UCONN
UNIVERSITY OF CONNECTICUT

GRADUATE STUDIES IN

BEHAVIORAL NEUROSCIENCE

The Program

The Behavioral Neuroscience Division of the Department of Psychological Sciences offers two Ph.D. programs that specialize in **Behavioral Neuroscience** and **Neuroscience**. Although these programs differ somewhat in content and emphasis, both provide an opportunity for the student to specialize in the topics of his or her greatest interest within the field, while acquiring a background of strong preparation in related fields.

The programs offer a wide variety of techniques and approaches to studying the relationship between the nervous system and behavior. A special emphasis of these programs is on electrophysiological and neurochemical analyses of sensory, motor, motivational, and cognitive processes organized within the mammalian telencephalic forebrain (e.g. neocortex, entorhinal cortex, hippocampus, thalamus and basal ganglia). Interaction among students and faculty from different laboratories is strongly encouraged, and students acquire a broad perspective on behavioral neuroscience. Research opportunities are further augmented by both local and international collaborations between the faculty and colleagues at other research institutions.

Facilities

The Behavioral Neuroscience research facility encompasses an entire floor of the newly renovated Psychology Building. The modern research facilities are situated in close proximity, which allows interactions between laboratories, faculty, and students. Facilities include state-of-the-art anatomical, electrophysiological, optical imaging, neurochemical, virtual reality testing systems, human physiology testing, behavioral equipment, and an AAALAC accredited animal housing facility.

Admission

Admission criteria include transcripts, GRE scores (General GRE is required, Psychology Subject Test is optional), or MCAT, previous research experience, three letters of recommendation, and compatibility of research interests of the applicant with those of the core faculty. Students are strongly encouraged to directly contact (email) members of the faculty with whom they may be interested in working.

Completed applications should designate ***Psychological Sciences*** as the Field of Study and either ***Behavioral Neuroscience*** or ***Neurosciences*** as the Area of Concentration. Applicants who are willing to be considered for both areas should indicate that fact on their application, as well as their preference.

Financial Aid

Financial support includes teaching assistantships, research assistantships, and fellowships. All assistantships include a stipend, full tuition waiver and medical/dental health benefits.

Location

The Behavioral Neuroscience division, which is part of the highly ranked Psychological Sciences department, is located at the main campus of the University of Connecticut, at Storrs. The University of Connecticut is a Research I university, with an enrollment of about 28,000 including 6,000 graduate students, served by 1,600 faculty. Storrs is a small community located in a scenic, rural, hilly area of northeastern Connecticut. Several major urban areas are within easy driving distance: Hartford, 35 min.; New Haven, Boston, and Providence 1 - 1.5 hrs; and New York City, 3 hrs, as well as major skiing areas and the waters of Long Island Sound, 45 min.

A great number of cultural and recreational opportunities are available at the university itself. Concert and theatrical series bring to campus internationally renowned groups encompassing a wide variety of performances, in addition to the University's own musical and dramatic productions. Specialized art galleries, the William Benton Museum of Art and the University Museum of Natural History present frequently changing exhibitions of traveling shows and their own collections all situated on campus.

For further information and application forms please contact:

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or go to: http://psych.uconn.edu/behavioral-neuroscience-division/

Core Faculty

Robert S. Astur (203) 236-9938; robert.astur@uconn.edu

Website: http://asturlab.uconn.edu/

Neural basis of learning and memory in humans; hippocampal function assessment using virtual reality; gender differences; spatial memory skill / hormones; chemical and behavioral addictions; eating disorders; posttraumatic stress disorder factors; psychological resiliency techniques

James J. Chrobak (860) 486-4243; james.chrobak@uconn.edu

Emergent physiological (i.e., fast-frequency oscillations) and cognitive properties (memory consolidation) of the hippocampal formation and interconnected circuits; relation to neuropathology of temporal lobe dysfunction (e.g., dementia, temporal lobe epilepsy).

R. Holly Fitch (860) 486-2554; roslyn.h.fitch@uconn.edu

Website: https://fitchlab.uconn.edu/

Animal models of early brain damage and genetic mutations associated with developmental disability. Research incorporates a wide range of behavioral assessments, with emphasis on deficits in auditory processing as a model for language disability. We also consider variables such as sex, experience, therapeutic intervention, and neuroanatomic outcomes.

