

1-1-1996

Volume 9, Number 1 - CogSci News (Spring 1996)

Lehigh University Cognitive Science Program

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Lehigh University Cognitive Science Program, "Volume 9, Number 1 - CogSci News (Spring 1996)" (1996). *CogSci News*. 15.
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CogSci News

Cognitive Science Program, Lehigh University, Bethlehem, PA.

Volume 9, Number 1
Spring 1996

Editorial Staff

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Editorial Policy

This newsletter is published twice each year, in spring and fall issues, by the Cognitive Science Program at Lehigh University. Its purpose is to inform faculty and students about the interdisciplinary and growing field of cognitive science and to report the activities of Lehigh's Program.

The newsletter is distributed free of charge in the United States and Canada to academic programs and individuals interested in cognitive science. Anyone who would like to be added to the mailing list should simply notify the Editor.

The Editorial Staff welcomes readers' comments and *solicits materials* dealing with cognitive science. We are especially pleased to consider course syllabi, short essays, brief descriptions of scholarship and research in progress, extended abstracts of doctoral dissertations, book reviews, and original art work (e.g., cartoons, line-drawings, computer-generated images).

Address all submissions, comments, and subscription requests to: Padraig O'Seaghdha, CogSci News, Lehigh University, 17 Memorial Drive East, Bethlehem, PA 18015. Or send electronic mail to: pgoo@Lehigh.edu.

Cognitive Science Education at the University of Pennsylvania

Mickey Lynch
Institute for Research in Cognitive Science

Like the human mind it studies, Cognitive Science is far too broad to be encompassed by a single academic discipline. It can develop only where conditions are optimal for maximum communication and collaboration across disciplinary boundaries. Diverse specialists must be brought together to study problems that defy solution by a single discipline.

The situation at the University of Pennsylvania is ideal for the teaching of this new science. Cross-disciplinary collaboration has long been the hallmark of the University, facilitated by Penn's compact urban campus and its recruitment of faculty with a wide range of expertise. Psychology, computer science, linguistics, philosophy, and mathematics faculty members associated with the Institute for Research in Cognitive Science (IRCS) provide the nucleus of scholars needed to conduct a successful program in Cognitive Science at Penn. IRCS, located on Penn's campus, is one of the National Science Foundation's Science and Technology Centers, a designation given only to research programs that are at the forefront of their fields and take a cross-disciplinary approach to research, knowledge transfer, and education.

This multi-disciplinary characteristic of cognitive science presents a challenge of training a new generation of researchers who will be able to synthesize the perspectives of several heterogeneous disciplines in order to better understand cognition. To meet this challenge, the University of Pennsylvania is creating educational opportunities at both the undergraduate and graduate level.

Undergraduate Education

At the undergraduate level, IRCS faculty have created a dual-degree program in "Computer and Cognitive Science." Students admitted to the program pursue a challenging course of study leading to a Bachelor of Applied Science (BSE) in computer science or the Bachelor of Arts (BAS) in linguistics, philosophy, or psychology. The student must satisfy the course requirements for both degrees: the BAS dual-degree normally takes four years, and the BSE dual-degree normally takes five years. A 3.0 cumulative GPA is required for the dual degree program. An extensive faculty/student advising system helps each student to explore and use the overall resources of the University in designing a curriculum that is individually tailored to his or her career plan.

Penn also offers a cognitive science minor that is aimed at a wide range of undergraduates in either Penn's School of Engineering and Applied Sciences or the School of Arts and Sciences and allows a number of options. Students must choose at least six courses from a larger set organized into three levels identified as "introductory," "foundational," and "advanced." The introductory course (Introduction to Cognitive Science) and the advanced courses are cross-disciplinary. The remaining introductory and foundational courses are further organized into five "tracks" corresponding to the parent disciplines of computer science, linguistics, neuroscience, philosophy, and psychology. Students take a prescribed number of

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CogSci at U. Penn (cont.)

introductory and foundational courses, but are free to choose among tracks, and free in their choice of their advanced courses.

