processes that violate the boundaries between ontological domains.'' Most worship a god that in most ways resembles a person; at the same time that god is assumed to be eternal and omnipresent—a clear domain violation. Other examples of domain violations rooted in religion include the resurrection of Jesus, the Virgin Birth, God's omnipresence, etc. All of these phenomena violate our expectations of the ways in which the physical world works.

According to some, domain violations are what make religion so powerful. Domain violating stories such as the resurrection or the immaculate conception persist because these stories, like all domain violations, are more memorable than concepts and images that conform to expectation (see e.g. McCabe and Peterson, 1990; Boyer, 2001; Boyer and Ramble, 2001; Atran, 2002; Fiske and Pilemer, 2007). But how does one translate that finding to contemporary religious discourse? Wuthnow (2008) brought a sociological eye to this issue in an exploratory study of prayer and prayer recall. During in-depth interviews, Wuthnow asked 77 respondents to report any recollections they had from prayers offered during recently attended worship services. The prayers that proved most memorable to respondents were those containing language that referenced a domain violation. But Wuthnow notes that the form of these violations was quite different from the ones established in more historic religious images. In these contemporary prayers:

> the domain violation was not a literal transgression of the known, natural world by a supernatural being who enters in tangible form to divert hurricanes, regenerate amputated limbs, or perform other magical feats. Instead, the language juxtaposed two domains – the human and the non-human – in a rather particular way. The human side in this pairing was described as a concrete person, rather than as an abstract concept or category of people, thus implying (but usually not stating) that the interviewee could identify with the person for whom prayer was offered. But, more importantly, the human side was described as fragile, weak, small, childish, vulnerable, or lacking in understanding. In contrast, the non-

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[4] Certainly, people like George Lakoff have started us on this path, but the work is limited and there is so much more to do.

human or divine side was often described as strong, big, or powerful, but otherwise left rather vague (2008:504).

These data suggest that domain violations may be tempered by the sociocultural context in which the prayer is offered. The juxtapositioning of images must be unexpected yet believable with reference to the community's current cultural norms. Wuthnow explains:

> In contemporary congregational settings, participants are taught to pray and to talk about prayer in culturally acceptable ways that emphasize divine power without having to make statements about divine intervention that to them would seem unreasonable or absurd. . . . A weak, needy human who is prayed for and with whom ordinary humans can identify ritually dramatizes a divine ''other'' that is not weak, needy, or human. The contrast works to evoke emotion and to elicit thoughts about power. . . . The thought is [also] jarring and thus memorable'' (2008:505).

Marketing provides another fruitful area for sociological explorations of domain violations. Cerulo (1988, 1995a,b:117–144) explored the issue with reference to syntactic and sequential message formats. Her work showed that moderate distortions of expected message formats actually heightened receivers' attention to a message, their comprehension of it, and enhanced the likelihood that receivers would respond to the message in ways desired by the sender. But Cerulo notes some important qualifications to this finding. For example, when distortion is coupled with a negative or offensive message, using the technique can backfire. Under such circumstances, receivers find themselves actively attending to an offensive or anxiety provoking message, a process that makes them uncomfortable and unreceptive. Similarly, domain violations have certain limits. Extreme distortion proves too confusing for receivers, encouraging disattention to the message. (See Boyer, 2000, Barrett and Nyhof, 2001 and Lisdorf, 2004 for experimental support of these findings.)

2.2.2. Schema

Like domains, schemas are mental structures that aid in our understanding of the world. We can think of schemas as abstract generalizations or composites built from a collection of specific exposures or experiences. So, for example, after sitting in several classrooms, one develops a general notion of classrooms – a schema constructed from the various attributes of the different classrooms one has directly experienced. Individuals use such classroom schemas in many ways: to interpret new encounters, to remember past experiences, to help in sense making and problem solving, or to steer action.

Cognitive neuroscientists have carefully examined several aspects of schemas. In exploring schematic operations, for example, cognitive neuroscientists contend that schemas do not function in isolation. Rather, they cluster in the brain, forming associated networks. When one schema is activated, it creates a neural ''charge'' that triggers other schemas in the network. What actually activates schemas? Some cognitive neuroscientists believe that routines and experiential patterns repeatedly elicit certain schemas, keeping them foregrounded or ''in the ready'' within our brains. Others suggest that schemas can be deliberately activated via a process called priming – that is, presenting a concept (often subliminally) in order to steer individuals toward related or similar ideas. But no matter how schemas are activated, they have important effects on perception and behavior. As knowledge structures, they allow us to ''fill in the blanks'' and make sense of new experiences. Schemas also filter our perception, making some of the things we encounter seem more germane to us than others. Schemas may even create perceptual biases, as they can

commit to memory ''facts'' more elaborate than those we actually experience. Thus, our memory of a classroom may include desks or blackboards to which we were never exposed. We mistakenly remember such things because our classroom schema dictates that such objects belong in the room. (See Solso et al., 2005 for a good review of the literature.)

