Building Meaning from Language

Tufts University Initiative on Emerging Trends in Psychology

June 14th - 16th 2007

Hosted by the Department of Psychology
Tufts University Initiative on Emerging Trends in Psychology:  
Building Meaning From Language

Schedule of Events

All events will take place in the Granoff building. Talks and panel discussions will take place in the Distler Hall. Registration and meals will take place in the Murnane Lobby.

Thursday, June 14

Opening Session

6:00 – 8:30 pm  Registration

7:00 – 7:15 pm  Jamshed Bharucha, Provost, Tufts University, Welcoming Remarks
7:15 – 8:00 pm  Daniel C. Dennett, Tufts University, What are words?

Friday, June 15

Session 1: Building Linguistic Structure: From Linguistics to Psycholinguistics
Chair: Daniel C. Dennett, Tufts University

8:00 – 11:30 am  Registration
8:00 – 8:45 am  Continental Breakfast
8:45 – 9:00 am  Gina Kuperberg, Tufts University, Opening Remarks
9:00 – 9:50 am  Ray Jackendoff, Tufts University, Building Linguistic Meaning
9:50 – 10:40 am  James Pustejovsky, Brandeis University, Polysemy and Coercion

10:40 – 11:10 am  Coffee Break
11:10 – 12:00 pm  Matthew Traxler, University of California at Davis, Meaning, Argument Structure, and Parsing

12:00 – 1:30 pm  Lunch

Session 2: Semantic Representations and Cognitive Processes
Chair: Tali Ditman, Tufts University

1:30 – 2:20 pm  Walter Kintsch, University of Colorado, Statistical Semantics
2:20 – 3:10 pm  Ken McRae, University of Western Ontario, Meaning and Structure

3:10 – 3:40 pm  Refreshment Break

3:40 – 4:30 pm  Panel Discussion, Sessions 1 and 2  
Chair: Edward Gibson, Massachusetts Institute of Technology
# Session 3: Semantics Grounded in Perception and Action
Chair: Tatiana Sitnikova, Massachusetts General Hospital & Tufts University

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<tr>
<th>Time</th>
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<tr>
<td>8:00 – 9:00 am</td>
<td>Continental Breakfast</td>
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<td>9:00 – 9:50 am</td>
<td>Arthur Glenberg, University of Wisconsin-Madison, Premotor Cortex, Action Control, and Language</td>
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<td>Rolf Zwaan, Erasmus University, Comprehending with Language</td>
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<td>Michael K. Tanenhaus, University of Rochester, Visual World Studies of Language Processing</td>
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<td>12:00 – 1:30 pm</td>
<td>Lunch</td>
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# Session 4: The Neural Basis of Building Meaning from Language
Chair: Phillip Holcomb, Tufts University

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<tr>
<td>1:30 – 2:20 pm</td>
<td>Morton Ann Gernsbacher, University of Wisconsin-Madison, Fine Tuning for Meaning</td>
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<tr>
<td>2:20 – 3:10 pm</td>
<td>David Kemmerer, Purdue University, Two Levels of Verb Meaning</td>
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<tr>
<td>3:10 – 3:40 pm</td>
<td>Refreshment Break</td>
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<tr>
<td>3:40 – 4:30 pm</td>
<td>Gina Kuperberg, Tufts University, The Neural Basis of Comprehension</td>
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<td>4:30 – 5:20 pm</td>
<td><strong>Panel Discussion, Sessions 3 and 4</strong></td>
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<td>Chair: David Caplan, Harvard Medical School</td>
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<td>5:20 – 5:25 pm</td>
<td>Gina Kuperberg, Tufts University, Closing Remarks</td>
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Note: Food and drinks are not permitted inside the Distler Hall. On conference badges, a yellow dot denotes a Speaker, and a blue dot denotes an Organizer.
Parking in the Dowling Hall Parking Garage

Visitors to the Tufts University Campus may park in the Campus Parking Garage located in Dowling Hall, 419 Boston Avenue in Medford.

- Visitors may park in the garage for the day for a nominal fee of $5.00.
- Visitors must purchase a token to exit the garage from token vending machines located on floors 3, 5, and 7 of Dowling Hall or at the Administrative Services Office during regular business hours.
- Overnight parking in the Dowling Garage is strictly prohibited.
- Visitors may enter the garage from the Boston Avenue entrance.

Walking Directions from Parking Garage to the Granoff Building
(Note: posters with directional arrows are placed along the path)

Shorter path (non-handicap accessible):
1. In the parking garage, take the elevator or stairs to the 7th floor.
2. Walk through the lobby and exit out the front entrance (you should see patio furniture).
3. Walk across the raised walkway and up towards the Academic Quad.
4. Proceed to the left of the Goddard Chapel tower and all the way down the stairs (you should pass Tisch Library halfway down the stairs)
5. When you reach the bottom of the stairs, proceed left around the circular garden and take the path around Tisch Library parallel to the road (Professors Row).
6. Cross the road at any brick archway, and continue following the road downhill.
7. Turn right at the railed pathway and take the stairs down between the two tall buildings (Sophia Gordon Hall). The Granoff Music Center is directly in front of you.