The undergraduate program focuses on interactions between basic scientific research and progress in technological applications. Among these are:

- the structure and function of language with application to the design and implementation of natural and graphic language interfaces to artificial systems;
- perception and action and their potential application to vision and robotic systems;
- modes of learning and their potential application to the acquisition of knowledge by natural and artificial systems;
- the relation of logic and computation; and
- problem solving and representation, and expert systems.

Graduates of Penn's undergraduate program interested in research careers will be strong candidates for graduate studies in computer science, linguistics, philosophy, or psychology. Others will be well-prepared for careers in the public and private sectors, particularly in such high-technology areas as artificial intelligence, natural and graphic language interfaces to expert systems, decision support systems, robotics, and manufacturing.

Graduate Education

We are currently exploring with the School of Arts and Sciences and the School of Engineering and Applied Sciences the development of a graduate minor in cognitive science. (Graduate minors do not yet exist at Penn.)

Currently, graduate education in cognitive science at Penn is conducted informally, through close interaction among faculty in the departments of computer science, linguistics, philosophy, and psychology. Students specializing in cogni-

tive science fulfill requirements for an advanced degree in one of the participating departments, and each department encourages its students to enroll in relevant courses in the other departments.

Many courses are conducted jointly by faculty in more than one department. These seminars have been an exciting and important focus for the synthesis of disciplinary perspectives; in many cases, they have resulted in significant research collaboration among faculty and graduate students across two or more departments.

The following recommendations for graduate students in cognitive science have been designed to be compatible with the differing requirements of the Ph.D. programs in the parent departments with respect to internal qualifying exams and Master's degree regulations:

- Students fulfill the normal requirements for the Ph.D. in the department awarding their degree.
- All students should take at least two thirds of their courses in their parent discipline.
- They should take at least six courses outside their home department by the end of their third year of graduate training.
- They should attend the weekly Computational Linguistics Feedback Forum (CLIFF), an informal gathering at which graduate students present work in progress.

Students also attend IRCS's weekly seminar on cognitive science. This seminar series, which has met regularly since 1980, included tutorial presentations designed to help bring researchers in one field into the "fold" of another. It also provides a forum for discussion of research in progress by both members of the Penn cognitive science community and a series of distinguished visitors. The seminar has provided an important opportunity for faculty and graduate students across the four different departments to meet weekly to exchange ideas and develop a joint sense of commitment to advancing the scientific enterprise.

English Language

Having chosen English as the preferred language in the EEC (now officially the European Union, or EU), the European Parliament has commissioned a feasibility study in ways of improving efficiency in communications between Government departments.

European officials have often pointed out that English spelling is unnecessary difficult; for example: cough, plough, rough, through and thorough. What is clearly needed is a phased programme of changes to iron out these anomalies. The programme would, of course, be administered by a committee staff at top level by participating nations.

In the first year, for example, the committee would suggest using 's' instead of the soft 'c.' Certainly, sivil servants in all sities would resieve this news with joy. Then the hard 'c' could be replaced by 'k' sinse both letters are pronounsed alike. Not only would this klear up konfusion in the minds of klerikal workers, but typewriters kould be made with one less letter. There would be growing enthusiasm when in the sekond year, it was anounsed that the troublesome 'ph' would henseforth be written 'f.' This would make words like 'fotograf' twenty persent shorter in print.

In the third year, publik akseptanse of the new spelling kan be expekted to reach the stage where more komplikated changes are possible. Governments would encourage the removal of double letters which have always been a deterent to akurate speling.

We would al agre that the horrible mes of silent 'e's in the languag is disgrasful. Therefor we kould drop thes and kontinu to read and writ as though nothing had hapend. By this tim it would be four years sins the skem began and peopl would be reseptive to steps sutsh as replasing 'th' by 'z.' Perhaps zen ze funktion of 'w' kould be taken on by 'v,' vitsh is, after al, half a 'w.' Shortly after zis, ze unesesary 'o' kould be dropd from words kontaining 'ou.' Similar arguments vud of kors be aplid to ozer kombinations of leters.

