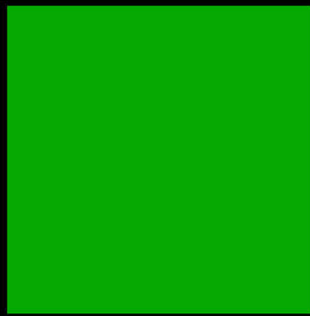
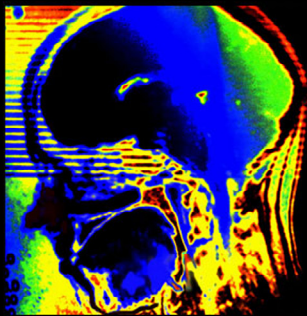
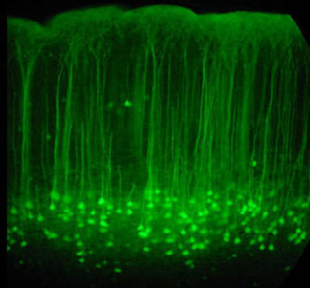
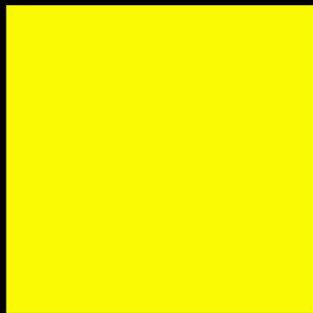


THE CENTER FOR COGNITIVE AND SOCIAL NEUROSCIENCE



Quarterly Newsletter

Summer 2009

THE UNIVERSITY OF CHICAGO

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Introduction

The Quarterly Newsletter of the Center for Cognitive and Social Neuroscience (CCSN) aims to keep center members and affiliates abreast of what's going on at the center. Encouraging innovative cross-disciplinary work constitutes one of the central missions and values of the CCSN. Therefore, this newsletter will feature examples of successful collaboration, especially interdisciplinary collaboration, between center members. In the future, we hope that our readers will communicate their new projects, events and discoveries with us so that we may in turn share them with our readership. If you have an idea for a story or would like to share your upcoming research or event with the CCSN community, please email ccsn_newsletter@uchicago.edu. Please visit our website at ccsn.uchicago.edu.

About the Center

A hallmark of cognitive and social neuroscience is the use of multiple methods that bridge disciplines and levels of analysis. The CCSN was founded on the premise that promoting interdisciplinary research that cuts across economic, social, behavioral, psychological, neural, cellular, molecular, and genetic levels of analysis can lead to new research advances and change how researchers from different fields think about the brain and mind. The University of Chicago Center for Cognitive and Social Neuroscience (CCSN), the first such interdisciplinary Center, was established in 2004. Center members are about equally distributed across the Social Sciences Division and the Biological Sciences Division. The particular mix of faculty training in CCSN represents a blend of science and theory that is well grounded in the past and embraces the technology and methods of the future. They offer a new and powerful mixture of theoretical and analytical tools with which to study complex human behavior. CCSN is committed to promoting rigorous, multi-level integrative research of complex social behavior.

Affiliate Lab Interview

Agustin Ibáñez and Esteban Hurtado on post-cognitivism

The *Laboratorio de Neurociencias Cognitivas*, associated with the *Universidad Diego Portales* located in Santiago, Chile, opened in 2007, and recently became an affiliate of the CCSN. Led by Esteban Hurtado, the laboratory is developing a “post-cognitivist” research paradigm, focusing on the study of contextual cues, language coordination and non-linguistic information, decision-making and semantic valence integration, facial expression processing and social cues. We are pleased to present an interview with Esteban Hurtado and Agustin Ibáñez, a lead researcher at the center.

JW: How would you characterize social neuroscience research in South America?

AI & EH: Social neuroscience is a newly emerging field of research in South America. Strong enthusiasm is observed across various academic departments for this new research agenda, accentuated by the interdisciplinary nature of academics in Latin America. Despite the widespread use of interdisciplinary approaches, certain research programs are quite isolated and limited by poor organization and scarce resources. Therefore, research collaboration with well-recognized international centers such as the CCSN is necessary to increase the quality of research.