Some sociologists have embraced schema as a useful tool for bridging the study of culture and cognition, although such work has been surprisingly limited.[5] The most common approach identifies schemas particular to certain status groups or subcultures, and then tracks the ways in which such schemas steer attention, perception, and behavior. Much of this work addresses the role of schemas with reference to class, gender, or racial inequality. (Bem, 1993 or Goldthorpe, 1997 offer two classic examples. For more recent work, see, Miller, 1995, Rosenfield et al., 2005, Harding, 2007, Hoffman and Bartkowski, 2008, Miller, 1995, Rosenfield et al., 2005.) Others have explored the role of schemas in complex interactional fields. In this regard, Ignatow (2004) examined the ways in which schemas order the discourse that can establish broader cultural beliefs and thereby guide collective action. Ignatow used both sequence and metaphor analysis to investigate the meeting transcripts of Scottish shipyard workers who were involved in a strike action. Not surprisingly, he found that the group's discourse was shaped by historical context, situational factors, and elements of social structure. But Ignatow also showed that shared schemas – particularly those about which there is collective consensus – powerfully contributed to the coherence of the group's discourse. Thus Ignatow's work provides ''insights into how thought communities filter collective representations drawn from their cultural environments'' (2004:430). In another venue, Johnson, Dowd, and Ridgeway examine the links between certain widely held consensual schemas and erroneous expectations of future action. The authors also plot the steps by which such expectations enable the misattribution of legitimacy and the adoption of ''nonoptimal actions and practices'' (2006:53, 72; see Zuckeman, 2004 for related work). In this issue, Shepherd (2010) explores the links between external classification systems and their resonance with individuals' internal classification schemas. Shepherd situated her study in the lending practices of the World Bank. Her data show that classifications are not simply absorbed by their users, nor do they have uniform cognitive and behavioral effects. Rather, the cognitive impact of classification systems must be judged relative to factors such as the system's degree of institutionalization, the strength of categorical boundaries, and the system's mode of implementation. (Hoffman and Bartkowski, 2008; Unnever et al., 2006 provide other interesting works on schemas.)

Organizational sociologists are doing promising work on the sociocultural dimensions of schematic transfer. In studying organizational sense making, for example, Elsbach et al. (2005:423) explored the ways in which ''cognitive schemas and cultural contexts come together to form situated cognition.'' Situated cognition, a term developed by Lave and Wenger (1991), refers to transitory thought that is embedded in the interactive context of the moment. The study of situated cognition is important because it suggests that interaction patterns are important triggers of schemas. Thus situated cognition provides a missing link that helps us to understand decisions and outcomes that heretofore seemed unpredictable or unlikely. In another arena, Chung et al. (2008) use elder care organizations as a site to further explore schematic transfer. They suggest several changes to managerial interaction patterns, changes that might effectively switch individuals' attention toward what they call ''target-based schemas – i.e. those designed to make elder care less stressful and more effective.

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[5] Part of the reason for this may rest in sociologist's preference for the study of framing which is more focused on interactive rituals as opposed to cognitive structures.

Sociological work on domains and schemas is still in its infancy. But research on these knowledge structures will benefit immensely from a sociological eye. Sociologists are uniquely placed to fully explore the ways in which macro-structures, situational cues, and interactional patterns enter the process of meaning making and action.

2.3. Culture acquisition

Some of the most controversial work of the past 10 years comes from sociologists who challenge well entrenched ideas on enculturation and socialization. Bergesen (2004b), for example, urged sociologists to reconsider ''blank slate'' notions of mind as promulgated by Mead and other symbolic interactionists. He also questioned social constructionist models of thought, arguing that concepts such as typification and habitualization are insufficient for a full understanding of cognition. Bergesen directs sociologists to cognitive neuroscience studies – particularly those involving babies. For Bergesen, these studies suggest that mind, especially our language skills, precede humans' interactive capacities (2004b:358). If this is the case, Bergesen contends that: ''Symbolic interaction may turn out to be a more Chomskyan than Meadian process.'' A finite number of mental rules may drive our understanding of the social world well before enculturation and socialization have a chance to begin. As such: ''It is our mental ability . . . to create an infinite number of interaction possibilities from a finite number of mental rules that enables us to interact with so many different people, in so many different situations, at so many different times, with so many different agendas on our-and their-minds'' (2004b:368). For Bergesen, it is the sociology of culture's mission to continue this story – to explicate that intricate process.