Longer path (handicap accessible):
1. In the parking garage, take the elevator or stairs to the 1st floor.
2. Exit the building and take a right on to Boston Ave.
3. When you reach the traffic light, take a right on to College Ave.
4. Follow College Ave. past Professors Row, and take a right on to Talbot Ave.
5. The Granoff Music Center is across the street in front of you.

Marty and Perry Granoff Music Center
20 Talbot Ave.
Thursday, June 14

Opening Session

7:15 – 8:00 pm  Daniel Dennett
University Professor and Austin B. Fletcher Professor, Department of Philosophy, Co-Director, Center for Cognitive Studies, Tufts University

Title: What are words?

Abstract: Curiously enough, philosophers who devote their careers to 'linguistic philosophy' and 'analytic metaphysics' often take words for granted, as if they were just as unproblematic bits of the world's furniture as tables and chairs, raindrops and sunrises. Yet when asked whether words are "in their ontology" some philosophers find themselves swallowing hard and saying that, strictly speaking, there are no such things as words! If words exist (and I am sure they do!), what, exactly, are they? And how did there come to be so many of them?
Friday, June 15

Session 1: Building Linguistic Structure: From Linguistics to Psycholinguistics

9:00 – 9:50 am    Ray Jackendoff
Seth Merrin Professor, Department of Philosophy & Department of Psychology Co-Director, Center for Cognitive Studies, Tufts University

Title: Building Linguistic Meaning

Abstract: What does a theory of sentence and discourse meaning have to account for?

- Word and construction meanings are stored in long-term memory, in association with phonological and syntactic information. Word and construction meanings can contain variables that stipulate combinatorial potential.
- Sentence and discourse meanings are built up online in working memory, in part by instantiating variables in word meanings.
- Because of the structured nature of semantic combinatoriality, semantic working memory cannot consist simply of the parts of long-term memory that are activated.
- Word, sentence, and discourse meanings involve the interaction of at least two kinds of combinatorial structures: a quasi-algebraic Conceptual Structure, which encodes categorial and function-argument information, and a quasi-geometric/topological Spatial Structure, which encodes details of shape and spatial configuration.
- Conceptual Structure itself is organized into a number of discrete but interacting tiers, including propositional (function-argument) structure, referential structure, and information (topic/focus) structure.
- Both Conceptual Structure and Spatial Structure interact not only with language but also with perception and action. This is what allows us to talk about what we see and act in response to instructions.
- Rules of inference (including heuristics) are defined over Conceptual Structure and Spatial Structure.
- Word meanings have internal combinatorial structure that enables them to trigger patterns of inference.
- Word meanings are not just sets of necessary and sufficient conditions. They also involve various sorts of violable constraints that show up in nonstereotypical situations.
- Building sentence and discourse meaning from word meanings involves more than just combining word meanings. Many aspects of meaning (often called pragmatic) are not represented by any words in the sentence but arise out of the necessity to combine word meanings in semantically well-formed and/or situationally appropriate fashion.
9:50 – 10:40 am  **James Pustejovsky**
Professor, Department of Computer Science, Brandeis University.

**Title:** Polysemy and Coercion

**Abstract:** Recently, there has emerged a new appreciation of the complexity at play in the interpretation of polysemy. Two classes of parameters have been broadly identified as contributing to the interpretation of polysemous expressions: more complex lexical representations, and a means of incorporating local context compositionally. In this talk, I formalize this distinction as that of inherent versus selectional polysemy, and demonstrate that polysemy cannot be modeled adequately without enriching the compositional mechanisms available to the language. In particular, lexically driven operations of coercion and type selection provide for contextualized interpretations of expressions, which would otherwise not exhibit polysemy. I contrast this with the view that it is not possible to maintain a distinction between semantic and pragmatic ambiguity. I will argue that a strong distinction between pragmatic and semantic modes of interpretation can be maintained, and is in fact desirable, if we wish to model the complexity of contributing factors in compositionality in language.

11:10 am – 12:00 pm  **Matthew Traxler**
Associate Professor, Department of Psychology, University of California at Davis

**Title:** Meaning, Argument Structure, and Parsing: Building Meaning from Language Using Lexically Stored Syntactic Representations

**Abstract:** A long-running debate in psycholinguistics pits autonomous syntax against lexically-driven structure-building processes. According to autonomous syntax accounts (e.g., Chomsky, 1965; Frazier, 1979, 1987; Pinker, 1997), syntactic structures are built on the basis of abstract, word-category representations by a mechanism that operates independently of other levels of representation. Lexicalist accounts (e.g., Boland & Boehm-Jernigan, 1998; MacDonald et al., 1994; Trueswell et al., 1993; Vosse & Kempen, 2000) suggest instead that elements of syntactic structure are tied to individual entries in the mental lexicon. Determining how words in sentences relate to one another (i.e., parsing the sentence) starts with accessing individual word representations, activating argument-structures and syntactic frames associated with those representations, and applying multiple sources of constraint to choose one structure from among competing alternatives. Syntactic priming experiments can be used to test these theories.

Syntactic priming occurs when a prime sentence affects processing of a subsequent target sentence because the two sentences share elements of syntactic structure. According to autonomous syntax accounts, priming should occur whether two sentences have overlapping words or not, as long as the two sentences have the same syntactic structure. Lexicalist accounts predict that priming effects should be larger when specific words are repeated across the prime and target sentences. A series of eye-tracking and ERP experiments have established the following:

1. Priming occurs in comprehension.
2. Priming occurs because of facilitated syntactic processes (rather than facilitated semantic processes).
3. It depends on overlapping lexical material in sentences involving argument relations.
4. It occurs independent of lexical overlap in sentences involving adjunct relations.
5. It does not depend on readers predicting the upcoming structure.