In addition to this general environment of intellectual curiosity, South America provides specific contexts that are conducive to the social neuroscience approach. For example, South America is home to indigenous minorities who could participate in social neuroscience studies on stereotype or prejudice. South America also provides socio-political contexts that are associated with civil conflicts, as well as remarkable educational

and economic social segmentation. Moreover, the continent is full of young societies undergoing rapid development and eager to answer the abundant questions thereby engendered.

While a quantitative scientific approach to studying behavior has been used in South America, qualitative and non-scientific approaches (e.g., psychoanalysis) have traditionally been more successful and popular. Neuroscience is a young discipline world-wide and has only very recently emerged as a field of study in South America. Therefore, researchers from other fields in the social



Santiago, Chile- home of *Universidad Diego Portales*.

and behavioral sciences see neuroscience as an intriguing and interesting field, ripe for discovery. However, there is a certain amount of fear that quantitative neuroscience could promote new reductionisms and steal attention from the qualitative analysis of important phenomena. In this environment, the

Neuroscience is a young discipline world-wide and has only very recently emerged as a field of study in South America.

social study of neuroscience renders the field accessible to proponents of qualitative as well as quantitative research. Therefore, South American scientists interested in exploring

the brain should use tools from the field of social neuroscience. Social neuroscience research in South America allows for the convergence of various methodological and theoretical approaches in a geographical region replete with conflict-laden social patterns.

JW: You've discussed "post-cognitivism" in recent papers. What do you mean by that term?

AI & EH: The core concept of post-cognitivism is primarily defined as opposed to the metaphor of the mind as a computer. From cognitive science to neuroscience, various alternatives to the cognitivist paradigm have emerged in the study of the mind and human cognition. These include embodied cognition, situated cognition, neurodynamics, and others. In general, these approaches highlight the need for a new experimental frame focused on action, intentionality and the intersubjective nature of cognitive phenomena. In short, post-cognitivism approaches call for an understanding of cognition as a multi-level process based on the interaction between mind, body, environment and culture. These connections imply a more contextual and ecologic approach to cognition. These trends have opened the field to phenomena not previously tackled by the orthodox tradition. Many classic issues of cognitivism have been reassessed and new dialogues between social and biological approaches have been initiated.

The mind should not be seen as abstract or ethereal but as a situated phenomenon that emerges from the coordination of a specific historical and ecological context.

JW: You've identified intentionality, intersubjectivity, and ecology of mind as important conceptual fields for post-cognitivism. What are these fields and how do they challenge cognitivist assumptions?

AI & EH: Intentionality has a variety of connotations, all of which aim to "make sense of an action" at different levels of

description. In a traditional sense, intentionality refers to the organization of different cognitive processes towards an action having a specific purpose. The Thomist tradition emphasizes that intentionality participates in an active creation of perception. In this view, intentional action would coordinate sensory and motor processes. Therefore the meaning of sensory, motor and cognitive dynamics that arise in a given situation could only be understood in reference to a context. Furthermore, intentionality has a dialogical nature. Intersubjectivity implies the interplay of multiple intentional actions engaged in this dialogue, in the interaction between self and other where actions are socially contextualized. Intentional action implies a co-construction of sense, only possible through dialogue with other person. Our intentions, those of the other and context are unavoidably intertwined from the point of action initiation. As a consequence, the mind should not be seen as abstract or ethereal but as a situated phenomenon that emerges from the coordination of a specific historical and ecological context. In a radical view of the ecology of the mind, one considers language, culture and communication not as individual factors of the sense of an action, but rather as elements that engage a global interplay of bidirectional (upward and downward) causality. Such a complex backdrop strongly precludes any reliance on classic cognitivism, since the latter analyzes each of the involved elements separately.

JW: Is there a unifying theoretical framework for post-cognitivism by which the areas of intentionality, intersubjectivity, and ecology of mind could be related?

