



DEADLINE FOR APPLICATIONS: Monday, April 3, 2017

TRAINING PROGRAM IN COGNITIVE NEUROSCIENCE

Institute for Neural Computation

University of California, San Diego

POSTDOCTORAL FELLOWSHIP OPPORTUNITIES

2017-2018

Applications are invited for postdoctoral fellowships from the Training Program in Cognitive Neuroscience through the Institute for Neural Computation at the University of California, San Diego. Please note, fellowships are subject to the NIMH Notice of Award process (pending). This program provides interdisciplinary training in cognitive neuroscience to create a new generation of cognitive neuroscientists studying normal and abnormal brain function. San Diego has a highly interactive research community in cognitive neuroscience, and 23 faculty members from the Salk Institute for Biological Studies and at UCSD participate in this training program. Training will be provided in a wide range of techniques including electrophysiology, magnetoencephalography, functional magnetic resonance imaging and computational modeling. Preference will be given for applicants whose research is consonant with the mission of the NIMH to transform the understanding and treatment of mental illnesses through basic and clinical research, paving the way for prevention, recovery, and cure.

The fellowships are supported by the National Institutes of Mental Health (NIMH) and provide an annual NIH stipend ranging from \$47,484 - \$52,140 depending on the years of postdoctoral experience and available funding. Please note that only individuals with 4 years or less of postdoctoral experience should apply due to UCSD's 5-year limitation of postdoctoral appointments. Postdoctoral health insurance is also provided as part of the fellowship at a cap of \$8,850 per Fellow. Therefore, a brief letter (Letter of Commitment) from the faculty sponsor must accompany the application acknowledging that if needed, supplemental support for health insurance *and* salary is guaranteed by their home department. Please note that any supplemental funding should come from unrestricted funds.

PRIMARY TRAINING FOCI

1. Sensory Processing and Perception. Investigators working on a broad range of topics that include psychophysics, electrophysiology, brain imaging and modeling studies include T. Albright, V. de Sa, D. Kleinfeld, D. MacLeod and T. Sharpee.

2. Selective Attention. The study of attention is broadly based and includes research on the neural mechanisms and the perceptual consequences of space-based, feature-based, and object-based selective attention. These include T. Gentner, J. Reynolds and J. Serences.

3. Learning and Memory. San Diego has an especially active research community studying mechanisms of memory at multiple levels ranging from synaptic plasticity to the cognitive neuropsychology of amnesia. The faculty studying different aspects of memory on this training grant includes J. Brewer, E. Halgren, M. Kutas, R. Malinow, T. Sejnowski, and L. Squire.

4. Cognitive Control. Executive control functions include brain processes that guide thoughts and behaviors through internally generated goals and plans. The investigators in this area include A. Aron, A. Saygin and B. Voytek.

5. Translational Research. Several laboratories are pursuing cognitive neuroscience research that translates directly into better understanding of the neural bases of mental disorders, including autism, schizophrenia, Williams syndrome and dementing disease. Training faculty who carry out substantial translational research include T. Sejnowski, J. Brewer, E. Halgren, G. Light, R. Malinow, J. Sebat and N. Swerdlow.

ELIGIBILITY Candidates must be citizens or permanent residents of the U.S. The Training Grant provides up to \$8,850 per trainee in health insurance costs. We require home departments/mentors to cover the health insurance costs that exceed the allowable per trainee expense, as well as cover the cost of the Postdoctoral stipend should NIMH not provide sufficient funds to fully support the Postdoctoral Fellow's stipend level. In addition, trainees will incur a payback obligation during their first year of postdoctoral NIMH support and are required to complete a Payback Agreement. Awardees must comply with NIH PubMed requirements. UCSD requires that Postdoctoral Fellows to have worked less than five years in a postdoctoral training position. Thus, we only accept applications from candidates with four years or less of postdoctoral experience by the date of appointment (generally on July 1).