The overall pattern of results in comprehension is most consistent with the argument structure hypothesis (Boland & Boehm-Jernigan, 1998; Boland & Blodgett, 2006) and lexically mediated parsing (Traxler & Tooley, 2007).
Session 2: Semantic Representations and Cognitive Processes

1:30 – 2:20 pm    **Walter Kintsch**
Professor Emeritus, Department of Psychology, University of Colorado  
**Title:** Statistical Semantics  
**Abstract:** Statistical semantics attempts to infer semantic knowledge from the analysis of linguistic corpora. For example, Latent Semantic Analysis (Landauer & Dumais, 1997; Landauer et al., 2007) constructs a high-dimensional map of meaning that allows the ready computation of similarities between word meanings as well as text meanings. I briefly describe LSA as well as several related methods and then focus on two limitations of such systems.

Typically, semantic representations are generated from data that consist only of word co-occurrences in documents, neglecting information about word order, syntax, as well as discourse structure. Ways to include word order as well as syntactic information in the construction of corpus-based semantic representations are described. Specifically, dependency grammar will be used to guide the construction of semantic representations and comparisons.

Secondly, statistical semantics is based solely upon verbal information, whereas human semantics integrates perception and action with the symbolic aspects of meaning. A map of meaning that considers only its verbal basis can nevertheless be useful, in that language mirrors real world phenomena. Furthermore, it is argued that meaning, while clearly based on perception and action, transcends this basis and includes a symbolic level, which we attempt to model by statistical semantics.

2:20 – 3:10 pm    **Ken McRae**
Professor, Department of Psychology, University of Western Ontario  
**Title:** Meaning and structure: Influences of real-world events on language comprehension  
**Abstract:** A significant proportion of everyday utterances concern real-world events. Thus, people's knowledge of everyday events, including their common participants, is an important component of sentence comprehension. Our original research on this topic focused on verb-specific thematic role conceptual knowledge as an important basis for expectancy generation in language with respect to both upcoming fillers of thematic roles, and upcoming structure. That is, as is common in the literature, we considered structural and semantic expectancy generation in sentence processing as being driven primarily by the verb in the aggregate. However, it has become apparent that the empirical phenomena demand a richer, less verb-centered approach in three ways. First, rather than being verb-specific, the evidence demands an event-specific explanation. This is particularly pertinent to situations in which verbs have multiple senses and thus can refer to multiple classes of real-world events, which is the case with many verbs, at least in English. Second, other sentential elements can influence event-based expectations. We have focused primarily on various types of thematic role fillers (i.e., agents, patients, instruments). Third, extra-sentential context can bias language comprehenders to a range of event spaces. I will present experimental results that provide evidence for this richer event-based view of language comprehension.
Saturday, June 16

Session 3: Semantics Grounded in Perception and Action

9:00 – 9:50 am  

Arthur Glenberg
Professor, Department of Psychology, University of Wisconsin-Madison

**Title:** Premotor cortex, action control, and language.

**Abstract:** To effectively control action, the brain has evolved to solve a number of thorny problems: Learning complex action sequences with hierarchical structure, exquisite timing of movements (e.g., in tennis, piano playing, walking) when sensory feedback may be too slow to help, and determining just what information in the sensory array might be useful. Interestingly, similar problems arise in learning and using language. Might the brain use mechanisms of action control to learn, produce, and comprehend language? Recent findings of mirror neurons tuned for action and speech recognition in premotor cortex (Broca's area in particular) suggest a positive answer. In this talk, I will illustrate how a formal theory of action control, Wolpert's HMOSAIC model, can be modified to account for basic facts in language. Then, I will discuss the results of several projects testing theoretically derived claims regarding language acquisition, how manipulating the motor system affects language comprehension, and how manipulating language comprehension affects the motor system.

9:50 – 10:40 am  

Rolf Zwaan
Professor, Department of Psychology, Erasmus University Rotterdam, The Netherlands

**Title:** Comprehending with Language

**Abstract:** Language comprehension has long been understood as the comprehension of language--first as the recovery of the syntactic and semantic structure of the linguistic input, and later as the construction of a situation model based on the linguistic input and background knowledge. I will argue that language comprehension is better understood as comprehension with language. That is, language comprehension is a special form of event and action comprehension. There are similarities between how we understand an action that we observe (e.g., someone pouring himself a cup of coffee) and an action we hear or read about (e.g., *He poured himself a cup of coffee*). Specifically, there is overlap in the brain systems that are involved (e.g., the area of premotor cortex that controls movement of the right hand). In both cases, comprehension appears to involve a mental simulation of the actions and events. However, comprehension with language is special because the mental simulation is not modulated directly by the observed actions and events, but indirectly via language. Thus, the key to developing a theory of language comprehension is to examine how language modulates mental simulations of actions and events. I will discuss recent empirical findings that speak to this issue.