Etan J. Markus (860) 486-4588; etan.markus@uconn.edu

Website: http://markus.lab.uconn.edu/

Brain basis of learning, memory and navigation; age-related changes in learning; spatial and context learning; using immediate early genes to examine which populations of cells encode an experience; recording from networks of individual hippocampal neurons as rats learn and perform different tasks.

Heather L. Read (860) 486-4108; heather.read@uconn.edu

BNS Website: http://read.lab.uconn.edu/

Engineering Collaborative Website: http://escabilab.uconn.edu/

We use animal models, behavioral training, high-resolution electrophysiology and optical imaging techniques to measure the neurobiological bases for discriminating tone, shape and rhythm in natural sounds including social communication sequences. The biomedical applications include developing diagnostic tools and interventions for natural sound processing and communication deficits. Seeking qualified graduate students for Interdisciplinary Neuroscience Core projects on Brain Computer Interface (BCI).

John D. Salamone (860) 486-4302; john.salamone@uconn.edu

Website: http://salamone.lab.uconn.edu

Motivational and motor functions of dopamine, adenosine and acetylcholine, neural/behavioral pharmacology, microdialysis methods for studying neurotransmission, neurotransmitter interactions and signal transduction, animal models of Parkinsonism, depression, schizophrenia and binge eating, neuroinflammation and motivation.

Ian H. Stevenson (860) 486-6822; ian.stevenson@uconn.edu

Website: http://stevenson.lab.uconn.edu

Computational neuroscience; statistical analysis of neural data; neural coding, dynamics, and interactions; plasticity and adaptation.

Harvey A. Swadlow (860) 486-2252; harvey.swadlow@uconn.edu

Processing of sensory information by thalamocortical and intracortical networks; modulation of this processing with different states of alertness and attention.

Maxim Volgushev (860) 486-6825; maxim.volgushev@uconn.edu

Website http://www.volgushev.uconn.edu/

Neurophysiology of the visual system; signal processing in visual cortical neurons in vivo; fast and slow oscillations of brain activity; action potential generation and cellular electrophysiology; synaptic transmission and plasticity.

Affiliated Faculty

Jose-Manuel Alonso

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Monty Escabi

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Deborah Fein

Department of Psychology (Clinical Subdivision), University of Connecticut
(860) 486-3518, deborah.fein@uconn.edu

COURSES in BEHAVIORAL NEUROSCIENCE

PSYC 5140. Foundations in Neuropsychology (*Fein, Salamone)***.** First semester. Three credits. Three class periods. An introduction to neuropsychology, including functional neuroanatomy, neurochemistry, neuropharmacology and cognitive/emotional function and dysfunction.

PSYC 5150. Neurodevelopment and Plasticity *(Fitch)***.** Also offered as COGS 5130. Offered bi-annually in Spring semester. Overview of brain development including: embryonic neurogenetics; evolution and evo-devo; how emergent behavioral capabilities reflect neural growth in neurobehavioral development; and how disruptions of neurodevelopment cause developmental disabilities.

PSYC 5200. Behavioral Neuroscience Research Seminar. Each semester. Two credits. One class period. Seminar on current research, with intra- and extramural colloquium speakers.

PSYC 5270. Current Topics in Behavioral Neuroscience. Each semester. One-six credits. One class period. Special topics (grant writing) or areas of research (neuroanatomy) with particular attention to recent developments in the field.

PSYC 5270. Synaptic Transmission and Plasticity. *(Volgushev).* Three credits. The class covers a broad range of topics in the area of cell electrophysiology, synaptic transmission, plasticity of synaptic transmission, synaptic plasticity during development and in learning and memory. The main focus is on operation of neurons in the cerebral cortex.

PSYC 5284. Human Behavior Genetics. Each semester. One-six credits. One class period.

PSYC 5285. Neurobiology of Aging: Changes in Cognitive Processes *(Markus).* Second semester. Three credits. Three class periods. Neural basis of age-related changes in learning and memory. Both the normal aging process and age-related pathologies examined. Encompasses both animal models and human data.

PSYC 5228. Neuropsychopharmacology *(Salamone).* Second semester. Three credits. Three class periods. This course will review the anatomy and physiology of the CNS and then discuss the effects of pharmacological agents on it. Topics include general anesthetics, hypnotics and sedatives, anticonvulsants, alcohol, muscle relaxants, tranquilizers, hallucinogens, and narcotics. Student presentations will treat topics relating the CNS and behavioral pharmacology.

