

Human & Artificial Mentality: A Cognitive Science Institute at Notre Dame

“A deep scientific understanding of how the mind perceives, thinks, and acts is within our grasp. Such an understanding will have a revolutionary impact on national interests in science, medicine, economic growth, security, and well-being.” --From a call for a “Decade of the Mind.” (Science, 2007)

PURPOSE

Cognitive Science is the interdisciplinary field that aims at understanding the nature of mind, thought, and intelligence, in all of its various expressions. In the recent *Science* editorial cited above, leading cognitive neuroscience researchers have called for a “Decade of the Mind Initiative” that will have four interrelated aims: healing and protecting the mind; understanding the mind; enriching the mind; and modeling the mind. Cognitive science will be a significant contributor to this initiative, as it addresses critical questions about what cognition is at many levels of analysis, from the behavioral regularities that reflect thought, to the neural structures that implement thought, to the abstract properties and processes that underlie thought. Being fundamentally interdisciplinary, cognitive science historically has drawn knowledge from various academic fields including psychology, engineering, philosophy, psycholinguistics, anthropology, neuroscience, and biology. Notre Dame today is in a perfect position to bring all of these fields, and others, together in an interdisciplinary effort under the umbrella of a unique and highly visible cognitive science institute on our campus.

This proposal is timely because no area of research today holds greater promise than cognitive science for achieving a better understanding of what it means to be human. Work in this field challenges many traditional philosophical and theological assumptions about human nature as it sheds new light on age-old issues such as the relation of mind and brain, the nature of human cognition, and the connection between mentality and embodiment. Even the Vatican has embraced cognitive science for its potential to influence the evolution of Catholic thought, having recently sponsored its own scientific conference on “Mind, Brain, and Education” under the auspices of the Pontifical Academy of Sciences. Moreover, the Pontifical Universities have formed a joint “Science, Technology, and the Ontological Quest (STOQ)” initiative to further pursue the important connections between science, philosophy and theology. The Scientific Vice-Coordinator of STOQ, Genauro Auletta, in a recent communication with us has shared his perspective that developments imminent within cognitive science will be a critical source for “bringing new understanding to the worldwide Catholic culture.” Certainly, then, the world’s leading Catholic research university, with its highly regarded philosophy and theology departments, its renowned expertise in ethics, and its strong representation in cognitive psychology, is poised to play a primary role in the evolving conversation stimulated by developments in cognitive science. However, it is very hard to be a credible participant in this conversation without also having an ongoing, visible, institutionally supported program of research within that science itself.

Cognitive Science at Notre Dame has the potential to be truly unique in that it will draw together conversational participants beyond the usual suspects in this dialogue. On our campus, more than anywhere else, the disciplines of psychology, philosophy, theology, and ethics all can be brought to bear on advances in cognitive science as this field produces new applications from the possibilities of cognitive enhancement programs, to the utilization of artificially intelligent robotic weapons, to the treatment of cognitive disorders. The combined strengths of our faculty in the Reilly Center for Science, Technology, and Values, in the Departments of Philosophy,

Theology, and Psychology and more broadly in the Colleges of Arts & Letters, Science, and Engineering provide a unique academic environment in which Notre Dame can and should aspire to preeminence in cognitive science.

APPROACH

Our approach is to propose that a new interdisciplinary institute be established to pursue the study of human and artificial cognitive systems from both a teaching and research perspective. This institute will draw together and enhance existing faculty and student interests in cognitive science, but only if resources are available to endow it with the following key attributes:

A physical location and joint appointments. There has been a long history of interest on campus related to cognitive science dating back to Ken Sayre's early work on cybernetics conducted under the Philosophic Institute, which achieved national recognition. More recently, efforts of several faculty members have resulted in an interdisciplinary cognitive science interest group that has met regularly for reading and discussion and has given rise to productive inter-college research collaborations dealing with various topics (see <http://www.nd.edu/~ndcogsi/> for more information on this group). An institute with a physical space for congregation will foster greater proximity among its faculty, which in turn will enhance informal dialogue and facilitate collaborative teaching and research efforts. Also, formalizing the involvements of interested faculty across campus in the form of joint appointments will help to solidify their important contributions to the cognitive science endeavor. Moreover, it will help build an identity for the institute, which will enhance the recruitment of new cognitive scientists to Notre Dame.