AI & EH: Intentionality, intersubjectivity and the ecology of mind are three dynamic aspects of contextual action. The continuity that links sensory, motor, cognitive, speech (public or private) and social (individual or macro-social) processes is known as a gestalt. A gestalt comprises self-ordering processes consisting of multiple coordinated events. These processes

underlie phenomena such as intentionality, intersubjectivity and the ecology of cognition. This continuum of sense-making can be understood as meaning, albeit a meaning that transcends the formal meaning of utterances necessary for action and perception.

JW: You've proposed that we think of cognitive events as non-separable, holistic processes.

What methods should be used to study these events?

AI & EH: We think there are conceptual and methodological challenges that highlight the benefit of thinking of cognitive events as non-separable, holistic processes. By avoiding the excessive fragmentation of cognitive processes in favor of a more dynamic and contextual approach, scientists can complement the classic heuristic of decomposition and localization that characterizes the computational approach. In addition, recent methodological advancements allow us to study the interaction between cognitive processes or their dynamics at the cognitive as well as the brain level (i.e., whole-brain dynamics).

However, our primary tool is a multi-level approach. The study of this continuity of contextual interaction, bridging intentionality, intersubjectivity and the ecology of the mind, does not have to be understood as a unitary research program, much less as a theory. Cognition can be considered as a multi-level phenomenon that must be approached simultaneously from neurological, psychological and social perspectives. Multi-level approaches offer a pragmatic approximation to the continuity of sense without requiring a unitary theory. This strategy respects the limits of each descriptive level while profiting from potentially enriching cross-talk. Thus, intentionality, intersubjectivity, and the ecology of mind can be studied from inter-level approaches, with methodologies derived from the neurosciences, psychological sciences or social sciences.

Measuring phenomena that can be observed at different

levels of description generates an opportunity to assess the relationships that arise and study which processes are connected and which are mostly dissociated. As the number of variables increases and diverse aspects are considered, more complex patterns can be studied, but quantitative analysis and

inference become challenging. This is fertile terrain for the exploration of new inference tools with current techniques from informatics like machine learning and data mining.

Perhaps the most important challenge is understanding data from neurological activity and other measurements in the context of current theory to answer questions from cognitive and social psychology. We strive to accomplish this goal without losing continuity between distinct levels of description and while avoiding overzealous statements about what our datasets cannot explain.

JW: What are the big questions you see right now for the post-cognitivist in relation to social neuroscience?

AI & EH: Social neuroscience is, in our opinion, a fascinating union of neuroscience and psychology. Scientists in the field use valid methodological approaches to research cognition by studying the dynamics of individual processes without losing track of phenomena with a social dimension. The questions we seek to answer are not new, but a social neuroscientific approach provides elegant tools for the effort. Furthermore, phenomena like emotions, empathy, intersubjectivity, and several aspects of language integrate very well into this scheme. While every approach has its limitations, classic cognitivism has frequently failed at incorporating those phenomena into its otherwise sound formal models.

Nevertheless, it must be recognized that some approaches

Cognition can be considered as a multi-level phenomenon that must be approached simultaneously from neurological, psychological and social perspectives.

from social neuroscience are based on classical social psychology, which has its roots in classic information processing models. Post-cognitivism can complement social neuroscience, providing alternative models of cognition that are less centered around a representational explanation and involve a more dynamic and contextual approach. In the same vein, the step from cognitivism to post-cognitivism implies the study of social processing from the brain to the action to the social context. Thus social neuroscience focuses on the interrelationship of context and action, rather than on a completely internal model of social cognition.

JW: What are you working on right now?

AI & EH: In our laboratory (<http://neuro.udp.cl/>), we are interested in contextual clues of cognition and their relation to social phenomena. We study these topics using event-related potentials (ERPs). We investigate the influence of context (linguistic and paralinguistic) on semantic processes. We also explore the contextual influence of racial-valence associations on face and word processing. More recently we studied the effect of some relevant contextual information (i.e., priming self vs. other faces) on the processing of images that depict pain and the electrophysiological correlates of the empathy process. Advice from Professor Jean Decety has been of enormous importance for the development of social neuroscience experimental paradigms in our laboratory.