Note that successful candidates need to work on projects that are currently funded by NIMH or conceivably could be funded by NIMH. Please write one or two sentences describing how your proposed research fits within the mission of NIMH, as found at these sites:

<https://www.nimh.nih.gov/about/index.shtml>

<https://www.nimh.nih.gov/research-priorities/index.shtml>

<http://www.nimh.nih.gov/about/strategic-planning-reports/strategic-research-priorities/index.shtml>

Additionally, please note that the mission of NIMH is broad, but that you need to conceptualize and express your research in a manner that makes clear how it contributes to that mission. Please bear that in mind as you write your proposal.

APPLICATION INSTRUCTIONS Postdoctoral fellowship candidates should submit an 8-page application for a project that can be completed in two years or less, written in consultation with the primary and secondary research sponsors following the guidelines given below. The application should also include a CV and three letters of recommendation, including two from the faculty research sponsors (see below). Women and minority candidates are encouraged to apply.

TRAINING PROGRAM REQUIREMENTS

1. Postdoctoral fellows will be chosen from a pool of Ph.D. and M.D. applicants. Candidates must apply each year. Full applications from current Fellows supported by this training program are also accepted.

2. Fellows will be trained in two or more major research techniques in cognitive neuroscience (outlined below) that will include the primary laboratory and a secondary laboratory. Special training courses on sterile techniques, animal handling, and surgery room procedures will be available for trainees working on vertebrate animals.

3. Fellows are expected to attend weekly laboratory meetings within the major laboratory as well as the weekly Cognitive and Neural Systems seminar series.

4. Fellows will meet once each month with all other postdoctoral fellows and predoctoral trainees to discuss research. Each month one of the trainees will be responsible for presenting the research being performed in that his or her laboratory.

5. Fellows will carry out a 3 to 6 month rotation in their secondary laboratory, including attendance at weekly research meetings.

6. Fellows are expected to present the results of their research at one or more of the major annual meetings of the Society for Neuroscience, the Cognitive Neuroscience Society, the Cognitive Science Society, the Neural Information Processing Systems conference, and other major meetings.

7. Fellows will be required to attend the course NEU270B, Neurobiology of Disease. This course focuses on Developmental Disorders, specifically addressing the neurobiology of neuropsychiatric disorders.

8. A course on responsible conduct of research is required.

9. Postdoctoral Fellows will attend the Fall Welcome Meeting (October) and the Annual Spring Retreat (May). The retreat is a day-long event that is co-hosted by the Kavli Institute for Brain and Mind which brings together the entire cognitive neuroscience community. At the retreat each Fellow will give a brief 5-minute PowerPoint presentation on their ongoing research project (additional information will follow).

Application Deadline: 12 noon – April 3, 2017

Application Checklist:

1. Cover (1 Page):

- Name:
- Institution and Year PhD granted:
- Number of years of Postdoctoral experience combined:
- Citizenship Status:
- Ethnicity (self-reported):
- Race (self-reported):
- UCSD or Salk E-mail address:
- Gmail or other alternate home email address:
- Primary research sponsor (from faculty list below):
- Secondary research sponsor (from faculty list below):
- Title of research project:
- Currently funded on NIH fellowship?
 - If yes, give end date of current fellowship:
 - eRA Commons User Name:
- Abstract:

2. Background and Research Interests (1 page)

- Academic background
- Research training
- Research goals

3. Research Proposal (8 pages)

- Specific Aims
- Methods
- Proposed research
- Facilities and special equipment available

4. Curriculum Vitae

5. Copies of Recent Publications Including abstracts (continuing applicants only)

6. Three Letters of Recommendation (2 letters from research sponsors).

Your research sponsors should each submit a letter of recommendation directly to:

incfellowships@inc.ucsd.edu **Subject line should read:**

Postdoc_reference_Candidate_name

7. Letter of Commitment – from primary research sponsor

8. Completed Application

Submit your completed application **in PDF format** directly to:

incfellowships@inc.ucsd.edu **Subject line should read:**

Postdoc_app_candidate_name

Please use NIH formatting instructions; References do not count against the page limit.