11:10 am – 12:00 pm  

Michael Tanenhaus
Professor, Departments of Brain & Cognitive Sciences and Linguistics, Director of the Center for Language Sciences, University of Rochester

**Title:** Visual World Studies of Language Processing

**Abstract:** In the Visual World Paradigm (VWP), participants’ eye movements are measured as they follow instructions to perform actions in a circumscribed visual world. This approach allows investigators to examine how language is interpreted in the context of perception and context-specific goal-directed action, and how language, vision and action interact. I’ll review the logic of the VWP, including how it combines the ‘language-as-product’ and ‘language-as-action’ traditions, focusing on the effects of action-specific affordances, intentions and interlocutors’ joint goals on real-time syntactic processing, reference-resolution and spoken word recognition. I’ll then review in-progress work with Kate Pirog and Dick Aslin that uses artificial languages with the VWP with fMRI to examine activation of motion-sensitive areas in V5 during spoken word recognition.
Session 4: The Neural Basis of Building Meaning from Language

1:30 – 2:20 pm  Morton Ann Gernsbacher
Vilas Research Professor and Sir Frederic Bartlett Professor, Department of Psychology, University of Wisconsin-Madison

Title: Fine Tuning for Meaning: Behavioral and Neural Imaging Experiments

Abstract: Over fifteen years ago, we began asking research participants to read a sentence and then judge quickly whether a test word was related to the overall meaning of the sentence that they had just read. Some test words were related to the final word of the sentence but unrelated to the sentence’s overall meaning, for example, the test word “ace” and the sentence, “He dug with the spade.” When the test words were presented immediately after participants read the sentences, participants were slower to correctly reject those test words as not being related to the sentence than they were to correctly reject test words that were completely unrelated to the sentences. Thus, participants experienced interference. However, when the test words were presented after a brief delay, this interference was attenuated. We interpreted this pattern of immediate interference followed by attenuation as manifesting the action of a cognitive mechanism of suppression. We have explored the basis of this suppression mechanism behaviorally with numerous participant groups (e.g., less-skilled readers, elderly readers, readers with small working memory spans), and we have used event-related functional magnetic brain imaging to identify its neural basis. These data will be presented to support the argument that fine tuning for meaning requires attenuating inappropriate information (i.e., suppression) as well as activating appropriate information.

2:20 – 3:10 pm  David Kemmerer
Associate Professor, Departments of Speech, Language, and Hearing Sciences and Psychological Sciences, Purdue University

Title: Two levels of verb meaning: Neuroimaging and neuropsychological evidence

Abstract: For over 20 years, research in linguistics has supported the existence of two levels of verb meaning. The first level consists of an austere representation, sometimes called the “event structure template,” that (a) is common to all the verbs in a given class (e.g., “manner of motion” verbs), (b) is composed primarily of simple predicates and variables for arguments, and (c) strongly constrains the range of morphological and syntactic constructions that are possible. The second level reflects the uniqueness of every verb and has been dubbed the “constant” because it captures idiosyncratic semantic features that (a) distinguish each verb in a given class from all the others (e.g., stroll vs. strut vs. stagger), (b) are often modality-specific in format, and (c) are grammatically irrelevant. I present evidence from two neuroscientific approaches—specifically, functional neuroimaging studies with normal subjects, and neuropsychological studies with brain-damaged subjects—that begin to reveal how these two levels of verb meaning are implemented in the brain. This research suggests that “event structure templates” depend on cortical structures in the classic left perisylvian language system, whereas “constants” depend on cortical structures in anatomically distributed sensorimotor systems, including regions involved in vision and action.
3:40 – 4:30 pm  Gina Kuperberg
Associate Professor, Department of Psychology, Tufts University and the Martinos Center for Biomedical Imaging, Mass. General Hospital

Title: The Neural Basis of Comprehension: Temporo-Spatial evidence from Event-related Potentials and functional Magnetic Resonance Imaging

Abstract: I will suggest that language processing proceeds along at least two dissociable but highly interactive neural processing streams: an associative semantic memory-based mechanism that is based mainly on accessing the frequency of co-occurrence of words or events, as stored within semantic memory, and a combinatorial mechanism in which structure is assigned to a sentence not only on the basis of morphosyntactic rules, but also on the basis of certain action-relevant (thematic) semantic constraints. Based on electrophysiological data, I will suggest that the semantic memory-based analysis operates as a first-pass mechanism, primarily between 300-500msec, and that a morphosyntactic and thematic-semantic combinatorial analysis around a verb begins, at least partially in parallel, within this time window. Any conflicts between the different representations that are output by the semantic memory-based and combinatorial streams lead to a continued or second-pass combinatorial analysis, operating between 500-900msec. This may serve as a double check to ensure that we effectively make sense of incoming information. Based on fMRI data, I will suggest that the semantic memory-based analysis is reliant on activity within the left anterior inferior frontal cortex that, together with temporal cortices, acts to retrieve information about the likelihood of words or events occurring together in the real world. In contrast, both morphosyntactic and thematic-semantic combinatorial analyses around a verb appear to engage a common frontal/inferior parietal/basal ganglia network, known to mediate the execution and comprehension of goal-directed action. Based on recent studies using silent movie-clips, I will suggest that these two processing streams may generalize beyond the language system and may also be engaged in relating people, objects and action during real-world event comprehension. I will conclude by briefly considering the implications of this model of language and real-world visual comprehension for understanding the neurocognitive basis of neuropsychiatric disorders such as schizophrenia.
Posters

Posters will be displayed in the Murnane Lobby.


