ANNUAL REPORT
2009-2010

SCHOLARS PROGRAM IN INTERDISCIPLINARY NEUROSCIENCE
(SPINR)

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Background

The ***Scholars Program in Interdisciplinary Neuroscience Research (SPINR)*** is a unique scholarship opportunity for pre- and post-doctoral candidates interested in novel **interdisciplinary, collaborative neuroscience research** projects. The Scholarship will provide **a competitive stipend, tuition and scientific travel/research support** for trainees involved in unique co-mentored neuroscience projects between two distinct disciplines. Trainees will become part of a greater cross-disciplinary neuroscience community of leaders, and will be academically supported by monthly mentoring luncheons and biannual research-leadership symposia.

The SPINR program was launched in 2009 with funding by the Neuroscience Initiative. The overarching goal is to identify exemplary students who can become the next generation of scientists that bridge neuroscience into other disciplines. The creation of neuroeconomics as field is often cited as a prime example. The vision of the program is to create a community of scholars that are vertically integrated at all levels: undergraduates, graduate students, postdoctoral fellows, and faculty.

Scholars are selected based on their past accomplishments and promise of future exceptional contributions. To facilitate interdisciplinary work, each scholar is required to have two mentors: one from neuroscience and one from a non-neuroscience field. Current areas of interest to the program include: economics, business, law, religion, music, anthropology, and engineering.

Currently there are 7 scholars (2 undergrads, 2 grads, 3 postdocs), which is projected to increase to 12 by the end of 2010-11.

Committee Membership

The membership of the SPINR committee was substantially expanded in the last year. The expansion was done to increase the representation in non-neuroscience departments. Approximately half the faculty on the committee are also members of the neuroscience graduate program.

Gregory Berns	Neuroscience & Economics
Monica Capra	Economics
Maryam Carn	NSI Support
Christopher Curran	Economics
Mary DeLong	Postdoctoral Office
Sonia Hayden	Neuroscience
Shawn Hochman	Neuroscience & Biomedical Engineering
John Johnston	English
Paul Lennard	NBB
Donna Maney	Neuroscience & Psychology
Jim Rilling	Neuroscience & Anthropology
Mark Risjord	Philosophy and LGS
Leah Anderson Roesch	Undergraduate Education
Deboleena Roy	Women's Studies

Julie Seaman	Law School
Yoland Smith	Neuroscience
Lena Ting	Neuroscience & Biomedical Engineering
Kristy Towry	Business School
Larry Young	Neuroscience

Website

The website went live last year and can be found at www.spinr.emory.edu. This is our main portal and is where applicants can find information to apply to the program. We are currently in the process of loading in faculty descriptions of research.

Undergraduate Program

Although NSI funding was cut from most of the undergraduate program, we were able to obtain other funding through Pat Marsteller and the Center for Science Education. This allowed us to maintain the vertical integration of different trainee levels. Out of four applicants, we accepted two students into the program.

Cost for undergrad for academic year is $2,000. We are cost sharing two students per year, and SPINR is paying a total of $2,000 for academic year support for the two students. Cost for undergrad summer is $6,000. We are cost sharing two students per year and thus paying a total of $6,000 for summer support for the two students. In addition, the NI is providing $1,000 per undergrad per year for travel funds. Thus we are paying a total of $2,000 per year for two students. Thus SPINR is contributing 10K and Center for Science Education 8K.

Matthew Rubin is a senior at Emory majoring in Economics and Math with a minor in History. For his Honors Thesis, he is researching ways to use economic incentives to induce more honest self-reporting. He is developing an fMRI feedback probe that helps align truthful reporting with economic incentives. He is co-mentored by Gregory Berns and Monica Capra. He received the George Benston and Richard Muth Award (Emory Economics Department Undergraduate Award for intellectual curiosity, passion, and skill in economic analysis) this year.

Ryan Matkinson is working Mark Wilson and Mar Sanchez to study the effect of puberty on emotional regulation.

We plan to admit two more undergraduates to the program in 2010-11.

Graduate Program

We added Ming-fai Fong to the program last year, joining Andrew Brooks as a graduate scholar. Already, she has proven to be one of our stars, receiving and NSF graduate research fellowship. Andrew Brooks, the other student, continues to do well, submitting one paper and an NRSA application.

Andrew Brooks is co-mentored by Gregory Berns and Monica Capra, and he is working in the area of neuroeconomics. As a SPINR fellow for one year, he has attended SPINR functions including the neuroimaging ethics seminar, brain & the court seminar, as well as several SPINR

trainee meetings. He also attended SFN 2009. He submitted an individual pre-doctoral research proposal to the NIH (NRSA), and he has designed and implemented an experiment to study the disposition effect. He took courses in economics, including graduate-level quantitative methods I (ECON 526), intermediate microeconomics (ECON 201), and stocks, bonds, and financial markets (ECON 215). Although Andrew is a SPINR fellow, Gregory Berns continues to pay his stipend, which has freed up SPINR funds for other fellows.