Agustin Ibáñez
Esteban Hurtado
Laboratory of Neuroscience
Faculty of Psychology
Universidad Diego Portales

Interview conducted by Joy Wattawa

Recent Publications

Cornejo, C., Simonetti, F., Ibáñez, A., Aldunate, N., Ceric, F., López, V., and Núñez, R.E. (2009) Gesture and metaphor comprehension: Electrophysiological evidence of cross-modal coordination by audiovisual stimulation. *Brain and Cognition*, 70: 42-52.

Ibáñez, A.; San Martín, R.; Hurtado, E.; López, V. (2008). Methodological consideration related to sleep paradigm using event related potentials. *Biological Research*, 41: 271-275.

Ibáñez, A.; San Martín, R.; Hurtado, E.; López, V. (2008). ERP studies of cognitive processing during sleep. *International Journal of Psychology*, epub ahead of print.

Ibáñez, A.; Cosmelli, D. (2008). Moving Beyond Computational Cognitivism: Understanding Intentionality, Intersubjectivity and Ecology of Mind. *Integrative Psychological and Behavioral Sciences*, 42, 2 129-136.

Cosmelli, D.; Ibanez, A. (2008). Human Cognition in Context: On the Biologic, Cognitive and Social reconsideration of Meaning. *Integrative Psychological and Behavioral Sciences*, 42,2, 233-244

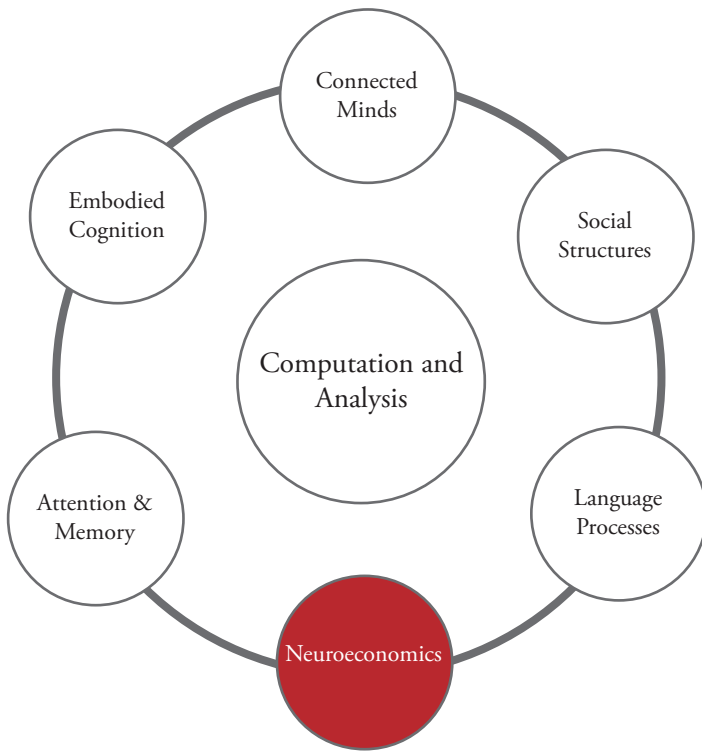
Ibáñez, A. (2007). The Neurodynamic Core of Consciousness and Neural Darwinism. *Rev Neurol (Behavioral Neurology)*, 1 (45): 547-555.

Cornejo, C., Simonetti, F., Aldunate, N., Ibáñez, A., Lopez, V., Melloni, L. (2007). Electrophysiological evidence of different interpretive strategies in irony comprehension. *Journal of Psycholinguistic Research*, 36: 16-23.

Research Initiative Update

Neuroeconomics at Chicago

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. These initiatives, however, are necessarily overlapping, a fact that reflects the Center’s commitment to interdisciplinary inquiry as well as the fundamental interconnectedness of cognition. Here we present an interview with Howard Nusbaum, a CCSN leader of the neuroeconomics research initiative. Howard Nusbaum, a professor in the Department of Psychology, speaks with us about emerging research in neuroeconomics at the University of Chicago.