Kontinuing zis proses yer after yer, ve vud eventuli hav a reli sensibl riten styl. After tventi yers zer vud be no mor trubls, difikultis and evrivun vud fin it ezi tu understand ech ozer. Ze drems of the Guvermnt vud finali hav kum tru.

—supplied by Dr. Stephen W. Thorpe, La Salle University

¹ *Editor's Note: The Cognitive Science Program at Lehigh University has encountered a similar stumbling block when trying to introduce a graduate minor. Are graduate minors for interdisciplinary programs a good idea? Have other universities organized graduate minors? How well do they work? Please let us know by contacting the editor. Thank you.*

The First Noetic Science Manifesto

Seán Ó Nualláin

Dublin City University, Ireland, EU and
the National Research Council, Ottawa, Canada

Knowledge, classically defined as “justified true belief,” has historically been treated by a sub-discipline of philosophy called epistemology. At least since Descartes, one of epistemology’s concerns has been to prove the existence of an external world, a world outside the private mental realm of an individual inquirer. Its failure to succeed in this endeavor, or to resolve such issues as whether knowledge comes only from the senses (empiricism) or from external “forms” (idealism), has given impetus to the development of cognitive science, which studies—or at least should study—these questions experimentally as well as theoretically. Philosophy is now thought of, even by its own practitioners, as rational inquiry in any field. (As Ayer stated, it no longer claims capital enough to set up shop on its own.)

The notion of knowledge being overturned in cognitive science is that of a God’s eye view, for example, a Laplacean set of equations which one can study and, by studying, enjoy fully that form of experience we call “knowledge.” Cognitive science, on the contrary, is developing a theory of knowledge that is profoundly dependent on the agent’s interaction with the object of knowledge (noema), a “knowing how” rather than a “knowing

that.” Basically, all our views and theories (economic, political, etc.) help us gather data. A Marxist economist will gather more data than a non-partisan economist unanimated by ideology or money. As Inhelder put it, if you want to get ahead, get a theory. Theories that animate action, even if ultimately wrong (as, of course, all theories ultimately are), still lead to knowledge.

This century has seen the development of scientific knowledge characterized successively in the terms of logical positivism, Popperian falsification, and Kuhnian paradigm shifts. It has fallen to cognitive science to characterize knowledge in terms of its development. This will not be the focus here: Ó Nualláin (1995) and Bickhard and Terveen (1995) expound on this. A summary of these views will suffice.

Knowledge initially consists of action schemes (“if I do this, that will happen”) that gradually become internalized and abstracted from. The result of this abstraction is amenable to symbolic manipulation. Remarkably, some symbolic systems arising from formalist consideration have referents in the real world when applied in certain contexts. Two examples from physics of what Steven Weinberg terms

“the unreasonable effectiveness of mathematics” are Riemann geometry and Hilbert spaces.

The mysterious process by which these entities have a real (intentional) referent has inspired numerous metaphors. According to the memorable Bohm/Pribram model, the mind/body acts as a reference beam in holography. Objects emerge from an “implicate” realm and emerge from apparent chaos through the mind/body’s acting as a “reference” beam. We shall work with this metaphor on a provisional “as if” basis.

This fertile metaphor deals entirely with physical reality; the action-scheme account above is due to Piaget. With the American philosopher John Dewey, we first encounter a description of how our initially physical experience can produce structures that represent reality. Some crucial points have emerged. First of all, the roots of knowledge are in action. Secondly, once the existence of an external world is assumed, there are different types of relations possible between knower and noema. Along with empiricism and idealism, which we’ve already looked at, the notion that noesis (the act of knowing) involves cognition of objective properties—a notion labelled “realism”—is correct for certain noetic acts. Most importantly, however, we realize that knowing is an activity, not a state. In the holographic metaphor, the mind/body’s action will create a different reference beam for each of its states. This has obvious consequences for the different objects it can reveal in the blooming, buzzing mass of data we deal with from moment to moment.