Ming-fai Fong is co-mentored by Pete Wenner and Steve Potter and is developing new electrophysiological approaches for examining the mechanisms by which neurons compensate for aberrant or pathological network activity. Since becoming a SPINR fellow, she has completed several concurrent patch clamp + multielectrode array recordings using the rig she built. She also designed a perfusion system for the recording chamber in order to allow for fast switching between pharmacological agents. She is currently writing software for automatic detection and sorting of postsynaptic currents.

Ming-fai received an NSF Graduate Research Fellowship (NSF 09-603). She also applied for international travel funds through her current fellowship (NSF IGERT, DGE-0333411) and received $6000 to conduct research in Switzerland.

We plan to admit two more graduate students to SPINR in 2010-11.

Postdoctoral Program

Overall, the three Postdoc Scholars are doing well and would be good candidates in applying for external funding. The three are very appreciative of two major items – the independence to try their own ideas and direct their own research and secondly the protection of their time for research with only minor requirements such as the NI lunches. They really like the structure of the program and appreciated the growth into the "independent faculty thinking" mode.

Paul Marvar has already submitted a K99/R00 that would give him 5-years of funding – 2 as Postdoc and 3 as faculty with a generous research budget. He has also been offered the opportunity to move to a Lecturer position and submit an R21. He is waiting for his K99 score now and will make the R21 decision depending on his NIH reviews. He is well on his way to being a tenure-track faculty at Emory with the area of his proposed research valued by Dave Harrison of Cardiology and Kerry Ressler of Psychiatry. Good publication and meeting presentation record.

Wendy Hasenkamp is submitting a K99/R00 in October and also an R21 with Larry Barsalou as PI. She is on track for a faculty position in Psychology and Larry is giving her great independence and treating her as such with a faculty office, etc. Her publication record and presentations at meetings are also very good.

Alexandre Franco already has a position offered to him at the end of next year as a tenure-track professor as Director of image processing at a new $30,000,000 Brain Research Institute at Pontificia Universidade Catolica do Rio Grande do Sul in the south of Brazil near Rio, He will not be applying for grants this year because he plans to take this position and return home to his native country. Helen Mayberg knows this and is very supportive him and his plans. Alex has publications coming out and is scheduled for various meeting presentations.

We have funds for one Postdoc Scholar this coming year (2010-11) and we are advertising the SPINR program in a Nature and on Nature Jobs. We have not received many good applications, but July and August are not good months for applications. Otis Smart and the other two applicants we had resubmit are planning on resubmitting September 15th.   Next year (2011-12) we will have funds for 3 Postdoc Scholars.

Events

We held the following events either solely or jointly with other programs, which provides substantial leverage.

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Suzanne Zukin, Ph.D.
Friday, February 5, 2010
Epigenetic Remodeling of Synaptic AMPA Receptors in Neuronal Death
12:00 pm
Whitehead Auditorium
****
Neurosciences Initiative Connectivity Event
February 20, 2010
Oral Presentation by Dr. Alexandre Franco, SPINR Postdoctoral Fellow
Poster Presentation by Paul Marvar, SPINR Postdoctoral Fellow
Participants
Undergraduate: Matthew Rubin & Ryan Makinson
Graduate: Andrew Brooks
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Friday, April 2, 2010
11:30 – 12:30 pm
White Hall #101
"The Brain in Court"
Seminar by
Helen S. Mayberg, M.D.
Professor of Psychiatry & Neurology
Emory University School of Medicine
and
Private Luncheon with SPINR trainees, trainee mentors & SPINR committee members
At the MCC Café Antico immediately following seminar
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Thursday, April 22, 2010
1:30 pm
SOM Auditorium #120
"The Neuroethics of fMRI Imaging"
Seminar by
Martha J. Farah, Ph.D.
Walter H. Annenberg Professor of Natural Sciences
Director, Center for Cognitive Neuroscience and Center for Neuroscience and Society

University of Pennsylvania
Co-sponsored by
The Graduate Program in Neuroscience Center for Ethics
The Neuroscience Initiative
****

SPINR Committee, Mentor and Trainee Dinner
 Tuesday, April 27, 2010
  At the home of Drs. Mary & Mahlon DeLong
 5:30 – 9:00 pm
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Summer Undergraduate Research Experience (SURE)
Ryan Makinson & Matthew Rubin
SPINR Undergraduate Fellows, Summer 2010

Plans for upcoming year

1. **Continue to expand SPINR cohort.** We are budgeted to admit 2 more undergrads, 2 grad students, and 1 postdoc.
2. **Expand programmatic components.** We will be launching a monthly event of informal seminars and get-togethers for the fellows.
3. **Preparation of application for external funding.** Although we are budgeted from the NI through 2013, we will begin the application process for transition to external funding in the spring. We expect that it will take more than one try, and so it is prudent to begin the process this year. Although we will also apply to NIH, NSF is the most likely sponsor of this type of program.

Proposal for financial support for Laney graduate students

Background
- Most departments at Laney have small graduate programs.
- Departments are usually concerned about "losing" graduate students because such a loss is not replaced with additional graduate slots.
- A SPINR sponsored graduate student signifies a partial loss to Neuroscience because the student may not be fully engaged in important activities (seminars and courses) and assignments (i.e., RA/TA) in their original department.
- Departments will not support SPINR unless we show that this partial loss is close to zero, or unless we show that they will benefit from it.

