13 Societies

Just as cognitive science has tended to neglect the location of thinkers in their physical environments, so it has tended to neglect the interaction of thinkers in social environments. Philosophy, cognitive psychology, and artificial intelligence have largely been concerned with the mental representations and processes that occur in individual thinkers. However, recent trends in each of these fields have pointed toward increasing appreciation of the social context of knowledge. The social challenge to CRUM concerns whether it can be expanded or supplemented to deal with social aspects of thinking.

Social Epistemology

Epistemology is the branch of philosophy concerned with the nature and justification of knowledge. Traditionally, epistemology has been concerned with what individuals know: how do we justify our beliefs? Recently, however, there has been increasing concern with social aspects of knowledge, particularly among philosophers of science. In modern science, knowledge is obviously a social enterprise. Most published papers have more than one author, and much research is performed by teams of scientists working together. The announcement of experiments pointing to the existence of the "top quark" was made jointly by more than 400 physicists. Contributors to the social epistemology of science include Giere (1988), Kitcher (1993), Solomon (2001), and Thagard (1999).

Many other kinds of knowledge are inherently social, from business expertise shared by people working together in corporations to artistic expertise shared by people collaborating in symphonies and the theater. Goldman (1999) explores the ways that human knowledge can be increased via social transactions. He evaluates many social practices that increase knowledge, including testimony, argumentation, and communication technologies. Much of what you know depends on the testimony of your friends and acquaintances: if your professor says that there is going to be an exam next week, then you have good reason to believe it. On the other hand, you probably know some people who are unreliable on particular topics, so you do not use their testimony as the basis for your own beliefs. Because we do not have the time and resources to investigate everything we are told about, we often must rely on others to provide us with information. Discourse is not confined to only factual reports. People sometimes present reasons or evidence for what they say, and this is known as argumentation. Learning how to evaluate the arguments of others can increase the reliability of the information that we acquire from them. Similarly, we can improve the quality of our beliefs by ensuring that they arise from communication media that are reliable. Contrast the newspapers, magazines, and television shows that you trust most with others that you have learned to doubt.

Social and Distributed Cognition

Psychologists and anthropologists have also been paying increasing attention to social aspects of knowledge. The field of social cognition studies how people make sense of their social world by reasoning about the thoughts, goals, and feelings of other people (Kunda 1999). What we believe about other people can be represented by concepts such as social stereotypes based on race and gender, or by rules about what to expect in social interactions. For example, if you meet someone for the first time, you will probably attempt to understand them by applying concepts such as *nice* or *obnoxious*. Understanding how people think and feel about each other is crucial for understanding social institutions such as marriage. Gottman et al. (2003) provide a dynamic systems model of how marriages succeed or fail as the result of how husbands and wives react to their perceptions of each other. One of their conclusions is that most marriages fail through a process of escalating negative emotions.

A more radical notion is that of *distributed cognition*, the idea that thinking occurs not just in individual minds but through the cooperation of many individuals. For example, a team of software engineers working collectively on a new computer program must ensure that they are progressing toward a common goal. They must develop a common representation of the task that the program is intended to perform, and they need continuous communication to make sure that the different parts of the project will work together. Similar communication and cooperation is necessary whenever accomplishing a task requires more than one person. The evaluation of various approaches to CRUM in chapters 2–8 discussed problem solving as an accomplishment of individual thinkers, but in today's world problems are often solved by teams of thinkers. Students sometimes work on class projects in teams, and anyone who has been involved in extracurricular activities such as a newspaper or club knows how important it is to be able to work toward common goals with other people. Contributors to the work on distributed cognition include Galegher, Kraut, and Egido (1990), Hutchins (1995), Resnick, Levine, and Behrend (1991), and Salomon (1993).

Hollan, Hutchins, and Kirsch (2000) discuss the relevance of distributed cognition for improving our use of computers. They describe three important kinds of distribution of cognitive processes. First, cognitive processes may be distributed across the members of a social group, such as a team of navigators on a ship. Second, cognitive processes may involve coordination with external structures such as computers. Third, cognitive processes may be distributed through time as people continue to interact with each other and with external objects. Because people's use of computers in fields such as science and business now involves networks of both people and computers, the theory of distributed cognition is highly relevant to understanding and improving human-computer interaction.