One possible taxonomy of knowledge, then, categorizes with respect to amount of activity in the knower. The more activity required, the more context-dependent the knowledge tends to be. For example, we know the date the Declaration of Independence was signed or the five-times table pretty well everywhere; we know how to swing a golf club or clinch a deal

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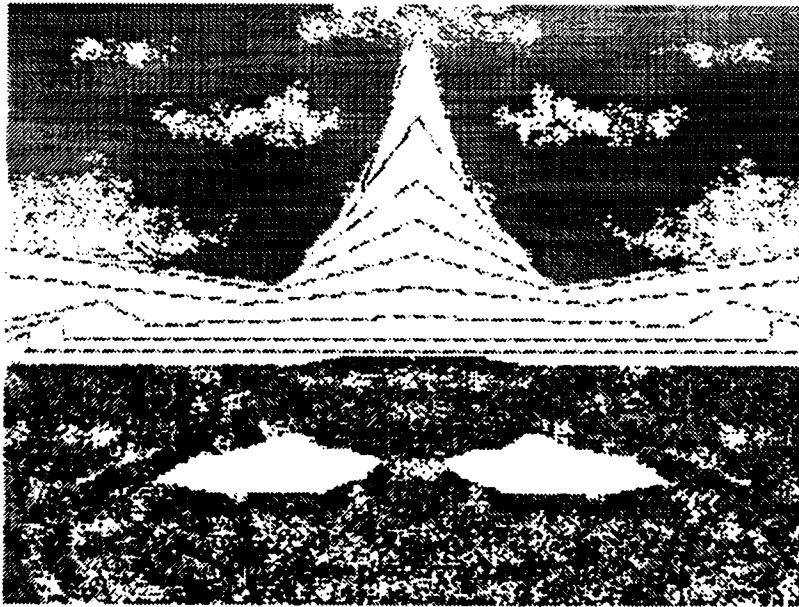


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All such help is greatly appreciated!

If you would like to make such a contribution (\$5, \$10, \$15), please make your check payable to “Cognitive Science Program” and mail it to Mark H. Bickhard, Cognitive Science Program Director, Lehigh University, 17 Memorial Drive East, Bethlehem, PA 18015.



(Computerized image by Gregory Brockway)

Noetic Manifesto (cont.)

only in the actual situation; and we can forget either type of knowledge when drunk. Nor is this an entirely novel approach to knowledge: for Aristotle some types of moral lapses were due to ignorance and—here's the link—agents were held blameworthy insofar as they were responsible for their ignorance (for example, by getting drunk).

This extended notion of knowledge has consequences for the roles of theories in cognition and action. All theories abstract from reality; all are right to some extent and wrong to some extent. For example, given quantum mechanics, Newton's physics is incomplete, but works well for macroscopic particles. In economics, monetarism works well for periods of rapid inflation, Keynesianism for short-run cyclical behavior, and Marxist economics provides the best long-run predictions; yet all claim to be comprehensive theories. This essay is inevitably limited to the types of knowledge that can be verbally expressed; its author, like every other human, has learned much by being in the presence of and physically learning from a teacher in a way this essay cannot imitate.

Wittgenstein's famous *Tractatus Logico-Philosophicus* ends with the admonition that the teaching contained in it is like a ladder, which should be kicked away the better to enjoy the perspective the climb has afforded. Umberto Eco's *The Name of the Rose* adapts this idea brilliantly. A complex plot at the center of

medieval Christendom is revealed to William of Baskerville, a Franciscan appointed to investigate a crime. Each bit seems in place, yet William questions whether he has discovered anything other than lies he was fed and, anticipating half a millennium, quotes a Germanic mystic to the effect that his theory was merely a ladder. My thesis puts as enormous a burden on the concept of knowledge as others have put on the concept of consciousness. I believe it can take the strain. I do so in the knowledge that this itself is theory-formation, and ultimately its "proof" is the legitimation a reader might feel in certain types of action or inaction. Successful theories are complicated plays on external data, the limits of human cognition (and emotion), and finally our desire to do something (out of boredom or necessity).