Accepted applicants will also be required to complete an Individual Development Plan

UC San Diego IDP form: [IDP Form](#)

Comprehensive Skills Analysis Worksheet: [Worksheet](#)

FACULTY RESEARCH SPONSORS

Co-directors:

Terrence J. Sejnowski and Eric Halgren

Executive Committee:

Thomas Albright

Jeffrey Elman

Marta Kutas

Larry Squire

Neal Swerdlow

Participating Faculty:

Adam Aron
James Brewer
Richard Buxton
Anders Dale
Virginia de Sa
Timothy Gentner
David Kleinfeld
Gregory Light
Don MacLeod
Roberto Malinow
John Reynolds
Ayse Saygin
Jonathon Sebat
Katerina Semendeferi
John Serences
Tatyana Sharpee
Bradley Voytek

FACULTY RESEARCH INTERESTS

Thomas Albright, Vision Center Laboratory, Salk Institute. Dr. Albright's laboratory focuses on the neural structures and events underlying the perception of motion, form and color. Through an integrative approach, which combines neurophysiological and psychophysical techniques, and computational modeling of neural networks, his laboratory is beginning to understand the mechanisms of higher-level vision in the visual cortex and to define their unique contributions to visual perception and visually-guided behavior.

Adam Aron, Department of Psychology, UCSD. Dr. Aron uses functional and structural MRI and Transcranial Magnetic Stimulation (TMS) to study neuropsychological and neurological patients to address a range of questions related to cognitive control. In particular, he is interested in how frontal/basal-ganglia circuits are engaged during cognition and in how pathology of these circuits relates to neuropsychiatric conditions such as impulse control disorders.

James Brewer, Departments of Radiology and Neurosciences, UCSD. Dr. Brewer's laboratory uses functional and structural magnetic resonance imaging (MRI) to study memory processes in volunteers with healthy memory and in patients with memory difficulties, such as in Alzheimer's disease (AD). This research focuses upon the medial temporal lobe (MTL), which shows selective damage early in the course of AD. The laboratory studies the contributions to memory that are made by distinct MTL substructures and the interaction of these structures with other brain regions.

Richard Buxton, Department of Radiology, UCSD. Dr. Buxton is a physicist by training and founding director of the UCSD Center for Functional MRI. His research interests focus on recently developed fMRI techniques for measuring patterns of activation in the brain, including basic studies of the physiological mechanisms that underlie fMRI, novel approaches to the design and analysis of fMRI experiments, and development of new imaging techniques to directly measure tissue blood flow.

Anders Dale, Neurosciences and Radiology Departments, UCSD. Dr. Dale is co-Director of the Multimodal Imaging Laboratory and specializes in the development and utilization of multimodality imaging technologies including functional MRI, DTI, PET, MEG, EEG, and optical imaging. Among his projects are the development of software tools for automated segmentation of the brain and application of these techniques for assessment of anatomical and physiological changes associated with normal brain development and aging, as well as brain related diseases such as schizophrenia, autism and Alzheimer's disease. Another major focus of Dr. Dale's research is on mapping the genetic influences on brain development using brain imaging and genome-wide association studies.

Virginia de Sa, Department of Cognitive Science, UCSD. Dr. de Sa studies unsupervised category learning and has developed an algorithm that makes use of information from other sensory modalities to constrain and help the learning of categories within single modalities. She has also shown that supervised learning can be improved by changing the way inputs interact. She has applied these algorithms to real-world visual and auditory data and compared them to human performance on the same tasks.

Jeffrey Elman, Department of Cognitive Science, UCSD. The major focus of Dr. Elman's has been on connectionist models of language, ranging from acoustic/phonetic processing to syntactic and semantic levels. In particular, he has used simple recurrent networks for predicting time series that occur in natural language. These networks are capable of extracting and representing abstract grammatical structure of considerable complexity. He has focused on modeling neural development in his recent work, applying neural network models to investigate problems of learning and change under different assumptions about the initial state of the organism and its subsequent development. (*Rethinking Innateness: A Connectionist Perspective on Development*, MIT Press, 1996).