PSYC 5251. Neural Foundations of Learning and Memory *(Markus)***.** Second semester. Three credits. Three class periods. Offered in alternate years. Examination of the processes involved in habituation, conditioning, learning, and memory through a study of the neural elements and systems involved in their production and maintenance.

PSYC 5257. Physiological Psychology Laboratory Semester by arrangement. Three credits. One class period. Techniques in behavioral neuroscience, neurophysiology, neuroanatomy and neurochemistry.

PSYC 5801. Neurophysiology *(Swadlow)*. Semester by arrangement. Three credits.

*Unless otherwise noted, course registration requires consent of instructor.

Related Courses

PSYC 5553. Introduction to Non-linear Dynamics
PNB 5301. Fundamental of Neurobiology
PNB 5314. Physiology of Excitable Cells
PNB 5330. Hormones and Behavior
PNB 6417. Developmental Neurobiology
PNB 6418. Integrative Neurobiology
PNB 6426. Molecular and Cellular Neurobiology
PHAR 5219. Biopharmaceutics and Pharmacokinetics
PHAR 6289. Pharmacokinetics
PHAR 6473. Function and Dysfunction of Brain Synapses

Representative Publications of BNS Faculty

Astur

Astur, R.S., Palmisano, A.N., Carew, A.W., Deaton, B.E., Kuhney, F., Niezrecki, R., Hudd, E., Mendicino, K.L., Ritter, C. (2015). Human Conditioned Place Preferences using a Secondary Reinforcer. Behavioural Brain Research, 297, 15-19.

Astur, R.S., Carew, A.W., Palmisano, A., Deaton, B.E., Kuhney, F., Niezrecki, R., & Santos, M. (2016). Cravings in a Virtual Reality Room Paired with Chocolate Predict Eating Disorder Risk. International Journal of Child Health and Human Development, 9(3), 9-19.

Astur, R.S., Carew, A.W., Palmisano, A., Deaton, B.E., Kuhney, F., Niezrecki, R., & Santos, M. (2015). Cravings in a Virtual Reality Room Paired with Chocolate Predict Eating Disorder Risk. Technology, Rehabilitation, and Empowerment of People with Special Needs. Nova Publishers: New York.

Astur, R.S., Palmisano, A., Hudd, E.C., Carew, A.W., Deaton, B.E., Kuhney, F., Niezrecki, R., & Santos, M. (2015). Pavlovian Conditioning to Food Reward as a function of Eating Disorder Risk. Behavioural Brain Research, 291, 277-82.

Astur, R.S., Carew, A.W., Palmisano, A., Deaton, B.E., Kuhney, F., Niezrecki, R., & Santos, M. (2014). Cravings in a Virtual Reality Room Paired with Chocolate Predict Eating Disorder Risk. Proceedings of the International Conference Series on Disability, Virtual Reality and Associated Technologies.

Astur, R.S., Carew, A.W., & Deaton, B.E. (2014) Conditioned Place Preferences in Humans using Virtual Reality. Behavioural Brain Research, 267, 173-7.

Newhouse, P., Albert, K., Astur, R.S., Johnson, J., Naylor, M., Dumas, J. (2013) Tamoxifen Improves Cholinergically-Modulated Cognitive Performance in Postmenopausal Women, Neuropsychopharmacology, 38(13), 2632-43.

Spieker, E.A., Griego, J.A., Astur, R.S., Holcomb, H. & Rowland, L.M. (2013). Facilitation of relational learning in schizophrenia, Behavioral Sciences, Behav. Sci. 3(2), 206-216.

Spieker, E.A., Astur, R.S., West, J.T., Griego, J.A., & Rowland, L.M. (2012). Spatial Memory Deficits in a Virtual Reality Eight-Arm Radial Maze in Schizophrenia, Schizophrenia Research, 135(1-3), 84-9.

Astur, R.S., Keller, M.W.,& Reini, S.A. (2011). Can You Handle the Stress: Testing to Predict Submariner Performance in High Stress Situations. The Submarine Review, 3, 121-128.

Folley. B.S., Astur, R.S., Jagannathan, K., Calhoun, V.D., Pearlson, G.D. (2010). Anomalous neural circuit function in schizophrenia during a virtual Morris water task. Neuroimage, 49(4), 3373-84.

Rzepecki-Smith, C.I., Meda, S.A., Calhoun, V.D., Stevens, M.C., Jafri, M.J., Astur, R.S., & Pearlson, G.D. (2010). Disruptions in functional network connectivity during alcohol intoxicated driving. Alcohol Clin Exp Res, 34(3), 479-87.