2. Emerson, J., Brunyé, T.T., Ditman, T., & Taylor, H.A. *Reading and memory costs with processing backward temporal shifts in narrative discourse.*


4. Kuperberg, G.R., Lakshmanan, B.M., Goff, D., & West C.W. *Double dissociations in hemodynamic modulation during the build-up of concrete and abstract meaning in schizophrenia: Evidence from fMRI.*


7. Madden, C.J., & Therriault, D.J. *Verb Aspect and Event Simulations.*


10. Sitnikova, T., Paczynski, M., & Kuperberg, G.R. *Context motivates comprehenders' attempts to make sense of novel events: Evidence from event-related potentials (ERPs).*


12. Lucia, L.C., Slocombe, E., & Schendan, H.E. *The time course of object-sensitive cortical activity: An event-related potential study*


14. Schendan, H.E., & Kutas, M. *Neurophysiological evidence for transfer appropriate processing: Role of memory for perceptual grouping processes, global shapes, and local contours in visual object cognition.*

15. Schendan, H.E., & Stern, C.E. *Mental rotation and object categorization share a common network of prefrontal and dorsal and ventral regions of posterior cortex.*


17. Pauker, K.J., Yano, R., Xu, Y., & Ambady, N. *Environmental Influences in Children's Stereotyping.*


19. Murphy, M., & Cook, R. *Utilization of absolute and relational factors in pigeons (Columba livia) in a sequential auditory discrimination task.*
The Tufts University Psychology and Cognitive Science Faculty welcome you to the Building Meaning from Language conference.

Please allow us to introduce ourselves:

**Nalini Ambady, PhD**, Professor and Neubauer Faculty Fellow, received her PhD in social psychology from Harvard University and taught at Holy Cross College and Harvard University, where she was the John and Ruth Hazel Associate Professor of the Social Science, before moving to Tufts. Her research interests focus on the accuracy of social, emotional, and perceptual judgments, how personal and social identities affect cognition and performance, nonverbal and cross-cultural communication. She examines these phenomena from multiple perspectives ranging from the biological to the sociocultural. She is the recipient of the Presidential Early Career Award for Scientists and Engineers (1999), the American Association for the Advancement of Science, Behavioral Science Research Award (1993), and the APA Division 5 (Evaluation, Measurement, & Statistics) Dissertation Award (1994).

**Jamshed Bharucha, PhD**, was named Provost and Senior Vice President of Tufts University in 2002. He received a PhD in psychology from Harvard in 1983. Dr. Bharucha’s research is on the perception of music, using computational neural net modeling and brain imaging techniques. He has served on the National Science Foundation’s advisory panel in Perception and Cognition, and was Editor of the interdisciplinary journal *Music Perception*. His work has been featured on National Public Radio, US News & World Report, Discover magazine, and the New York Times. He formerly served as Dean of Faculty and Deputy Provost at Dartmouth College, where he was the John Wentworth Professor of Psychological and Brain Sciences. At Dartmouth, he received the Huntington Teaching Award and the Undergraduate Teaching Initiative Special Award.

**Emily Bushnell, PhD**, is a Professor of Psychology. She received her doctorate from University of Minnesota. Her research interests include infant perception and cognition -- imitation of goal-directed actions; haptic perception and exploration, acquisition of perceptual-motor skills, evolution and development of tool using.

**Richard Chechile, PhD**, is a Professor of Psychology. He received his BS and MS in physics from Case-Western Reserve University and his MS and PhD in psychology from the University of Pittsburgh. Since 1973, he has been a member of the faculty at Tufts University. He is the past president of the Society for Mathematical Psychology and is the Book Review Editor of the Journal of Mathematical Psychology. Research interests include memory, mathematical psychology, cognitive psychology, pattern recognition, statistics, human factors, and decision making.

**Robert Cook, PhD**, is a Professor of Psychology and the Chair of the Department. Dr. Cook's research interests are in the general area of comparative animal cognition. In particular, he has been very interested in the mechanisms of visual perception and discrimination learning in pigeons, and their comparative relations to our own perception of the world. His NSF-supported comparative research has focused extensively on the mechanisms of stimulus control, discrimination learning, and memory in animals. He received his PhD in Biopsychology from the University of California, Berkeley. He is currently the co-editor of the on-line journal, *Comparative Cognition & Behavior Reviews*. He has also been very active in broadening the impact and public visibility of the area’s scientific work by use of the Internet with the publication of the multimedia cyberbooks *Avian Visual Cognition* and *Animal Spatial Cognition*.

**Joseph DeBold, PhD**, is a Professor of Psychology and was Chair of the Department 1990-93 and 2002-05. He received his doctorate from University of California, Irvine in Psychobiology. He was an Assistant Professor of Psychology at Carnegie-Mellon University for two years before coming to Tufts University in 1979. He conducts research examining the neural and hormonal control of animal sexual behavior, the neuroanatomy of brain systems necessary for animal social behavior, hormone-drug interactions, and aggressive behavior. Currently his work focuses on the role of GABA receptors and neurosteroids in the brain on the effects of alcohol on aggression in laboratory animals.