Omar Lizardo took a promising step in this regard, merging cognitive neuroscientific work on ''mirror neurons'' with sociological work on ''habitus''. In so doing, he suggested some new and exciting ideas on the study of enculturation. Lizardo begins his work with an explanation of mirror neurons. Mirror neurons exist as a neural network located in the pre-frontal motor cortex of humans and other primates. They ''fire'' in response to visual stimuli that require a motor response from humans, primates and certain birds. They also fire when one simply witnesses or hears others making motor responses. (For example, the same neurons will fire when I bounce a ball, or when I see or hear another bounce a ball.) In essence, mirror neurons take practical information based on specific observations and create generalized conceptual knowledge about the way objects ''work.'' Thus, instead of knowing what objects are in a decontextualized sense, mirror neurons allow us to know what objects are good for (Lizardo, 2007:22).

Why are mirror neurons important to sociologists? Lizardo contends that our understanding of mirror neurons may help us fill important gaps in practice theory. If cognitive neuroscientists are right, mirror neurons provide social actors with (1) ''the practical capacities productive of action'' and (2) ''the practical, representation, coding and comprehension of practical action – both for the self and others'' (Lizardo, 2007:13, 14). Lizardo continues that story, writing:

> In its ability to generalize from one observed use to other uses and from one sensory modality to the next . . . a mirror neuron system subserves the practical capacity for what Bourdieu (1990) refers to as ''bodily generalization'', where the same set of practical schemes are transposed by the actor from one object to another, and thus to different areas of practice. . . . Practical transmission, rather than being 'little short of magical' (Turner, 2002:11), is in fact commonplace (Lizardo, 2007:14, 17).

This observation is sociologically important. It means that the most central practical competences constitutive of Bourdieu's class habitus need not be the subject of explicit

instructions or imitation. They can be "picked up" by the actor simply by virtue of being surrounded by other actors who display the same competencies (Lizardo, 2007:17, 19).

By connecting the dots–cognitive neuroscience and sociology – Lizardo doubles the power of Bourdieu's work. For while Bourdieu rejected imitation as the means by which we acquire practical knowledge, he had no satisfying alternate explanation for the process. Lizardo's insight comes in merging Bourdieu's arguments with those of cognitive neuroscience. In so doing, he emboldens the findings of both traditions. (See also Lizardo, 2004.)

Other sociologists are turning fresh eyes toward cultural acquisition and the intersecting role of brain and society. For example, Ji et al. (2000) studied the relationships between race, perceived control and attention. Ignatow (2007, 2008) examines the role of embodied knowledge in cultural acquisition. And in this issue, Daipha (2010) explores professional enculturation by examining computer visualizations in the world of meteorology. While computer visualizations were designed to streamline the prediction process, Daipha shows that a full understanding of the weather forecasting process requires us to study the grounded, embodied logic that guides particular practices of seeing.

3. Conclusion

This essay reviews recent literature that constitutes a new and powerful page in cognitive sociology, and more broadly, in the study of culture and cognition. The articles that follow in this special issue are designed to enhance that agenda. Several of these pieces explore socio-neural aspects of cognition via empirical study: Phaedra Daipha's work on meteorology and perception, Hana Shepherd's on work classifications and group perception, Karen Danna-Lynch's work on cognitive switching, and Daina Harvey's work on space and cognition. In addition, two papers provide us with some new theoretical perspective on the sociological aspects of cognition. Omar Lizardo and Michael Strand attempt to reconcile two prominent lenses in sociological study of cognition: the "toolkit" and "strong" practice-theory perspectives. John Levi Martin considers the definition of culture and the extent of cognition's role within it.

What makes these works important is the fact that they are posing questions–questions that sociologists need to be asking in louder and louder voices. Just what is cognition? Is it habit, deliberation, or both? Is it conscious . . . executed together or in isolated? More importantly, where does it reside? Is cognition commanded by the brain – a pre-programmed, predesigned storm that charges through synaptic paths? Or does it reside in embodied beings at the intersections of their cultural practices and belief systems? Perhaps cognition originates and occurs primarily outside of us, in social space and cultural context. Perhaps it is raw, like an energy that is molded by constraints and resources, crafted by reflexive processes whereby individuals consider themselves consciously and in relation to their social, spatial or temporal environments. Maybe all of the statements are true – maybe none. But the type of interdisciplinary cross talk encouraged by this issue is, in my mind, the vehicle by which we will learn the ways and contexts in which thought dances from neuron to schema to practice to ritual and norm. Such crosstalk will help us understand how cognition moves seamlessly from the inner to the outer and when it dawdles in one place or another.

The brain IS hot . . . and it is time for sociologists to enthusiastically enter the discussion.

Acknowledgements

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