JW: Where do you see neuroeconomics and behavioral economics going in the next five years?

HN: Well, I’m not an expert in all of these fields, so I’m not sure I should be the prognosticator, but I’ve been interested to see that behavioral economics and experimental economics seem to have emerged as almost parallel tracks in psychology

I think for some reason that the biology implicated in neuroeconomics has allowed greater discourse across these fields than was previously the case.

and economics. Experimental economics seems to have developed substantially: economists are now trying to use laboratory methods to ask basic questions in microeconomics and decision making, essentially borrowing some of the techniques from behavioral economics, but not the theory. What neuroeconomics seems to be doing is breaking down a barrier that existed between those fields. I think for some reason that the biology implicated in neuroeconomics has allowed greater discourse across these fields than was previously the case. I still think that there’s resistance in some quarters to studying the brain, but I think that the resistance to neuroeconomics is less than what there was to behavioral economics. I find it interesting that there are more economists willing to study the brain than previously had been willing to study behavior. In part this might be because there’s a sense of greater quantification, or greater scientific control or perhaps it is just closer to what the real proximal control of variables for explanation might be. I think that this is going to do the following: it’s going to bring psychology, economics, and even business schools closer together. For example, we have proposed a graduate training program with economics, and that’s a huge new development. I don’t think our students have typically taken economics courses and vice versa, yet

now we’re proposing that students should be able to cross-register for those courses and be jointly trained. *(Continued on page 12)*

Collaborative Research Feature

To Sleep, Perchance to Dream

The exceptionally fruitful collaboration between Daniel Margoliash, professor in the Department of Organismal Biology and Anatomy, and the Department of Psychology, and Howard Nusbaum, professor in the Department of Psychology, has led to new understandings of the syntactic complexity of bird songs as well as new experimental paradigms for understanding the effects of sleep on human learning and memory consolidation.

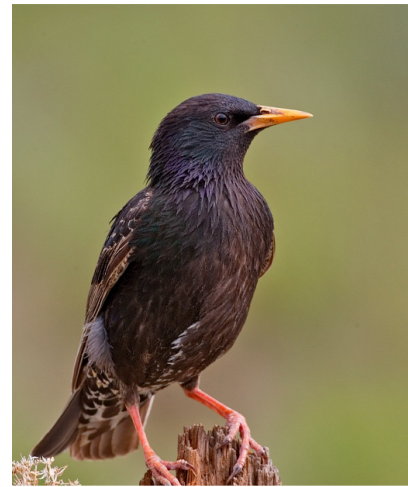
“Dan and I started at the University of Chicago the same week in 1986,” explained Nusbaum, “and we started talking then about what we could do to try to understand how birds learning songs could inform us about humans learning language, and vice versa.” It had long been recognized that there was a particularly attractive possibility for synergy between the two fields of study, but this potential had remained largely untapped. “It was an exciting introduction to the University of Chicago to meet Howard,” Margoliash added, “and opened possibilities for both of us that would have been hard to otherwise achieve.”

Dan and I started at the University of Chicago the same week in 1986. -Howard Nusbaum

Margoliash is an expert in neuroethology of avian vocal learning, a field that seeks to identify the evolutionary explanations for how neurons organize during development and in response to environmental cues. Similarities in neural organization across species can give insight into which mechanisms represent general solutions to evolutionary problems. In his research, Margoliash analyzes the neural mechanisms encoding complex natural behaviors such as learning, as well as song production and perception.

Nusbaum is a specialist in cognitive psychology. He studies

cognitive and neural mechanisms of language use, attention, learning, memory, and the perception and production of spoken language. His research is concerned with the way adult listeners can learn linguistic categories and combine those categories into more complex linguistic structures. He also investigates how variation in speech can convey referential and descriptive information, and how sleep consolidates learning.



Nusbaum and Margoliash’s collaborative research began surrounding the topic of memory consolidation through sleep.

Zebra finches and especially European Starlings, the types of songbird used by Margoliash and his colleagues

in their experiments, are extremely adept at learning sounds. Indeed this skill is necessary for many songbirds, as they are not born with the innate ability to communicate through song. Much like humans, birds must learn to “speak.” And they appear very adept at this process.

