Preface: Expanding Our Mental Horizons

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Introduction

Cognitive science aims to understand the nature of the mind. Yet the mind has many facets, and this fact has led to the evolution of different disciplines that study if from distinct perspectives. The challenge of cognitive science is to bring together the theories, phenomena, and techniques of its component areas, including artificial intelligence, cognitive psychology, education, linguistics, anthropology, and philosophy. Like the blind men with the elephant, only by combining our different impressions can we conjure a complete theory of the mind.

Research in cognitive science has been ongoing for centuries, but recent events signify its formal recognition as a field. One significant event occurred in 1977, when the first issue of the journal *Cognitive Science* appeared. The second and third took place in 1979, when the Cognitive Science Society was founded and when its first annual meeting was held in San Diego. The field has changed in many ways since then, but cognitive science has retained its identity as a forum for the exchange of ideas among its component disciplines.

The current volume contains a written record of the material presented at the Nineteenth Annual Conference of the Cognitive Science Society, which took place from August 7 to 10, 1997, at Stanford University. As in previous years, the proceedings includes an interesting mixture of papers on many topics from researchers with diverse backgrounds and different goals, presenting the multifaceted view of cognitive science that we have come to expect.

Increasing Diversity

But in recent years, there has been a general perception that the annual conference has become rather narrow, representing some segments of the cognitive science community but not others. In response, we made special efforts this year to attract participants from less well-represented constituents. Our activities in this direction included sending announcements to many mailing lists and wording the call for papers to encourage people who might not otherwise contribute.

These efforts appear to have been successful, since we received some 325 full-paper submissions, a 30 percent increase over the previous year's count. Moreover, in our efforts to be inclusive, we selected 140 of these papers, giving an acceptance rate of 43 percent. In fact, we considered accepting an even higher percentage, but we wanted no more than three parallel sessions, and these filled the slots even though we had foregone the traditional idea of plenary speakers.

In addition, on the recommendation of the Society's governing board, we continued the policy started at the 1996 meeting that let each Society member present a poster and include a one-page paper in the proceedings. We also made the deadline for such submissions later than the one for longer papers, giving authors more time to prepare. The poster option clearly proved attractive to many researchers, since we received some 170 one-page papers at submission time, and this had expanded to 240 after we told authors of rejected papers that they could include a one-page paper as well.

Another of the board's ideas was to organize a number of half-day invited symposia on topics designed to broaden the field's perspective. In selecting topics for these sessions, we strove for topics that fit within the general charter of cognitive science but that would attract speakers who might not normally attend the meeting. The speakers for these sessions included anthropologists, linguists, neuroscientists, philosophers, social psychologists, and others who were unlikely to participate without some efforts at recruiting them.

Encouraging Scientific Aims

Nevertheless, given limited speaking slots and proceedings pages, we had to make hard decisions about which submissions to accept for talks. We fell back on criteria that are common to many sciences and that we designed to address other problems we perceived with the cognitive science community. In particular, our review forms encouraged referees to favor papers that would be accessible and interesting to readers from many disciplines, that were clearly written and well organized, and that had scholarly merit in that they presented their work in a well-balanced historical context, rather than purely in terms of their own paradigm.

We also asked reviewers to evaluate submissions in terms of their scientific merit. For cognitive science to justify its name, it should be centrally concerned with the relation between theories and data. When forced to choose among submissions, we had a conscious bias toward papers that both discussed clear phenomena and presented a theory or model designed to explain those regularities. We attempted to reinforce this idea in the symposia, each of which included two integrative talks. In many cases, one survey focused on ma-

jor phenomena in the area, whereas the other reviewed major theories. In other sessions, the survey speakers examined the topic from different perspectives, but in each case reviewed both phenomena and theories.

Another effort in this direction involved our grouping of talks at the meeting. Rather than clustering presentations around theoretical camps, we decided to organize both the paper sessions and the symposia around phenomena and problem areas. Thus, we grouped submitted papers into areas like problem solving, natural language, and categorization, rather than into theoretical paradigms like production-system models, recurrent neural networks, and case-based reasoning.