Timothy Gentner, Department of Psychology, UCSD. Dr. Gentner's research takes an integrative, systems-level approach to study the neural mechanisms that govern the sensory, perceptual, and cognitive processing of real-world acoustic signals. The goal is to find out how the brain represents behaviorally important, complex, natural stimuli, with a primary focus on the elaborate vocal communication system in songbirds.

Eric Halgren, Neurosciences and Radiology Departments, UCSD. Dr. Halgren is co-Director of the Multimodal Imaging Laboratory and carries out research that combines fMRI, MEG, and EEG for high-resolution spatiotemporal mapping of brain activity during cognition. He validates these measures using intracranial recordings from microelectrode arrays in patients with epilepsy. Dr. Halgren's research aims to identify, locate and characterize the neurocognitive stages used to encode and interpret meaningful stimuli such as words and faces. Currently he is investigating memory replay for consolidation during sleep, and language development. The overall goal is to understand fundamental integrative processes of memory and cognition at the synaptic and system levels.

David Kleinfeld, Department of Physics, UCSD. Dr. Kleinfeld studies how the vibrissa sensorimotor system of rats enables animals to extract a stable picture of the world from the blur of inputs obtained with their actively moving sensors. Ongoing studies address the detailed muscular control of the vibrissae, and the modularity and interaction of brainstem nuclei involved in exploratory whisking. Additional projects include electrophysiological investigation of correlates of vibrissa contact and the fusion of contact and position signals, as well as exploration of intracellular mechanisms for nonlinear mixing of rhythmic whisking signals in neocortex. Experiments also address

the sensory feedback in cortical control of exploratory whisking, and the roles of arousal and cholinergic input in the control of whisking.

Marta Kutas, Department of Cognitive Science, UCSD. Dr. Kutas investigates language and memory processes, primarily using electrophysiological recording techniques with ERPs. Her studies of memory have shown specific patterns of brain activation associated with encoding and recognition processes for both episodic and semantic memory. Other processes under investigation include semantic and repetition priming and amnesic memory disorders. Dr. Kutas' methods reveal the precise timing of memory storage and retrieval operations for both verbal and non-verbal items.

Gregory Light, Psychiatry Department, UCSD. Dr. Light's research focuses on the neurophysiologic, endophenotypic and cognitive abnormalities of schizophrenia patients. A major aim is to study the relationship of measures of pre-attentive sensory information processing with higher order cognitive and functional outcomes in schizophrenia. Dr. Light also participates in the Consortium on the Genetics of Schizophrenia, which is investigating the genetic basis of psychotic symptomatology.

Donald MacLeod, Psychology Department, UCSD. Dr. MacLeod investigates visual perception using a variety of psychophysical and electrophysiological techniques, both in animals and humans. This involves tracing the sequence of neural operations that occur as information flows from retina to brain. His major research interests are in face perception, color vision, motion perception, and visual sensitivity.

Roberto Malinow, Neurosciences Department, UCSD. Dr. Malinow uses electrophysiological, optical, molecular and behavioral techniques to examine synapses and circuits underlying normal and abnormal behavior in rodents. His research established AMPA receptor trafficking as a major component of synaptic potentiation in hippocampal slice LTP, and established the nature and distribution of synaptic change during fear conditioning in the amygdala. He also studies the lateral habenula and depression, and the effect of amyloid on LTD.

John Reynolds, Systems Neurobiology Laboratory, Salk Institute. Dr. Reynolds studies the neural mechanisms of selective visual attention at the level of the individual neuron and the cortical circuit and relates these to perception and conscious awareness. He records from multiple neurons in the visual cortex of monkeys to identify the regions where the representations of objects compete with one another and create a computational bottleneck. He seeks to understand this selection process using a combination of psychophysics, neurophysiology, and computational neural modeling approaches.