Researchers are also investigating the role of emotion in organizations (Fineman 2000). Group success depends not only on exchanging cognitive representations such as concepts and rules, but also on exchanging values that are based on emotional attitudes. For example, a soccer team not only needs the knowledge that winning depends on players passing to each other, but also needs each player to attach a positive emotional value to passing as opposed to individual play. Emotional communication requires special mechanisms that transmit values by verbal and nonverbal means. One direct mechanism is emotional contagion, in which people acquire the emotions of others just by witnessing and mimicking their physical expressions (Hatfield, Cacioppo, and Ratson 1994). For example, if your friends are bubbling with excitement about seeing a new movie, you may acquire their excitement. Similarly, people often acquire attitudes about what is and what is not worth doing by interacting with and observing the emotions of role models such as parents and teachers.

A more cognitively complicated mechanism for emotional communication is analogy, when people try to convince people that they will like or dislike something by comparing it to something familiar (Thagard and Shelley 2001). For example, you may try to get someone to go to the newest *Matrix* movie by having them recall how they felt about the last one or similar movies. Empathy is a particular kind of emotional analogy in which you try to understand the emotional state of someone by comparison to your own previous mental states. There is experimental evidence that the development of ethical behavior in children is heavily shaped by emotional contagion and empathy (Hoffman 2000). Hence, distributed cognition is influenced by emotional as well as other kinds of communication.

Distributed Artificial Intelligence

Intelligent computation can also be understood as distributed. In its first few decades, AI concentrated on how individual computers might perform intelligently. Recently, however, there has been increased attention to how to get networks of computers to work together. A university campus today has thousands of computers electronically linked to each other, and the Internet links many millions of computers worldwide. Instead of trying to build a full kind of intelligence into a single computer, it might be possible to have varieties of specialized intelligence in many computers. By communicating with each other, the computers would solve problems beyond the capabilities of each working alone. Distributed artificial intelligence (DAI) is a branch of AI that investigates problems concerning how computers with different kinds of knowledge bases can be linked and put to work cooperatively. Imagine four distinct computers, each one running an expert system based respectively on logic, rules, analogies, and distributed representations. Could they be made to work together to overcome communication problems and produce an expert problem solver that exceeds in power any one of the systems? A more recent term for the field of distributed artificial intelligence is *multiagent systems*, reflecting the current concern in artificial intelligence with agents that perceive environments and act on them. For surveys, see O'Hare and Jennings 1996 and Wooldridge 2002.

One amusing application of DAI is the annual competition to build teams of soccer-playing robots (Asada et al. 2003). Just as successful human sports teams require cooperation among all their members, the success of robotic soccer teams depends on the ability of individual robots to work with each other. Robot soccer has become a useful forum for testing theories about what makes robots effective and what makes multiagent cooperation useful. Figure 13.1 shows some soccer robots in action.

DAI is similar to connectionism (chapter 7) in that both concern parallel activity of multiple processors, but differs in that each processor in a DAI system is on its own an advanced system possessing some intelligence. In contrast, the units in a connectionist system are very simple and merely pass activation to other units, not the complex messages that can be passed between computational agents in a DAI system.

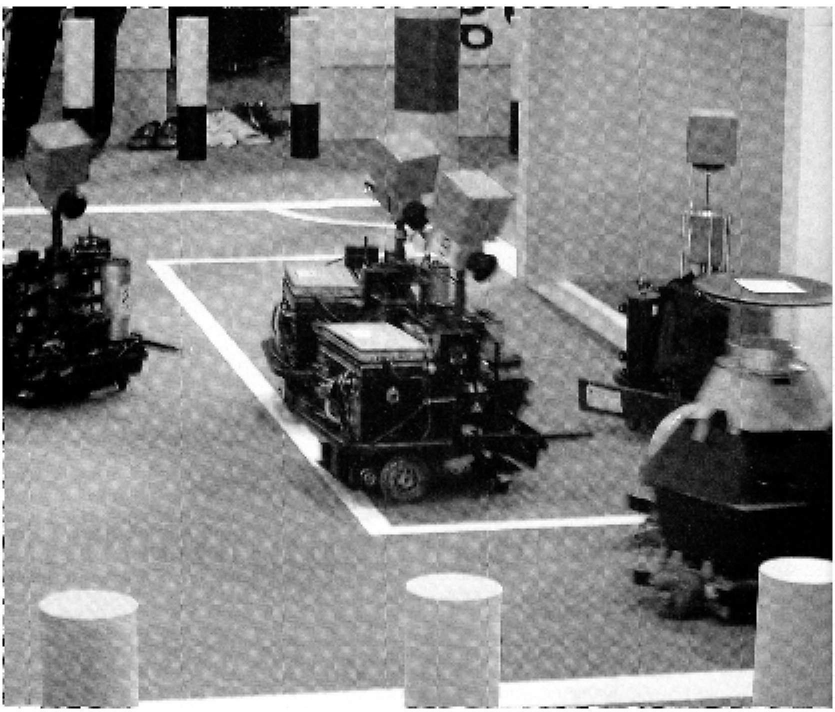

Figure 13.1
Soccer robots in action. Reprinted with permission from Asada et al. 2003, p. 28.