Shipman, S.L., Baker, E.K., Pearlson, G.D., & Astur, R.S. (2009) Absence of established sex differences in patients with schizophrenia on a 2-dimensional object array task. Psychiatry Research, 166(2), 158-65.

Canovas, R., Leon, I., Roldan, M.D., Astur, R. S., Cimadevilla, J.M. (2009). Virtual reality tasks disclose spatial memory alterations in fibromyalgia. Rheumatology, 48(10), 1273-8.

Allen, A.J., Meda, S.A., Astur, R.S., Calhoun, V.D., Ruopp, K.C., & Pearlson, G.D. (2009). Effects of alcohol on performance on a visual oddball task during simulated driving. Alcoholism: Clinical and Experimental Research, 33(4), 617-25.

Meda, S.A., Calhoun, V.D., Astur, R.S., Turner, B.M., Ruopp, K., & Pearlson, G.D. (2009). Alcohol dose effects on brain circuits during simulated driving: An fMRI study. Human Brain Mapping, 30, 1257-70.

Meda, S.A., Bhattarai, M., Morris, N.A., Kuzu, C.H., Astur, R.S., Calhoun, V.D., Mathalon, D.H., Kiehl, K.A., & Pearlson, G.D. (2008). An fMRI study of Working Memory in First-Degree Unaffected Relatives of Schizophrenia Patients. Schizophrenia Research, 104, 85-95.

Shipman, S., & Astur, R. (2008). Factors affecting the hippocampal BOLD response during spatial memory. Behavioural Brain Research, 187(2), 433-441.

Newhouse, P., Newhouse, C., & Astur, R. (2007). Sex differences in visual-spatial learning using a virtual water maze in pre-pubertal children. Behavioural Brain Research, 183(1), 1-7.

Kurtz, M., Baker, E., Pearlson, G., & Astur, R. (2007). A virtual reality apartment as a measure of medication management skills in patients with schizophrenia: A pilot study. Schizophrenia Bulletin, 33(5), 1162-1170.

Chrobak

Long LL, Bunce JG, Chrobak JJ (2015) Theta variation and spatiotemporal scaling along the septotemporal axis of the hippocampus. Front Syst Neurosci 9:37.

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Hinman JR, Penley SC, Escabi MA, Chrobak JJ (2013) Ketamine disrupts theta synchrony across the septotemporal axis of the CA1 region of the hippocampus. J Neurophysiology 109:570.

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Sabolek HR, Penley SC, Hinman JR, Bunce JG, Markus EJ, Escabi M, Chrobak JJ. (2009) Theta and gamma coherence along the septotemporal axis of the hippocampus. J Neurophysiology. 101:1192.

Fitch RH, Breslawski H, Rosen GD, Chrobak JJ (2008) Persistent spatial working memory deficits in rats with bilateral cortical microgyria. Behav Brain Function 4:45

Chrobak JJ, Hinman JR, Sabolek HR (2008) Revealing past memories: proactive interference and ketamine-induced memory deficits. J Neuroscience 28:4512.

Chrobak JJ, Amaral DG (2007) The entorhinal cortex of the monkey: VII. Intrinsic connections. Journal of Comparative Neurology. 500:612.

Tropp-Sneider J, Chrobak J, Quirk M, Oler JA, Markus EJ (2006). Differential behavioral state-dependence in the burst properties of CA3 and CA1 neurons. Neuroscience 141:1665.

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Fitch

Fitch, R.H., Threlkeld, S.W., McClure, M.M. & Peiffer, A.M. 2008. Use of a modified prepulse inhibition paradigm to assess complex auditory discrimination in rodents. Brain Research Bulletin, 76, 1-7.

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Szalkowski, C.E., Fiondella, C.G., Galaburda, A.M., Rosen, G.D., LoTurco, J.J., & Fitch, R.H. 2012. Neocortical disruption and behavioral impairments in rats following in utero RNAi of candidate dyslexia risk gene Kiaa0319. International Journal of Developmental Neuroscience, 30, 293 – 302.

Alexander, M.L., Hill, C.A., Rosenkrantz, T. & Fitch, R.H. 2013. Evaluation of the therapeutic benefit of delayed administration of erythropoietin following early hypoxic ischemic injury in rodents. Developmental Neuroscience, 34, 515-24.