David Harder, PhD, is a Professor of Psychology. He received his doctorate from University of Michigan. He is currently studying experiences of spirituality as well as the assessment of shame, guilt, and narcissism and how these traits relate to symptomatology and other aspects of personality functioning. Dr. Harder co-administers a special Psychology Department major in "Psychology/Clinical", which gives undergraduates a thorough grounding in the academic and clinical sides of psychology.

Phillip J. Holcomb, PhD, is a Professor of Psychology where he co-directs the NeuroCognition Laboratory with his colleague Dr. Gina Kuperberg. Dr. Holcomb received his PhD in 1984 from New Mexico State University, in Las Cruses, NM. He has been at Tufts since 1988. Dr. Holcomb’s primary research interests are in how the brain represents and processes language during reading and listening to speech both in ones native language and when learning a new second language. In a related vein he is also interested in how the brain recognizes visually encountered objects. The primary measure used in the lab for studying language and picture comprehension is the event-related brain potential (ERP) technique, although along with Dr. Kuperberg at MGH he also does some work with fMRI.

Ray Jackendoff, PhD, is the Seth Merrin Professor of Philosophy and Co-Director for the Center for Cognitive Studies. He majored in mathematics at Swarthmore College, where he discovered he was not cut out to be a mathematician and, taking a big chance, applied to graduate schools in linguistics. He ended up going to MIT, where he studied under Noam Chomsky and Morris Halle, and was a reluctant participant in the "Linguistics Wars" of the late 1960s. He taught at Brandeis from 1971 to 2005, and joined the Tufts faculty in 2005 as Co-Director of the Center for Cognitive Studies. His central research is on the semantics of natural language, how it relates to human conceptualization, and how it is expressed linguistically. In the course of working out the foundations for this enterprise, he has been drawn into research on visual cognition, music cognition, social cognition, consciousness, and the evolution of the language capacity, as well as more traditional issues for linguists such as syntax and the lexicon.

In another of his lives, Jackendoff is a classical clarinetist, having performed as soloist with the Boston Pops and several other Boston area orchestras. He has appeared frequently in recital and chamber music programs, and was for 20 years principal clarinet of the Civic Symphony Orchestra of Boston. With pianist Valentina Sandu-Dediu, he has recorded a CD, *Romanian Music for Clarinet and Piano*.

Robin Kanarek, PhD, is a Professor of Psychology. She received her PhD in psychology from Rutgers University. She came to Tufts as a research assistant professor, and then climbed the tenure ladder to become a full professor in the Psychology Department and at the Friedman School of Nutrition. In 2000, she was named John Wade Professor. From 2002 until 2006, she served as the Dean of the Graduate School of Arts and Sciences. Throughout her time at Tufts, Dr. Kanarek has been actively involved in undergraduate and graduate teaching, and in 2000 received the Tufts University Senate Professor of the Year award. Dr. Kanarek’s primary research interests are in the area of nutrition and behavior. She has conducted research investigating the effects of nutritional variables on the development of obesity and diabetes, the physiological and behavioral factors influencing diet...
selection in experimental animals and humans, the role of nutrients in determining the consequences of psychoactive drugs, the importance of nutrients for cognitive behavior in children and adults, the effects of obesity and diabetes on cognitive behavior, and the role of exercise in determining pain sensitivity and the actions of opioid and other pain relieving drugs. She is an author of more than 100 books, book chapters and articles. Her research has been funded by the National Institutes of Health, as well as by other governmental agencies and private companies. Dr. Kanarek is a member of the editorial boards of *Physiology and Behavior, Nutritional Neuroscience*, and the *Tufts Diet and Nutrition Newsletter* and is past editor-in-chief of *Nutrition and Behavior*. Dr. Kanarek has served as a member of the National Academy of Sciences, Committee on Military Nutrition Research, and on review committees for the National Institutes of Health, United States Department of Agriculture, and National Science Foundation.

**Gina R Kuperberg, MD, PhD,** is an Associate Professor of Psychology at Tufts University and an Associate Psychiatrist in the Department of Psychiatry at Massachusetts General Hospital. She earned her MD at St. Bartholomew's Medical School, London, and her PhD in Psychology and Cognitive Neuroscience at Kings College, University of London. She completed an internship at St. Bartholomew’s Hospital and a residency and fellowship in psychiatry at the Maudsley Hospital and Institute of Psychiatry, London. She came to the US in 1998 and completed research fellowships in neuroimaging and cognitive electrophysiology at the Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Boston, and the NeuroCognition Lab at Tufts University. Dr. Kuperberg has a joined Lab across Tufts University (the NeuroCognition Lab, in collaboration with Dr. Phillip Holcomb) and the Martins Center for Biomedical Imaging (Mass. General Hospital). Dr. Kuperberg’s Lab focuses on the cognitive neuroscience of language, thought and meaning. Her lab is interested in when, where and how the human brain builds up the meaning of sentences, discourse (whole stories) and visual images (movie-clips). To address these questions multimodal neuroimaging techniques are used: event-related potentials (ERPs) have excellent temporal resolution and can tell us *when* neurocognitive processes happen in the brain; functional magnetic resonance imaging (fMRI) has excellent spatial resolution and can tell us *where* neurocognitive processes occur in the human brain. In addition to studying normal brain function, the lab is also examining how the build-up of meaning is impaired in patients with schizophrenia and how such impairments are reflected by abnormal patterns of brain activity in such patients.