“Birds are an exceptional animal model for auditory and vocal learning because they are extremely talented at auditory perception and vocal production behaviors,” explained Timothy Brawn, a graduate student in the Integrative Neuroscience Program, who works with Margoliash.

Sleep appears critical to the ability of songbirds to remember the songs they've learned, or have been "taught" by a "tutor song."

"For example, in an experiment where zebra finches were first exposed to song at 40 days of age, their vocal patterns only start to change on the day after the day they were exposed to the tutor song. But that night, the brain has already changed. This gives us a window into fundamentally new insights into the neural mechanisms of memory consolidation," said Margoliash. The sleep-dependent daily fluctuations in singing behavior persist throughout the next two months and only wane as the bird crystallizes his song and achieves sexual maturity.

Uncovering the changes to the brain that occur between day one, learning the

song, and day two, remembering and reproducing the song, allow researchers to perform further experiments regarding how different parts of the brain work together to produce the behaviors observed.

Importantly, song learning and consolidation constitute a special type of behavior, known as an adaptive behavior. Adaptive behaviors are those that organisms can use to rapidly adjust to new situations in the future, as opposed to other behaviors like rote learning or memorization.

"Adaptive behaviors include skills that we may hone or sharpen as a function of our practice of those skills, and they adapt to the circumstances that are presented to them. So if you learned how to solve the combination of your combination lock, you remember how to solve that combination. But that's not going to teach you anything about any other locks. So what we're looking at here are skills that can transport across a number of different circumstances," explained Nusbaum.

To both compare the model of birds and humans, as well as

to develop experiments that would be useful in both systems, Margoliash and Nusbaum needed to develop some sort of test in humans that would speak to memory consolidation of an adaptive learning process as well.

Kimberly Fenn, a former graduate student of Nusbaum's, suggested a series of experiments in humans analogous to the birdsong experiments, which also involved skill learning. The experimental homology developed in these experiments is already beginning to allow for the study of these complex behaviors in humans using the procedures developed in birds, including neurophysiological measurements, studies of the life-cycle, and vice versa.

Birds are an exceptional animal model for auditory and vocal learning because they are extremely talented at auditory perception and vocal production behaviors. -Timothy Brawn

In Fenn's experiment, subjects were taught a series of common words produced by a computer-controlled text-to-speech synthesizer. This "synthetic speech" was difficult to understand, but subjects were able to learn to comprehend the speaker over time, though they were never presented with the same word twice. Nusbaum compares the task to learning how to understand a person speaking with a foreign accent. Subjects were trained at different times during the day, tested later, and then again the next day. Based on these experiments, he and Fenn were able to conclude that sleep plays an important role in consolidation of skill learning, or adaptive behaviors like speech generalization.

"Sleep seems to do two things. The first thing is that, over the course of the day, after you've learned something and had a bunch of other experiences, like taking a class in the morning and then having other classes in the afternoon, you will forget, perhaps by interference or maybe just by some temporal decay, some of the information that you've learned. What sleep seems to do is bring back what you've forgotten.

So sleeping, at some point in time after learning, allows you to restore some of what you've forgotten over the course of the day following that learning. The second thing is that sleep seems to make that learning robust against future forgetting," said Nusbaum.

The set of ideas developed in songbirds with respect to the role of sleep in skill development and consolidation were, in these

This is the first time such experiments were reported in vocal learners outside of humans. -Daniel Margoliash

experiments, shown to have some explanatory power when looking at the acquisition of speech perception in humans. However, the collaboration has cut both ways.

"Conversely, we were doing some work on perceptual and neurophysiological mechanisms in starlings with their wondrously complex songs, and Howard suggested, 'Well, you know, you could do some very interesting work on syntactic organization.' So it went in the other direction. I hadn't thought of it, and it turned out to be very valuable," enthused Margoliash.

Using experiments inspired by Nusbaum's work in humans, Nusbaum and Margoliash were able to show that birds could learn more complex patterns than was previously believed possible.