Ayse Saygin, Cognitive Science Department, UCSD. Dr. Saygin's research examines mechanisms of sensory-motor coordination, including the temporal dynamics of action perception and unconscious perception of biological motion. Another line of research in her laboratory investigates individual differences in social perception and cognition.

Jonathan Sebat, Departments of Psychiatry and Cellular & Molecular Medicine, UCSD. Dr. Sebat is Director of the Beyster Center for the Genomics of Psychiatric Disease. His laboratory is interested in how rare and *de novo* mutations in the human genome contribute to risk for common psychiatric disorders such as autism and schizophrenia. To this end, he is developing novel approaches to gene discovery that are

based on advanced technologies for the detection of rare variants, including studies of copy number variation (CNV) and deep whole genome sequencing (WGS). His goal is to identify genes related to psychiatric disorders and determine how genetic variants impact the function of genes and corresponding cellular pathways.

Terrence Sejnowski, Computational Neurobiology Laboratory, Salk Institute and Department of Biology, UCSD. Dr. Sejnowski uses computational models and experimental approaches at several levels of investigation ranging from the biophysical level to the systems level. Realistic models of electrical and chemical signal processing within and between neurons are used as an adjunct to physiological experiments. Network models based on the response properties of neurons are studied to explore how populations of neurons code and process information. Dr. Sejnowski has developed a new research program in his laboratory led by M. Behrens to study a mouse model for schizophrenia, and he collaborates with J. Ecker at Salk to study the methylome of the developing brain and the possible involvement of epigenetics in mental disorders.

Katerina Semendeferi, Department of Anthropology, UCSD. Dr. Semendeferi's research involves the comparative neuroanatomy of the human brain exploring neural systems involved in complex cognitive and emotional processes in humans, apes and other primates, as well as in human mental disorders. More recently Semendeferi's research expanded to the study of selected human mental disorders (Publications), that affect aspects of social cognition including autism and Williams Syndrome (Salk Institute). Semendeferi is the Director of the Laboratory for Human Comparative Neuroanatomy at UCSD.

John Serences, Department of Psychology, UCSD. Dr. Serences' research focuses on understanding how behavioral goals influence perception, decision-making, and memory. To investigate the influence of behavioral goals and previous experiences on perception and cognition, his group employs a combination of psychophysics, computational modeling, and neuroimaging techniques.

Tatyana Sharpee, Computational Neurobiology Laboratory, Salk Institute. Dr. Sharpee works on theoretical principles for information processing in the brain. She is interested in how sensory processing in the brain is shaped by the animal's need to create parsimonious representations of events in the outside world. Her approaches are derived from methods in statistical physics, mathematics, and information theory. She is particularly interested in understanding how neural feature selectivity is influenced by, and to what extent is determined by, the statistics of real-world inputs. One of her long-term goals is to understand how invariant feature selectivity is achieved in cortex.

Larry R. Squire, Department of Psychiatry, UCSD. Dr. Squire studies the neuropsychology of memory in humans and non-human. His research involves studies of identified patients with amnesia. The analysis of such cases provides useful information about the structure and organization of normal memory. He also studies non-human primates in an effort to understand anatomy of memory functions in collaboration with S. Zola. The goal is to identify medial temporal lobe and diencephalic structures important for memory.

Neal Swerdlow, Psychiatry Department, UCSD. Dr. Swerdlow's laboratory conducts studies in both humans and animal models focused on the neural circuits and molecular regulation of information processing and its deficiencies in specific brain disorders including schizophrenia and obsessive-compulsive disorder. One line of research has elucidated the neural regulation of pre-pulse inhibition, a measure of sensorimotor gating

that is impaired in schizophrenia and other brain disorders. A broad goal is to elucidate how limbic system and basal ganglia dysfunction contributes to mental illness.

Bradley Voytek, Department of Cognitive Science, UCSD. Dr. Voytek investigates the role of the frontal lobes in executive control and working memory. Using electrophysiological recordings of human brain activity, he studies oscillating network communication, brain-computer interfaces and brain/cognition/societal interactions.