**Keith Maddox, PhD,** is an Associate Professor of Psychology and director of the Tufts University Social Cognition (TUSC) lab. He received his PhD (1998) in social psychology from the University of California, Santa Barbara. Dr. Maddox is the recipient of a number of grants and awards from the National Science Foundation, the Society for the Psychological Study of Social Issues, and the Tisch College of Citizenship and Public Service, as well as a President’s Dissertation Year Fellowship from the University of California. Currently, Professor Maddox is a Faculty Fellow of the Tisch College developing a project to explore the impact of racial phenotypicality bias in communities surrounding Tufts. The TUSC Lab is focused on research programs examining social cognitive aspects of stereotyping, prejudice, and discrimination. His lab seeks to understand topics such as: cognitive representations and stereotypes of African Americans based on variation in skin tone and other phenotypic characteristics; the experience of stereotype threat among members of socially marginalized groups; how the perception of ulterior motives can influence social judgments; the role of social categories in spatial representation. His long-range goal is to further the understanding of the representation of stereotypic knowledge and its implications for the behavior and treatment of members of stereotyped groups.

**Klaus A. Miczek, PhD,** is the Moses Hunt Professor of Psychology, Psychiatry, Pharmacology and Neuroscience. He received his PhD in Biopsychology from the University of Chicago. He has served on research review committees for the National Institute on Drug Abuse, National Institute on Mental Health, National Institute on Alcoholism and Alcohol Abuse, and National Center for Research Resources. He was a member of the National Academy of Science panel on "Understanding and Preventing Violence" (1989-1992) as well as its ILAR/NRC panel on the "Psychological Well-being of Primates." He is the Coordinating and Principal Editor of *Psychopharmacology* since 1992, and he serves on the editorial board of half a dozen other journals in this area. He was the president of the Division of Psychopharmacology, and of the Behavioral Pharmacology Society, and chaired the Committee on Animals in Research and Ethics of the American Psychology Association. He has received numerous prizes including the Solvay Duphar Award of the Division of Psychopharmacology
and Substance Abuse of the American Psychological Association, a MERIT award from NIAAA, Silver Medals of the Charles University (Czech Republic). In 1997, the president of the Federal Republic of Germany bestowed the Knight's Cross of the Order of Merit on him. Dr. Miczek was named the Boerhaave professor at the medical faculty of Leiden University (Netherlands) and was twice Japan International Science & Technology Fellow at the University of Tokyo. He was visiting professor at La Sapienza University in Rome, the Charles University in Prague and at the University of Tuebingen (Germany). In 2006, Tufts University recognized Dr. Miczek with the Distinguished Scholar Award, and he was elected fellow in the American Association for the Advancement of Science. He published some 200 research journal articles, 40 reviews and edited 20 volumes on psychopharmacological research concerning brain mechanisms of aggression, anxiety, social stress and abuse of alcohol and other drugs. Currently, the work in Dr. Miczek's laboratory investigates two problems in the areas of (1) stress and drug abuse, and (2) behavioral neurobiology of aggression. First, members of the laboratory aim to learn about neuroadaptive mechanisms via which specific social stressors can intensify compulsive drug use or alternatively engender depressive-like anhedonia. Second, they are seeking to characterize the neurobiological features of those individuals who engage in escalated aggression after alcohol consumption.

Sinaia Nathanson, PhD, is a Senior Lecturer in Psychology. She received her doctorate from Tufts University. Her research interests include conflict resolution, decision-making processes, issue framing, integrative agreements, leadership, mediation training, and organizational behavior.

Raymond S. Nickerson, PhD, is a Research Professor in the Psychology Department. He is the former senior vice president of Bolt Beranek and Newman Inc, from which he is retired. His PhD, in experimental psychology, is from Tufts University. A past chair of the National Research Council’s Committee on Human Factors, and a recipient of the Franklin V. Taylor Award from the American Psychological Association, he was the founding editor of The Journal of Experimental Psychology: Applied and of Reviews of Human Factors and Ergonomics, an annual publication of the Human Factors and Ergonomics Society. Dr. Nickerson’s research interests include cognition, human factors and applied experimental psychology. His recent work at Tufts has focused primarily on probabilistic reasoning.

Haline E. Schendan, PhD, is an Assistant Professor of Cognitive Neuroscience in the Department of Psychology. She also holds appointments as Adjunct Assistant Professor in the Department of Psychology at Boston University and as Visiting Scientist at the Center for Functional Neuroimaging Technologies at the Athinoula A. Martinos Center for Biomedical Imaging affiliated with Harvard Medical School. Dr. Schendan has received grant funding to support her research from the National Institute of Health and private foundations. She is interested in the brain basis of human visual knowledge, investigating visual perception, object and scene cognition, and learning and memory, using event-related potentials (ERPs) and functional magnetic resonance imaging (fMRI), as well as behavioral methods in neuropsychological studies of patients with neurological disorders, such as Parkinson’s disease. She is especially interested in which posterior and prefrontal cortical regions enable people to categorize what they see, and how long an image is processed before they can do this. She also investigates the role of corticostriatal circuits and the medial temporal lobe in visual cognition.