"The second study that we pursued had to do with syntax, moving up a level from the basic sounds that were being learned to learning patterning of those sounds. We used birds, animals wherein researchers had implied that they could not learn certain syntactic organizations. However, Timothy Gentner in Dan's lab was able to train the birds to learn exactly those kinds of organizations," Nusbaum responded. "Again, the birds allow us to use one kind of testing approach, which entails a lot of conditioning, offers the opportunity to do single-unit physiology and to do interventions in the brain."

"This is the first time such experiments were reported in vocal learners outside of humans," Margoliash added. "The results challenge long-held beliefs in linguistics, and afford opportunities to further redefine the evolutionary substrates of syntactic processing."

Both Nusbaum and Margoliash emphasize the importance of experiments in *both* humans and birds to understanding general mechanisms of communication, from both an evolutionary point of view and from the point of view of experimental design.

"If you want to know how we work, you need to understand not just us, but the constraints that resulted in us getting to be us, that is, the evolution of *homo sapiens*," asserted Margoliash.

While Margoliash jokingly dismayed of the fact that even an extra \$40 won't convince student subjects to undergo electrophysiological experiments, which is something that can easily be accomplished in birds, Nusbaum and Margoliash both agreed that there are unique opportunities in the study of humans as well as in the study of birds.

"With humans, we can get them to tell us what they're doing, we can give them more explicit instructions, and we can use other kinds of manipulations that aren't as easy to do with birds," said Nusbaum.

Currently, both labs continue to benefit from the collaboration. For example, one study directed by Timothy Brawn, as Nusbaum puts it, is "bringing the bird paradigm much closer to the human paradigm." Whereas previously Margoliash's research centered on understanding the implications of sleep in the natural developmental process, Brawn is training the birds on certain tasks and then testing to see whether this kind of training is affected by sleep. In this sense, Brawn is teaching the birds "unnatural" behaviors, much like the

example wherein Nusbaum and Fenn taught their human subjects to recognize synthetic speech.

“By showing that starlings exhibit sleep-dependent performance benefits, I will be able to do experiments looking at neural activity before, during, and after sleep, and potentially connect the brain activity with the behavioral benefits of sleep,” explained Brawn.

Once these congruencies between the experiments performed in both birds and in humans are established, both labs will be able to pursue questions regarding the neurophysiological mechanisms of sleep-dependent consolidation as well as pattern learning using the diversity of tools offered by both systems.

Margoliash, however, warned that the dream of fully understanding of neural correlates of syntax and other communication processes remains elusive.

“We don’t actually know how to look for syntax, or what would be the neural instantiation of the process, so theories that look for neurological correlates of high-level processes don’t go far enough to present a hypothesis in a way that could be tested electrophysiologically,” cautioned Margoliash. “We don’t yet have a way to assemble the activity properties of hundreds of thousands of individual neurons all brought together under one gigantic modeling methodology where we can really see the emergence of the representation of auditory objects, and how the sequence of those auditory objects end up interacting in a way where one could or could not hope to see something like recursion.”

Margoliash, though, was by no means discouraged.

“What’s exciting is to work towards bridging that gap.”

Written by Joy Wattawa

Research Initiative Update

Continued from Page 8

Part of that has come from a shift within the economics department where people in economics, like John List and Ali Hortascu are interested in experimental economics and in the brain. Other people like Jim Heckman are interested in the brain and developmental effects. In psychology, faculty like Boaz Keysar, John Cacioppo and myself are interested in decision-making, negotiation, and aspects of the interaction of cognition and emotion. So, institutionally, there’s more opportunity now for a dialogue between these disciplines. Perhaps biology has given a greater common language for this kind of discussion.

JW: What do you think that the University of Chicago can uniquely bring to this emerging field of neuroeconomics?

HN: What I think we bring to it is an incredibly strong economics department: in theory, in modeling, and in ability to apply these strengths to modeling brain responses. What psychology brings to the table is a great deal of experience in experimental design and behavioral data analysis, as well as individual subject research. The Booth school brings a group of psychologists and economists who are looking at certain kinds of applied problems and certain kinds of basic problems in conjunction, trying to understand the broader appeal of some aspects of psychology and economics together. And so I think together this becomes a very powerful combination.