Szalkowski, C.E., Booker, A.B., Truong, D.T., Rosen, G.D., & Fitch R.H. 2013. Knockdown of the candidate dyslexia susceptibility gene homolog Dyx1c1 in rodents: Effects on rapid and complex auditory processing, visual attention, and cortical and thalamic anatomy. Developmental Neuroscience, 35 (1), 50-68.

Alexander, M.L., Smith, A.L., Rosenkrantz, T., and Fitch, R.H. 2013. Therapeutic effect of caffeine treatment immediately following neonatal hypoxic-ischemic injury on spatial memory in male rats. Special Issue Brain Sciences; Neuroprotection Against Brain Ischemia, 3, 177-190.

Fitch, R.H., Alexander, M. & Threlkeld, S.W. 2013. Early neural disruption and auditory processing outcomes in rodent models: Implications for developmental language disability. Frontiers in Systems Neuroscience, Special Issue, vol. 7, 00058.

Alexander, M.L., Smith, A., Rosenkrantz, T., Garbus, H., & Fitch, R.H. 2014. Behavioral and histological outcomes following neonatal HI injury in a preterm (P3) and term (P7) rodent model. Behavioral Brain Research, 259, 85-96.

Smith, AL, Alexander, ML, Rosencrantz, T, Fitch, RH. 2014. Sex differences in behavioral outcome following neonatal hypoxia ischemia: Insights from a clinical meta-analysis and a rodent model of induced hypoxic ischemic brain injury. Experimental Neurology, 254, 54-67.

Smith, A.L., Hill, C.A., Alexander, M., Szalkowski, C.E., Chrobak, J.J., Rosenkrantz, T.E. & Fitch, R.H. 2014. Spatial working memory deficits in male rats following neonatal hypoxic ischemic brain injury can be attenuated by task modifications. Brain Sciences, 4, 240-272.

Truong, DT, Che, A, Rendall, AR, Szalkowski, CE, LoTurco, JJ, Galaburda, A. & Fitch, RH. 2014. Mutation of Dcdc2 in mice leads to impairments in auditory processing and memory ability, Genes, Brain and Behavior, 13 (8), 802 - 811.

Truong, DH & Fitch, RH. 2014. Behavioral consequences of early disruption and injury to the developing brain: studying rodent models. In The Maze Book (Bimonte-Nelson, H., Ed), Neuromethods Series. Springer Press, New York. p. 93-120 (CH 4).

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Rendall, AR, O'Connell, K, Johnson, GC, Kehindel, T, Rosen, GD & Fitch, RH. 2017. Anatomical and behavioral strain differences in a mouse model of repetitive mild traumatic brain injury. In press.

Rendall, A.R., Perrino, P., LoTurco, JJ & Fitch, R.H. 2017. Visual motion processing deficits in mice with knock-out of the dyslexia risk homolog gene Dcdc2. In press.

Markus

Markus, EJ, Qin, Y, Leonard, B, Skaggs, WE., McNaughton, BL.,& Barnes, CA. (1995). Interactions between location and task affect the spatial and directional firing of hippocampal neurons. J Neurosci., 15:7079.

Oler, J.A., and Markus, E.J. (1998) Age-related deficits on the radial maze and in fear conditioning: Hippocampal processing and consolidation. Hippocampus, 8:402.

Tropp J, and Markus EJ (1999). Navigational strategy shifts with training: Rats on the radial arm maze. Psychobiology 27: 480.

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Sava S. & Markus EJ. (2008). Activation of the medial septum reverses age-related hippocampal encoding deficits. J Neurosci. 28:1841.

Oler JA, Penley SC, Sava S. & Markus EJ. (2008). "Does the Dorsal Hippocampus Process Navigational Routes or Behavioral Context? A Single Unit Analysis". Eur J Neurosci. 28(4): 802-812

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Schmidt B, Satvat E, Argraves M, Markus EJ, Marrone DF (2012). Cognitive demands induce selective hippocampal reorganization:Arc expression in a place and response task. Hippocampus 22(11):2114-26.

Schmidt B, Hinman JR, Jacobson TK, Szkudlarek E, Argraves M, Escabí MA, Markus EJ (2013). Dissociation between Dorsal and Ventral Hippocampal Theta Oscillations during Decision-Making. J. Neuroscience 33(14):6212-6124.

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Schmidt B, Papale A, Redish AD & Markus EJ (2013). Conflict between Place and Response Navigation Strategies: Effects on Vicarious Trial and Error (VTE) Behaviors. Learning & Memory 15;20(3):130-8

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Read

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