

Research Initiative Update

Language Processes

CCSN Research Initiatives were designed to organize faculty into groups addressing similar “big questions.” Faculty within each initiative strive to identify and employ complementary methodologies as well as intellectual opportunities for the creation of new programs of research. We interview Steve Small, Professor of Psychology and Neurology at the University of Chicago and leader of the Language Processes Research Initiative.

What interests unite the Language Processes Research Initiative?

While the CCSN hosts some of the most prominent social neuroscientists in the world, there is a whole other group of cognitive neuroscientists participating in the Center who focus on subjects such as language, vision, memory and attention—people like myself, Dave Gallo, and Howard Nusbaum, for example. I focus on the neurobiology of language, or the cognitive neuroscience of language. We are one of the major groups in the world in this area. People in the labs of Howard Nusbaum, Susan Goldin-Meadow, Dan Margoliash, and myself are all interested in how the brain does language. There are different ways of conceiving the issues, but I think overall we are interested in the same question: How does the brain talk, understand, read and write?

What is the integration like across divisions in the community of University of Chicago language scholars?

THE FACT THAT LANGUAGE IS ALWAYS PERFORMED IN A SOCIAL SETTING BRINGS THE STUDY OF SOCIAL AND COGNITIVE NEUROSCIENCE OF LANGUAGE TOGETHER.

STEVE SMALL

Most of us in the Center work together. I don't think we have all worked together on a single project, but every pair-wise combination has worked together. More broadly, the literature of our field encompasses linguistics, as well as psychology, neuroscience, and neurology. The people who study language in the world come from many different departments and walks of life, so there are many perspectives to consider. We have French, English, and Slavic professors here who study basic mechanisms of language, in addition to anthropologists, theoretical linguists, applied linguists, psychologists, and neurologists.

Can you give me some examples of research you've been doing?

Howard Nusbaum and I recently had a couple of graduate students, one of them a Ph.D. student in psychology named Jeremy Skipper, who did some work on the role of the motor system of the brain in perceiving speech. One doesn't think of the system used for producing speech as being terribly important for understanding language or perceiving speech, but he did some really fascinating studies showing that the motor system is very important for perceiving speech, and even developed a theory as to why that might be the case. I have a post doc now who is using not only functional Magnetic Resonance Imaging (fMRI), but also repetitive Transcranial Magnetic Stimulation (rTMS). With fMRI you can see which areas participate in performing functions, but you can't tell if any of those regions are actually critical to the task. With rTMS, one causes a reversible lesion with a bit of stimulation, and then tests whether a subject's behavior changes. That is a much more modern and controlled way of doing what was done before with lesion patients. Those experiments of nature were completely uncontrolled, and therefore sometimes led to quite unclear inferences.

Can you tell me about the recent neurobiology of language conference you hosted?

We organized the first Neurobiology

of Language Conference (NLC2009) last fall. It was a full-fledged scientific conference, supported by a grant from the Center for Integrative Neuroscience and Neuroengineering Research (CINNR) at the University of Chicago. We ended up having over 200 abstracts submitted, and 353 attendees. It was an enormous success. We are in the process of organizing the second meeting, NLC2010 (<http://www.neurolang.org>), which will be held in San Diego this fall. We are also in the process of organizing a neurobiology of language society. The society, which will host the conference, aims to stimulate research in how the brain does language. It also aims to provide education, especially for people who do not have strong neurobiology backgrounds. Our keynote speakers this year, as well as previous speakers, will be researchers who do neurobiology and systems neurobiology because we want people to get excited and interested about learning genetic and electrophysiological methods, research in neurogenesis, and so forth. We hope to encourage researchers who study language from the perspective of other disciplines to take on the habit of thinking in more neurobiological terms.

What current research questions do you find the most exciting?

One among many important questions is, “How does the brain represent meaning?” There is a big controversy about whether the brain contains codes for meaning that are separate from representations of sensory (e.g., visual, auditory, tactile), and motor (e.g., manipulability) properties. There are some people, and I think our group would be included, who believe that the representation of meaning incorporates all of the sensory and motor codes and forms a large network of representations, and that this whole network becomes involved when meanings get processed, though different parts may not become involved to the same degree. Regardless, many people pose the question of whether or not there are some representations of meanings that do not depend at all on these factors, so that when we process language (e.g.,

listen to someone talking who mentions some object), we don't need to visualize what the object looks like or think about manipulating it. For example, when I hear “soda bottle,” I don't always have to see one or grasp one, because I actually have a way to represent the concept independently. The alternative is that contextual factors do get involved no matter how a word or concept is mentioned, so that how you say the word “soda,” the motor articulators for saying it, the letters that make it up, and the taste of the drink are all part of the meaning and become active in the brain no matter what.

The fact that language is always performed in a social setting brings the study of social neuroscience and the study of the cognitive neuroscience of language together. Sometimes these meanings I am talking about do rely on parts of the brain responsible for processing social information. If you take my perspective to its ultimate degree, which is that everything is active when I process language, then these social aspects will become active too. And depending on the circumstances, they will be more or less important to the impact of that meaning on behavior.

Here we are very adamant about studying language in an ecological context. If we view language as a symbol system, or in terms of mathematical set theory, and we're interested in knowing whether a particular string is a part of the set, whether the set might be acceptable English, or acceptable French, or acceptable Zulu—if we're interested in knowing whether this string is legal or illegal, we don't have to worry about context, or memory, or human beings at all. However, if we are interested in knowing how the brain actually works, we have to come to terms with the fact that people are going to process things very differently in different settings, in different contexts, and for different purposes. The brain mechanisms for doing that represent the substrate of the Neurobiology of Language and one of the key topics of the Human Neuroscience Laboratory (<http://www.fmri.uchicago.edu/>) at Chicago. ■

UPCOMING EVENTS

Upcoming Lectures

A.J. Carlson Memorial Lecture
19 May 2010
12:00 pm, BSLC 205
Paula Niedenthal, Université Blaise Pascal, FR.

The Simulation of Smiles (SIMS) Model: Embodied Simulation & the Meaning of Facial Expression

Research in Progress Seminars

The Center faculty also participate in various workshops, brown bags, and research in progress seminars. To be added to the email list for announcements of talks and events, email Anna Gomberg, agomberg@uchicago.edu.

2010 CCSN Advanced Study Workshop Speakers

The Center for Cognitive and Social Neuroscience in collaboration with other Departments, Centers, Institutes, and Programs, sponsor talks on a wide range of topics by visiting scholars. Upcoming speakers include:

11 May 2010
Stuart 105
4:00 pm
Amir Raz, McGill University
Atypical Attention and Overriding Automatic Processing.

25 May 2010
Stuart 105
4:00 pm
Natalie Denburg, University of Iowa
Why So Many Seniors Get Swindled: Brain Anomalies and Poor Decision-Making in Older Adults.