Culture

Unlike philosophers, psychologists, and AI researchers, anthropologists have always been attuned to social aspects of cognition. The central concept of anthropology is *culture*, “the systems of agreed-upon meanings that serve as recipes, or guidelines, for behavior in any particular society” (Barrett 1991, 55). The concept of culture is obviously social, for it concerns shared beliefs and values that make social interactions possible. As part of the trend to consider cognition in social contexts, some psychologists have recently been shifting their attention to culture. Hirschfeld and Gelman (1994, 4) contend that the mind is “less an all-purpose problem solver than a collection of enduring and independent subsystems designed to perform circumscribed tasks.” These tasks may be specific to particular cultures, so that problem solving would show cultural variability. Similarly, emotions may not be fully wired into human thinking, but may vary in different cultures (Kitayama and Markus 1994). According to Ekman (2003), there are biologically universal human emotions such as happiness, sadness, and anger. But there also seems to be considerable variation across cultures in the linguistic description and behavioral display of emotions (Wierzbicka 1999). For example, most languages have words for sadness, but Russian contains words for subtle kinds of sadness with no English language counterparts.

Nisbett (2003) describes many differences in the styles of thought between Westerners (Europeans and North Americans) and East Asians (Chinese, Japanese, and Koreans). Psychological experiments have shown that East Asians are more likely than Westerners to notice environments and relations, whereas Westerners attend more to objects. Westerners are more likely to see stability where East Asians see change. Westerners have a tendency to explain other people’s behavior in terms of their personality traits, whereas East Asians are more aware of how situations and relationships determine people’s behaviors. These contrasts are not the result of any biological differences between Westerners and East Asians, but rather reflect cultural influences: Western culture emphasizes the independence of individuals, whereas East Asian culture emphasizes interdependence.

Whorf (1956) claimed that different languages carry with them such different views of the nature of space and time that people of different cultures live in different worlds. Subsequent research has indeed found that people with different languages vary with respect to their ways of thinking about space, time, objects, color, shapes, events, and other minds (Boroditsky 2003). For example, English speakers use front-back spatial terms to talk about time: childhood is behind you, and a career is ahead of you. Mandarin speakers differ in that they also use up-down spatial terms to talk about time. Thinking is a complex collaboration between linguistic and nonlinguistic representations.

Some sociologists have taken the idea of cultural variability to such an extent that they throw out any idea of objective knowledge. The world is “socially constructed,” and people’s belief systems arise not from their cognitive processes but from their social situations. Skepticism about cognitive explanations of knowledge has been common in sociology of science—for example, in Latour and Woolgar 1986. But recognizing the importance of social factors in the development of scientific knowledge is consistent with both the existence of cognitive factors and the objectivity of science (see Thagard 1999). All humans share the same basic perceptual and neurological apparatus, which provides a biological commonality to cultural variability.

Responses to the Social Challenge

Denial

How should CRUM respond to these diverse arguments that thinking should not be understood in a social vacuum but as an inherently interactive process? Denial could take the form of a doctrine philosophers of social science call *methodological individualism*. This is the view that since groups are just collections of individuals, there are is no need for explanations of group behavior to concern anything but individuals. Methodological individualism is popular among some economists who claim that explanations in terms of macroeconomic groups such as nations, corporations, and social classes are all in principle dispensable in favor of explanations of the behavior of individuals. Similarly, one could argue for an individualistic CRUM by claiming that the talk of groups, networks, and culture in the social challenge should eventually be eliminable in favor of talk of individual thinkers.

One can admit the physical fact that groups, networks, and societies consist of individuals while maintaining that explanation cannot ignore social structures. Societies are very complex systems, and their operations are so dynamic and interactive that reductive explanation of what happens in them in terms of what happens to individuals is extremely hard to achieve. We saw the same problem of complexity in chapters 9 and 12: the operations of the brain may just be the operations of neurons, but there are billions of neurons that interact with each other in highly complex ways that make it unlikely that we will every be able to specify fully the behavior of individuals on the basis of the behavior of their neurons. A more promising strategy is to take seriously all of the various levels of explanation (neurons, persons, societies) and to investigate how these levels are related to each other (see chapter 14).