For Quine, much of what we call "mentation" is already out there, manifest in our science and technology. (A flavor of Quine's thought can be savored in his 1953 collection.) As he later put it, the keynote of the mental is the contention "that p". It follows that our attempts to circumscribe mentation with a set of programs are doomed to failure. However, such circumscription is still the dominant trend in cognitive science, with what I believe are unfortunate results.

I conclude by mentioning a final advance due to cognitive science (and physics). The ideal of scientific data has, since Galileo, excluded subjectivity, emphasized "primary" instead of "secondary" qualities. Cognitive science has abundantly demonstrated that emotion has a noetic quality; physics, as we are about to

see, has reintroduced the observer (as a species of measurement/determination). Perhaps cognitive science may eventually advance to the point where it can characterize one's activity in applying a theory in terms other than those of the theory itself. Then one could, for example, use the Marxist "ladder" to reveal the power-relations lurking under economic realities without accepting any of the Marxist premises, even on an "as if" basis. We may also learn in what deep sense the acts of mind required to understand physics are different from those required for sociology, to take but one example.

To label such a study "cognitive science" is to claim ancestry from Aristotle and his initial identification of a set of acts of mind of which one could predicate "true" or "false." However, while maintaining this link, it may be as well to follow the lead of consciousness studies and leave the cognitive science mainstream. Given the redundancy of most current cognitive science, we will call our field "noetic science".

References

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- Quine, W.V.O. (1953). *From a Logical Point of View*. Cambridge, Mass.: Harvard University Press.

Lehigh Events

9 February 1996

"The Search for Mind: A new foundation for Cognitive Science"

Seán Ó Nualláin

Dublin City University, Ireland, EU and the National Research Council, Ottawa, Canada

It is a measure of the maturity of cognitive science that, considered as the science of mind, it has developed sufficiently to be in crisis. This talk explored the nature of this crisis, in particular cognitive science's treatment of emotion, consciousness, and social factors, and proposed a new foundation for the discipline. The new foundation comprises a set of new fundamental tenets with specific em-

pirical consequences as well as a new basic orientation in approaching the search for mind.

The talk began by noting the current state of cognitive science, i.e., its ruling paradigm and the attacks on it, both on empirical and theoretical grounds. It then outlined the main substantive tenets of the new foundation and the evidence for them across the disciplines that comprise cognitive science. In general, it seems valid to identify a subset of mental acts, which can informationally be characterized (once "information" itself is defined), as the domain of cognitive science. Once that is done, cognitive science can best be thought of as experimental epistemology. It can take on board consciousness considered in terms of its informational content;

consciousness as subjectivity is the subject-matter of a different discipline. Likewise, emotion as considered informationally is relevant to us; the subjective correlate (affect) is outside our scope.

The second part of the talk outlined a general cognitive architecture that provides a viable medium between the concerns of the symbolists and those who choose to oppose them with the catch-cries of "situatedness" and "embodiment." In order truly to understand cognition, one must refer to its development. The following entities are regarded as fundamental: image schemas and other "operational" knowledge, the distinction between "ego-centric" and "intersubjective" cognition, the use of a symbol system, and the crucial role of selfhood in distinguishing subject from object. Cognitive development is seen as the establishment of myriad context-specific competencies. The difficulty in developing AI systems with strong functionality over different domains was explained in this light.

Finally, it was suggested that the interdisciplinary nature of cognitive science necessitates that, in Darwinian fashion, one or other discipline will come to the fore for a time. The danger is that the mantle of "The Science of Mind" may be passed on to another, less well-formed conceptual and administrative research structure if we don't broaden our concept of cognitive science appropriately.