We also have one of the strongest social sciences divisions in the world, and so I’m not sure that this is just going to be restricted as an advance to psychology and economics and the Booth School. I think that political scientists are getting more interested in doing more experiments. Broadly, in social sciences, the attempt to bridge the individual and the group, to understand the relationship between those two, is the bigger picture that I see developing.

Featured Publication

From Nusbaum/ Margoliash Labs

Brawn TP, Fenn KM, Nusbaum HC, Margoliash D. (2008) Consolidation of sensorimotor learning during sleep. *Learn Mem*; 15(11):815-9.

Consolidation of nondeclarative memory is widely believed to benefit from sleep. However, evidence is mainly limited to tasks involving rote learning of the same stimulus or behavior, and recent findings have questioned the extent of sleep-dependent consolidation. We demonstrate consolidation during sleep for a multimodal sensorimotor skill that was trained and tested in different visual-spatial virtual environments. Participants performed a task requiring the production of novel motor responses in coordination with continuously changing audio-visual stimuli. Performance improved with training, decreased following waking retention, but recovered and stabilized following sleep. These results extend the domain of sleep-dependent consolidation to more complex, adaptive behaviors.

Related Publications

Shank SS, Margoliash D. (2009) Sleep and sensorimotor integration during early vocal learning in a songbird. *Nature*; 458(7234):73-7.

Low PS, Shank SS, Sejnowski TJ, Margoliash D. (2008) Mammalian-like features of sleep structure in zebra finches. *Proc Natl Acad Sci*; 105(26):9081-6.

Francis AL, Nusbaum HC, Fenn K. (2007) Effects of training on the acoustic phonetic representation of synthetic speech. *J Speech Lang Hear Res.*;50(6):1445-65.

Gentner TQ, Fenn KM, Margoliash D, Nusbaum HC. (2006) Recursive syntactic pattern learning by songbirds. *Nature*; 440(7088):1204-7.

Margoliash D. (2005) Song learning and sleep. *Nat Neurosci*; 8(5):546-8.

Fenn KM, Nusbaum HC, Margoliash D. (2003) Consolidation during sleep of perceptual learning of spoken language. *Nature*; 425(6958):614-6.



Daniel Margoliash



Howard Nusbaum

Empathy Conference Speakers

September 30, 2009, Gleacher Center, Chicago

Led by Jean Decety, The Center for Cognitive and Social Neuroscience will be hosting an Empathy Conference in Chicago this September. The conference will provide up-to-date knowledge on empathy ranging from brain circuits to patient-physician relationships, and will emphasize how many academic areas and applications, such as clinical psychology, education, psychotherapies, and others, can benefit from new knowledge about the social brain. The conference will showcase some of the most important researchers in empathy today.

SOCIAL NEUROSCIENCE OF EMPATHY

Dr. Jean Decety
Psychology & Psychiatry
University of Chicago

PROSOCIALITY
Dr. Daniel Batson
Social Psychology
University of Kansas



EMPATHY AND
PROSOCIALITY
Dr. Nancy Eisenberg
Psychology
Arizona State University



EMPATHY AND
MEDICAL PRACTICE
Dr. Jodi Halpern
Bioethics &
Medical Humanities
UC Berkeley



ETHNOGRAPHY OF
PSYCHIATRIC SCIENCE
Dr. Allan Young
Social Sciences in Medicine
McGill University



ETHOLOGY AND
PRIMATE BEHAVIOR
Dr. Frans de Waal
Psychology
Emory University



NEUROBIOLOGY OF
SOCIAL BEHAVIOR
Dr. Sue Carter
Psychiatry
University of Illinois

Recent Publications from Empathy Speakers

Batson, C.D. (2008). Moral masquerades: Experimental exploration of the nature of moral motivation. *Phenomenology and the Cognitive Sciences*, 7 (1): 51-66.

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