Expand CRUM

Taking the social challenge seriously requires CRUM to acquire a somewhat different perspective on representations and processes. The function of mental representations is not just for them to be representations by and for an individual, but also for them to be shared and used collectively. Propositions, rules, concepts, images, analogies, and even distributed representations need to be transmitted from one individual to another. Analogy, for example, is not just a process by which one person solves a problem alone, but can also be an important way in which someone helps someone else to solve a problem, leading to a shared representation of a situation. When you solve the problem of how to register for courses for the term or how to get a computer account, you are likely to rely heavily on information that is provided by others. Understanding consciousness may also rely on looking at cognition from a social perspective. You may not need much awareness to solve problems yourself, but consciousness is valuable for noticing what you are doing in order to teach other people. It is also crucial for empathic understanding in which you appreciate the emotions of others by analogy to your own experiences.

For representations to have a social application, there must be interpersonal processes that permit the spread of representations from one person to another. Such transmission in computer networks seems at first glance to be very simple, since electronic links make such transmissions as electronic mail and file transfers seem effortless. In fact, even simple transmissions depend on establishing protocols so that computers with very different hardware and software can communicate with each other. Distributed AI is far from trivial. Similarly, communication among humans is often very difficult. Teaching is not just a matter of dumping information into students' heads, but of striving to convey the desired representational systems. Hence, we need to expand CRUM to include descriptions of processes by which representations are transmitted among individuals.

Supplement CRUM

Investigation of the social processes of cognition, including their psychological, computational, epistemological, and cultural aspects, is barely beginning. Although CRUM can be expanded in a social direction to include enhanced ideas about representation and computation, we should still expect that explanation of thinking will have to rely additionally on inherently social concepts such as group, network, society, culture, and communication. The brain, emotion, consciousness, body, and world challenges showed the need to supplement CRUM with biological considerations, and similarly CRUM needs to be supplemented with social considerations. We might call the desirable approach to the study of mind CRUMBS, for *Computational-Representational Understanding of Mind, Biological-Social*. This acronym invites dismissal of the whole enterprise as offering only tiny morsels of understanding about the mind. But progress is being made on numerous aspects of CRUMBS, and no other approach to mind currently offers to tell us more about the full range of mental phenomena.

One emerging area of research is computational modeling of institutions and groups (Prietula, Carley, and Gasser 1998). Just as we can understand the mechanisms of individual cognition by developing computer simulations, so we can learn about social processes by developing computer models of them. For example, I have described elsewhere a computational model of how consensus is achieved in scientific controversies such as the debate about the causes of stomach ulcers. In this model, the individual scientists are simulated using the ECHO program for explanatory coherence (described in chapter 7 of the present volume), and group consensus is reached by repeated communication between scientists (see Thagard 2000).

Abandon CRUM

Like extreme proponents of the Heideggerian and situated-action perspectives, some social constructivists propose avoiding CRUM in favor of a purely social perspective on knowledge. Although admitting the importance of the social dimensions of human thinking, we should not forget that problem solving, learning, and language are also to be explained in terms of the representations and processes of individual minds. Mind and society are complementary explanatory notions, not competitors. Hence, the social challenge to cognitive science should be viewed as a spur to expand and supplement CRUM, not to abandon it.

Summary

According to the social challenge, cognitive science has largely neglected the relation of minds to their social environments. But research on social epistemology, distributed cognition, multiagent systems, and culture is increasingly describing and explaining how human thought operates in societies. The social challenge does not mount an alternative to CRUM, but rather points to issues about groups, networks, societies, and cultures that cognitive science can take seriously by expanding and supplementing CRUM.

Discussion Questions

1. What are the social contexts in which you acquire and apply knowledge?
2. How do emotions contribute to distributed cognition?
3. Would you expect a network of computers to be any more intelligent than a computer working alone?
4. Is CRUMBS coherent? Can there be a theory of mind that is biological and social as well as computational?

Further Reading

On social epistemology, see Goldman 1999, 2002. On distributed cognition, see Hutchins 1995. On multiagent systems (distributed AI), see Wooldridge 2002. For a concise survey of cultural differences in social cognition, see Kunda 1999, chap. 11.

Web Sites

Culture and cognition at the University of Michigan: http://www.lsa.umich.edu/psych/cultcog/index.html

RoboCup (robotic soccer): http://www.robocup.org/

Social epistemology resources: http://ucsu.colorado.edu/~brindell/soc-epistemology/

UCSD distributed cognition and human-computer interaction laboratory: http://hci.ucsd.edu/lab/

University of Massachusetts Multi-Agent Systems Lab: http://dis.cs.umass.edu/