Lisa Shin, PhD, is an Associate Professor. She received a PhD in Psychology at Harvard University. She completed a post-doctoral fellowship at the Massachusetts General Hospital/Harvard Medical School and has been a faculty member at Tufts since 1998. Her research involves examining brain function and cognitive processing in patients with anxiety disorders, especially posttraumatic stress disorder (PTSD). Specifically, she uses positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) to study brain function while patients perform attention and memory tasks in the scanner. The goal of this research is to determine whether brain structures such as the amygdala, medial prefrontal cortex, and hippocampus function normally in patients with PTSD. Evidence thus far suggests that in PTSD, the amygdala is hyperresponsive and medial prefrontal cortex is hyporesponsive to threat-related stimuli. Dr. Shin and her colleagues are currently conducting studies to determine whether their functional neuroimaging measures can help predict response to treatment. Her research interests also include studying the neural mechanisms underlying the processing of emotional information (e.g., facial expressions, emotional words and pictures) in healthy individuals.
**Samuel Sommers, PhD**, is an Assistant Professor of Psychology. He is a social psychologist interested in race, stereotyping, and group diversity. He is interested in the ways in which race influences people's judgments and behavior in a wide range of social situations. His research focuses on two broad, often overlapping topic areas: 1) the influence of race-related norms and motivations on social cognition, judgment and decision-making, group dynamics, and interpersonal interaction; 2) the intersection of psychology and law. He is currently funded by the Russell Sage Foundation for his work on the effects of diversity on group decision-making processes. He is the creator and organizer of Tufts' Diversity & Cognition colloquium series and an inductee to the Tufts Hall of Diversity.

**Robert J. Sternberg, PhD**, is Dean of the School of Arts and Sciences and Professor of Psychology. Prior to accepting this position, he was IBM Professor of Psychology and Education in the Department of Psychology, Professor of Management in the School of Management, and Director of the Center for the Psychology of Abilities, Competencies, and Expertise at Yale. This Center, now relocated to Tufts, is dedicated to the advancement of theory, research, practice, and policy advancing the notion of intelligence as developing expertise-as a construct that is modifiable and capable, to some extent, of development throughout the life span. He also was the 2003 President of the American Psychological Association and is the 2005-2006 President-Elect of the Eastern Psychological Association. He was on the Board of Directors of the American Psychological Association (2002-2004) and of the Board of Trustees of the APA Insurance Trust (2004). He is currently on the Board of Trustees of the American Psychological Foundation (2005-2009) and on the Board of Directors of the Eastern Psychological Association (2005-2008). Dr. Sternberg has also been president of the Divisions of General Psychology (1), Educational Psychology (15), Psychology and the Arts (20), and Theoretical and Philosophical Psychology (24) of the APA. He has been Acting Chair and Director of Graduate Studies in the Department of Psychology. He received a PhD from Stanford University in 1975. He also holds honorary doctorates from the Complutense University of Madrid, Spain; the University of Leuven, Belgium; the University of Cyprus; the University of Paris V, France; and Constantine the Philosopher University, Slovakia; and the University of Durham, England, and is scheduled to receive honorary degrees from St. Petersburg State University in Russia and the University of Tilburg in Holland.

**Holly A. Taylor, PhD**, is a Professor of Psychology. She earned a PhD in Cognitive Psychology from Stanford University in 1992. She has been a faculty at Tufts since 1994. Dr. Taylor’s research examines the mental representation of information, sometimes referred to as mental models or situation models. She is particularly interested in the domains of spatial cognition and comprehension. Her work focuses on how information sources influence mental models. For example, if someone learns the Tufts University campus by walking around versus from a map, how different and how similar are their mental models? This work also extends to multimedia information sources and their effects on mental representations. In addition to basic research in this area, she is interested in applications to real-world information sources. Another area of research, in collaboration with Dr. Robin Kanarek, examines nutritional effects on cognitive behavior, in both children and adults.

**Ayanna Thomas, PhD**, is an Assistant Professor of Psychology. She received her PhD in cognitive psychology from the University of Washington. She has recently joined the Department of Psychology at Tufts. Ayanna's primary research interest lies in the interaction between subjective experience and objective performance. Her research is based on the assumption that cognitive assessments are made using accessible perceptual and contextual cues; however these cues are often idiosyncratic in nature. Because of the idiosyncratic nature of subjective experience, she employs an individual differences approach to the study of memory and metacognitive accuracy. This line of research allows Ayanna to gain leverage on theoretical constructs of memory and metacognitive accuracy by: 1. comparing college students to non-demented older adults; 2. comparing non-demented older adults to older adults in the early stages of Alzheimer's disease; 3. dividing non-demented older adults along dimensions of frontal and medial temporal functioning; and 4. dividing college and high school students on reading comprehension ability.

**Heather Urry, PhD**, is an Assistant Professor of Psychology. She completed her PhD at the University of Arizona. She accepted a position as Assistant Professor at Tufts in the Fall of 2005 where she established the Emotion, Brain, & Behavior Laboratory. The lab uses a variety of tools to learn how the brain and body work together to let us experience, express, and regulate emotion. Studies involve people of all ages, from young infants to older individuals in their mid 60s. Tools include functional magnetic resonance imaging, autonomic psychophysiology (skin conductance, EKG, facial electromyography), eye tracking, salivary cortisol, and behavioral measures.
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