22 February 1996

"Neural Darwinism and What it Has to Say about Functionalist Theories of Brain Function"

George N. Reeke

Laboratory of Biological Modelling
Rockefeller University

In the search for the biological bases of cognition and behavior, functionalism, whether in the form of symbolic computation or "neural networks," has been the guiding philosophy ever since McCulloch and Pitts equated thought with logical calculus. This approach cannot easily explain how symbols come to represent objects and events in the world, how processing

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If Dr. Seuss Were a Technical Writer ...

Here's an easy game to play.

Here's an easy thing to say:

If a packet hits a pocket on a socket on a port,
And the bus is interrupted as a very last resort,
And the address of the memory makes your floppy disk abort,
Then the socket packet pocket has an error to report!
If your cursor finds a menu item followed by a dash,
And the double-clicking icon puts your window in the trash,
And your data is corrupted 'cause the index doesn't hash,
Then your situation's hopeless, and your system's gonna crash!

You can't say this? What a shame, sir!

We'll find you another game, sir.

If the label on the cable on the table at your house
Says the network is connected to the button on your mouse,
But your packets want to tunnel on another protocol
That's repeatedly rejected by the printer down the hall,
And your screen is all distorted by the side effects of gauss,
So your icons in the window are as wavy as a souse,
Then you may as well reboot and go out with a bang,
'Cause as sure as I'm a poet, the sucker's gonna hang!

The End

Events (cont.)

algorithms can form and be transmitted to new generations, or how conscious awareness can arise from a computation.

G. M. Edelman has proposed that these difficulties can be overcome by a kind of "neural Darwinism" that operates during the lifetime of an individual to map the world onto neural circuits and signals. Reek presented this theory and several biologically realistic models (including the autonomous device "NOMAD") that have been developed to clarify the important differences between functionalist and selective theories. The models are "synthetic" in the sense that they simulate not just a neural network, but an organism with senses and motor outputs acting in an environment.

Selectional systems replace determinism with degeneracy, representation with mapping, algorithm with experience, and epiphenomenal consciousness with efficacious consciousness.

1 March 1996

"From Apprentice to Expert in Ten Years (or Less)"

Valerie L. Shalin

Department of Industrial Engineering
and Center for Cognitive Science
State University of New York at Buffalo

Examples from observational studies in medicine, aviation, and manufacturing illustrate deficiencies in the prevailing cognitive account of expert knowledge. This account largely ignores the expert's ability to interact with a physical and social environment, and in so doing vastly underestimates the scope of workplace knowledge and the training it requires. Drawing on anthropology, the notion of accepted methods acknowledges the social foundations of workplace expertise. But the challenge of executing accepted methods in a physical setting raises new questions regarding the manner in which experts recognize problems, adapt accepted methods for current settings, and evaluate their progress as work proceeds over time. Implications of this emerging view of expertise will be discussed regarding the design of technology to support workplace activity and learning.

19 March 1996

"How Can I Miss You If You Won't Go Away? (The Real Reason We Represent Reality)"

Brian Cantwell Smith

Xerox Palo Alto Research Center
(Cognitive Science Keynote Speaker)

If we were causally coupled to everything that matters, we wouldn't need to represent. But we aren't (notwithstanding

the Internet). Important things lie out of reach; people we care about go to Majorca; it pays to remember the past and attend to the future (neither of which is causally present). Representation, Smith argued, is a strategy for dealing with what is absent. Specifically, it involves stabilized patterns of disconnected coordination. This view, he claimed, can do justice to both realism and antirealism. For ontology (what exists) is an achievement, not a given.

26 April 1996

"Why Children Think Opaque Containers are Referentially Transparent"

Jill de Villiers

Department of Psychology
Smith College

Children below the age of approximately three fail to appreciate that another person might not have the same knowledge that they do. For instance, if Johnny sees a piece of cake being put into a cupboard, and Susie later sees it being moved to the refrigerator, Susie is likely to say that Johnny will look for the cake in the refrigerator. The speaker argued that mastery of the syntax of embedded clauses such as in "Johnny believes that the cake is in the cupboard" is an aid to, and prerequisite for, mastery of the associated concept of false belief.