Similarly, the symposium topics included (in alphabetical order) cognitive neuroscience, distributed cognition, language acquisition, motor behavior, scientific discovery, semantics, spatial cognition, and social cognition. Moreover, we tried to include representatives of different theoretical paradigms within each symposium, with the hope that grounding their theories in the same phenomena would lead to more constructive discussions than the rhetorical arguments that can occur when theoretical issues take precedence. We believe that, for cognitive science to mature into a true science, we need more informed interactions among researchers who come from different theoretical paradigms but who are concerned with the same phenomena. We hope that our strategies have at least moved the field in the desired direction.

Distributed Efforts

Overall, the 1997 meeting has been both challenging and rewarding to organize. Of course, we could not have done it without help from many sources. Other members of the organizing committee, including Jeff Elman, James Greeno, Keith Holyoak, and Paul Smolensky, provided input at critical points in the overall process. In particular, the ideas for including poster abstracts from Society members and half-day symposia came from Paul Smolensky. Thanks also go to the symposium organizers, including Meredith Gattis, Lila Gleitman, James Greeno, Steven Hanson, Ziva Kunda, Nancy Nersessian, David Rosenbaum, and Keith Stenning, who recruited excellent speakers representing diverse communities.

Although these contributions were the most visible, much of the essential work was done by others who focused on the details. People who helped at this level included Wayne Iba, Paul Maglio, and Roger Remington, who helped greatly in the decision-making process on papers. We also received considerable help from Maureen Greeno, who crafted the conference poster, Mark Maloof, who wrote the software for processing reviews, and Stephanie Sage, who helped check the formats of papers.

Susan Stansbury acted as the general conference administrator, handling the papers as they came in, responding to electronic mail queries, dealing with the university's conference office, and serving in other important ways. And many others played a more distributed but still crucial role, including the 163 reviewers (especially the ones who sent careful, detailed comments) and the student volunteers who helped with local arrangements and registration. Finally, none of this would have been possible without the many researchers who took the time and energy to submit papers, revise them, and present their work.

Another part of our strategy for increasing participation at the conference was to keep registration costs low. On this front, the contributions we received from various sponsors proved invaluable. Daimler-Benz Research and Technology Center, Interval Research Corporation, and Xerox PARC all provided generous donations. The Center for the Study of Language and Information (CSLI) at Stanford University donated office space and supplies, and also handled the funds. Finally, the Institute for the Study of Learning and Expertise (ISLE) provided substantial administrative resources in support of the conference.

A Symbol for the Future

Of course, the story of cognitive science will not end with this year's conference. The field has evolved in many ways since the Society's first meeting, and it will certainly continue to change. We hope that our efforts toward increasing the conference's diversity and scientific emphasis will carry over into future years, but that depends on the organizers of successor meetings and, even more, on the cognitive science researchers themselves.

One discovery gives us reason for optimism about the state of the field. In seeking to advertise the conference through electronic media, we were encouraged by the number, quality, and diversity of World Wide Web sites devoted to cognitive science programs at leading universities throughout the world. We also found many active UseNet newsgroups focusing on aspects of cognitive science. Together with the papers submitted to the conference, these finds suggest a healthy discipline that will continue to develop in interesting directions.

Undoubtedly, some readers will wonder at the 'labyrinth of thought' on the volume's cover, which also served as unofficial logo for the conference. The design for this particular labyrinth comes from the floor of Chartres Cathedral, but it also appears in Grace Church in San Francisco. At one level, the sinuous motion as one walks the pattern represents the sequential aspects of human cognition, which, although often goal driven, typically wanders before achieving its aim. Unlike the mythical Labyrinth of Crete, this design has no branch points, thus depicting the role of knowledge in constraining search.

More generally, the labyrinth also reflects the central role of pattern and structure in the mind, independent of the particular theory one favors to represent that structure. Moreover, in some religions, the labyrinth symbolizes passage through life, with the path moving sometimes closer to God and sometimes away. This seems a reasonable metaphor for our field's ongoing pursuit of a viable theory of mind. We encourage all cognitive scientists to keep these images at hand as they walk the path toward a true science of cognition.