New faculty lines for senior and junior cognitive scientists. It will be important to make strategic hires of additional cognitive scientists with well-established and visible ongoing programs of sponsored research, as well as young, up-and-coming investigators in this field. This will help to balance the recent losses of key interest-group faculty and will further define the identity of this endeavor at Notre Dame. Having a critical mass of active researchers known for their work in cognitive science is crucial to the long-run viability and success of the institute. At present, we envision these hires will bring additional expertise in key areas such as the philosophical issues related to cognitive science, human cognition, neural mechanisms, as well as artificial cognitive systems and robotics.

A central focus on getting external support for research and teaching. A critically important dimension of the institute's dual research and teaching mission will be to seek external funding from both public and private sectors. The presence of an interdisciplinary cognitive science institute, with active and visible researchers, will make its faculty even more competitive when applying for major cross-disciplinary funding initiatives from private foundations, (e.g., James S. McDonnell Foundation's Brain, Mind, & Behavior program), and government agencies (e.g., NIH, NSF, DOE). Moreover, an institute with an interdisciplinary graduate program will make Notre Dame eligible to compete for funding that is not presently available to us (e.g., NSF's IGERT). Also, the presence of an institute on campus will make Notre Dame more credible and attractive to potential industry partners and other benefactors who seek to fund important research and teaching initiatives within the broad umbrella of cognitive science.

An interdisciplinary graduate program leading to the Ph.D. in cognitive science. The History and Philosophy of Science Program within the Reilly Center is a great example of a graduate program at Notre Dame that has flourished within the context of an interdisciplinary academic

unit. The cognitive science graduate program we envision at Notre Dame would take advantage of many existing courses taught by participating faculty in various departments, and also would give rise to new ones spawned within the institute. A preliminary proposal for an interdisciplinary cognitive science Ph.D. already has been presented last year to the Graduate School and the Deans of the Colleges of Arts & Letters, Science and Engineering where it received great support.

An undergraduate concentration or interdisciplinary minor in cognitive science. Undergraduate involvement in the teaching and research dimensions of the institute will be critical to its long-term success. Having at least an undergraduate concentration in cognitive science will make our students more competitive when applying to graduate programs in this field.

ANTICIPATED INVESTMENTS AND RETURNS

We are requesting a total of 5.5 M over three years including salary for 4 new hires (2 senior at 200 K each per year including fringes, and 2 new mid-level at 100 K per year each including fringes), plus estimated start-up costs of 3 M for these four hires. Also, the request includes an annual administrative and operational budget (50K per year), a speakers/conference budget (25K per year), and funding for graduate and undergraduate assistants (300K total over 3 years). Note that the College of Arts & Letters has agreed to match the above hires with an additional two open junior positions already in place. In addition, we are requesting sufficient physical space for the institute, including office, meeting, and appropriate research space for the new faculty. We expect the four new faculty lines requested herein to be funded through endowment after the grant period, but we have not included endowment costs in this proposal.

Substantial returns on this investment are expected in monetary and non-monetary forms. Even without a formal institute, members of the cognitive science interest group on campus have generated over 4 M in externally funded research in the last few years. We expect to at least match the 5.5 M investment amount with aggregate external support dollars accumulated within the first five years of the institute's existence, to be increased by at least 50% (7-8 M) in the subsequent five-year period. The long-range goal for the institute thereafter will be to keep external funding support at the level of at least 1.5 to 2 M a year.

Non-monetary returns will occur in various ways including enhanced national visibility for ND in this area, published research reports and scholarly products, sponsorship of notable speakers and relevant academic conferences on campus, successful placements of our graduates in academic positions or graduate programs, and other events that will garner donor support and capture student and faculty interest.

CONTACT PERSON AND ANTICIPATED PARTICIPANTS

The following list contains faculty identified thus far from the Departments of Biological Sciences, Electrical Engineering, Philosophy, Psychology, and Theology with an expressed interest in being affiliated with the proposed institute. The asterisk indicates the main contact for this proposal.

Peter Bauer, Sunny Boyd, Laura Carlson, Chuck Crowell*, Kathleen Eberhard, Bradley Gibson, Don Howard, Gerald McKenny, Vaughn McKim, Darcia Narvaez, Wolfgang Porod, Leopold Stubenberg, and Michael Villano.