Donald T. Campbell, 1916–1996

Professor Donald T. Campbell, 79, died May 6, 1996, of complications after surgery. Don had retired in 1994 as professor of Psychology and of Sociology and Anthropology at Lehigh University, Bethlehem, Pennsylvania, but continued to be active on campus and in writing until his death. He joined the Lehigh faculty in 1982; taught courses in many departments; co-authored the proposal that created the Henry R. Luce Professorship in Cognitive Robotics and the Philosophy of Knowledge; participated in and taught the Philosophy Faculty Seminar; and encouraged and inspired everyone with his intellectual energy and enormous interdisciplinary breadth and depth.

Don's career was astounding. He was a member of the National Academy of Sciences since 1973; President of the American Psychological Association in 1973; member of the American Philosophical Society since 1993; and recipient of awards and honorary degrees far too numerous to list here. He authored more than two hundred and fifty articles.

Don's work is best known in Philosophy for his development of evolutionary epistemology, an approach to epistemology applicable at all biological, psychological, and social levels. He is,

moreover, considered to be one of the most influential social psychologists of the last half century. Don, however, called himself a "dabbler" as he roamed the fields of philosophy, psychology, anthropology, sociology, and education. His most recent work was in the sociology of science, focusing on what he called the sociology of scientific validity, and the philosophy of science. Among many as yet unfinished collaborations are an extension of his notion of downward causation, and an extensive argument that variation and selection is a general and useful form of explanation not limited to biological evolution or epistemology.

Don was a genius. But his heart was even larger than his intellect. He was caring and unpretentious. He encouraged and mentored people all over the world. He was a good friend and a good human being. He is deeply missed.

Don is survived by his wife Barbara Frankel of Bethlehem, who retired from Lehigh in 1993 as a professor of Anthropology; by two sons, Martin Campbell of St. Croix, U.S. Virgin Islands, and Thomas Campbell of Mundelein, Illinois; and by a sister Louise Silver of Salmon Arm, British Columbia, Canada.

— written by Mark H. Bickhard

Meetings of Interest

Yale Workshop on Adaptive and Learning Systems

The ninth annual workshop at Yale University, June 10-12, 1996, will bring together perspectives on the viability of intelligent systems operating in complex environments offered by learning theory, adaptive control, robotics, artificial neural networks, and biological systems. For further information contact:

Ms. Lesley Kent
Center for Systems Science
Yale University
P.O. Box 208267
New Haven, CT 06520-8267
or phone: (203) 432-2211
or send electronic mail to:
lesley@sysc2.eng.yale.edu.

Association for Computational Linguistics

The 34th annual meeting of the ACL will take place June 23-28, 1996, at the University of California, Santa Cruz. In addition to research papers and tutorials there will also be a special poster session for students organized by a committee of ACL graduate student members. For more information, send electronic mail to:

ACL96-questions@linc.cis.upenn.edu

The ACL maintains an electronic document archive by electronic mail. Requests for files from the archive should be sent as e-mail messages to:

listserv@cs.columbia.edu

with an empty subject field and the message body containing a request command. The most useful requests are "help" for general help on using LISTSERV, "index ACL-L" for the current contents of the ACL archive and "get ACL-L" to get a particular file named from the archive.

SIGPHON 96

The 2nd Meeting of the Special Interest Group in Computational Phonology will hold a workshop on Friday, June 28, 1996 in conjunction with the annual meeting of the ACL (see above). Speech researchers working on speech recognition or speech synthesis have traditionally had little interest in the theoretical issues involved in

building, for example, grapheme-to-phoneme conversion systems. Computational phonologists, on the other hand, have usually been more concerned with the relationship between computational models of phonology and theoretical phonology than they have in seemingly more mundane applications of their results. In recent years, however, there has been an increasing body of work that is informed by ideas and methods of both computational phonology and speech technology. This workshop will provide an excellent opportunity to air such work as well as to make contact between the speech and computational linguistics communities. For more information, send electronic mail to:

sigphon@research.att.com

Society for Text and Discourse

The sixth annual meeting will be held July 11 and 12, 1996 (preceding the Cognitive Science meeting) at the Radisson Hotel La Jolla (near the University of California at San Diego campus). The Society for Text and Discourse is an international society of researchers who investigate all aspects of discourse processing and text analysis. This year's meeting will feature invited addresses by Herbert Clark, Robin Lakoff, Wendy Lehnert, Emanuel Schegloff, and Barbara Rogoff. For further information, contact Rachel Robertson, Conference Manager, by phone at:

(608) 262-6989

or send electronic mail to:

RRRobert@facstaff.wisc.edu.

Cognitive Science 1996

The Eighteenth Annual Conference of the Cognitive Science Society will be hosted by the University of California, San Diego (La Jolla), July 12-15, 1996. The Annual Cognitive Science Conference began with the La Jolla Conference on Cognitive Science in August of 1979. The organizing committee of the Eighteenth Annual Conference would like to welcome members home to La Jolla, by recapturing the pioneering spirit of the original conference in core areas of Anthropology, Computer Science, Linguistics, Neuroscience, Philosophy, and Psychology, as well

as extending a welcome to fields on the expanding frontier of Cognitive Science, including Artificial Life, Cognitive and Computational Neuroscience, and Evolutionary Psychology. For more information, view the WWW page:

<http://www.cse.ucsd.edu/events/cogsci96/>

or send electronic mail to:

cogsci96@cs.ucsd.edu

or call (619) 534-6773 or (619) 534-6776.

Spoken Language Processing

The 4th International Conference on Spoken Language Processing (ICSLP 96) will convene in Philadelphia, October 3-6, 1996. The conference focuses on speech processing by both humans and machines. For more information, call:

(302) 651-6830

or send electronic mail to:

ICSLP96@asel.udel.edu

Boston University Conference on Language Development

The 21st Annual Conference, November 1-3, 1996, will focus on first and second language acquisition, and will related topics such as bilingualism, creoles, neurolinguistics, sociolinguistics, language disorders, speech perception and production, etc. For more information, contact:

Boston University
Conference on Language
Development

2 Cummington Street
Boston, MA 02215 U.S.A.

Or call: (617) 353-3085

Or send electronic mail to:

langconf@louis-xiv.bu.edu

Knowledge Representation Systems Based on Language

This AAAI symposium will be held at MIT, November 4-7, 1996. The symposium will address building knowledge representation systems that parallel the representational and inferential characteristics of natural language (e.g., ambiguity, complexity, and context-dependence). For more information, call Lucja Iwanska at:

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Meetings (cont.)

(313) 577-1667
or send electronic mail to:
Lucja@cs.wayne.edu

AAAI Symposium on Embodied Cognition and Action

This symposium, to be held at MIT, November 9-11, 1996, will focus on the role of physical embodiment in cognition. It is largely accepted in AI that embodiment has strong implications for the control strategies for generating purposive and intelligent behavior in the world. Some theories have proposed that embodiment not only constrains but may also facilitate certain types of higher-level cognition. Evidence from neuroscience allows for postulating shared mechanisms for low-level control of embodied action (e.g., motor plans for limb movement)

and higher-level cognition (e.g., abstract plans). Work in animal behavior has also addressed the potential links between the two systems and linguistic theories have long recognized the role of physical and spatial metaphors in language. The symposium will study the role of embodiment in both scaling up control and grounding cognition. We will explore ways of extending the existing typically low-level sub-cognitive systems such as autonomous robots and agents, as well as grounding more abstract typically disembodied cognitive systems. We will draw from AI, ethology, neuroscience, and other sources in order to focus on the implications of embodiment in cognition and action, and explore work that has been done in the areas of applying physical metaphors to more abstract higher-level cognition. The WWW

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(Thank you.)

home page for this symposium can be found at:

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