Here we have a few suggestions to keep Laney disciplines on board.

Benefits for the department:
- SPINR will help departments argue for more flexibility in the management of graduate resources. Clearly, departments value such flexibility.
- The money that is saved from having 2nd or 3rd year students in the SPINR could be made available to the department to support one or more additional graduate student lines in subsequent years. As a consequence, graduate slots for the deparment may actually increase.
- After completion of SPINR, the sponsored graduate student will be self-supported through either grants with the mentor or, if necessary, by teaching courses in the College.

Benefits for Laney
- Laney's objectives are: to reduce time to degree and attrition, and to improve placement. SPINR can help achieve such objectives by investing in the student through providing access to interdisciplinary research, grant training, and intensive mentoring.
- Dean Tedesco supports initiatives that motivate faculty and graduates students to apply for external funding. SPINR can become an interesting catalyst and model for motivating Laney students to get external funding.
- We could require the sponsored graduate student to be a PI or a Co-I in grants that would support other graduate students.

PROPOSED FINANCIAL SUPPORT FOR PRE-DOCTORAL SPINR SCHOLARS IN THE LANEY GSAS									
Year of admission Year 1	SPINR Year 1	SPINR Year 2	SPINR Year 3	GSAS Year 1	GSAS Year 2	GSAS Year 3	GSAS Year 4	Mentor/ Student# Year 4	Mentor/ Student# Year 5
Stipend	0	24.5K	24.5K	16.5–21.5K*	0	0	0	17K – 24.5K	17K – 24.5K
Student fees									
TOTAL									
Year of admission Year 2	SPINR Year 1	SPINR Year 2	SPINR Year 3	SPINR Year 4	GSAS Year 1	GSAS Year 2	GSAS Year 3	GSAS Year 4	Mentor/ Student# Year 5
Stipend	0	0	24.5K	24.5K	16.5–21.5K*	16.5–21.5K*	0	0	17K – 24.5K
Student fees									
TOTAL									

* We have different levels of support: Diversity (Blacks and Hispanics $21,500), Merit ($20,000 or $20,500), and Regular ($16,500)
# If the student self-supports, s(he) can make $7000/course and can usually teach 2 courses during the term. An additional course can be taught in the summer for $3000.

Other notes: Students pay $250/term for health insurance, which is 25% of the health insurance costs. They also pay about $300/term in fees such as recreation.

SPINR FELLOWS

UNDERGRADUATE STUDENTS

Matthew Rubin: Emory College Senior
I am a senior at Emory majoring in Economics and Math with a minor in History. For my Honors Thesis, I am researching ways to use economic incentives to induce more honest self-reporting. Specifically, I am pursuing this by looking at the neural pathways of emotion, and whether the brain processes identities of people based on their actions or their attributes. I am working under the supervision of Dr. Gregory Berns with assistance from Dr. Michael Prietula and Dr. Monica Capra.

Since receiving the fellowship, I have designed a behavioral questionnaire and had 10 subjects complete this. I ran various statistical analyses on this data to identify groupings of adjectives and verbs that account for the variance in responses. After scanning two members of my research team, I compared these groupings to the brain activation data and created contrast models to locate Regions of Interest (ROIs) in my subjects. I am currently researching Multi-Voxel Pattern Analysis, a statistical method to investigate the representational content of regions (instead of just looking at the involvement of different regions), and will begin implementing this analysis on my two subjects at the end of August. After the MVPA, I plan to recruit more subjects and compare their behavioral responses to their brain activation patterns.

Honors
George Benston and Richard Muth Award (Emory Economics Department Undergraduate Award for intellectual curiosity, passion, and skill in economic analysis)

Ryan Makinson: Emory College
This summer, I helped to characterize the emotional reactivity of my subjects through standardized testing procedures. This included the approach-avoidance test (A/A) which presents novel objects that vary in degree of threatening qualities. In the A/A test, subjects are placed in a test-cage and presented with objects within tactile reach. Each object was presented for 5min in a stimulus presentation box directly in front of the cage. Objects included a cup, a plastic bear with large eyes, a coiled rope, a rubber snake, a large yellow ball and a pink pig that moves and makes noises. A jelly bean was placed in front of the object for each trial requiring the subject to actively reach into the box to retrieve it. All tests were digitally recorded in 30-minute intervals and later quantified using an established ethogram designed to assess a range of behaviors in rhesus monkeys, including anxiety and fear-related behaviors. The responses were summarized and analyzed via repeated measures ANOVA statistical approach.
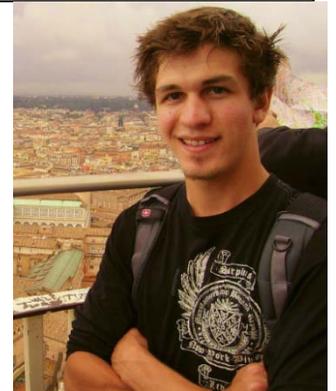
Summary of Research
Puberty represents a critical and vulnerable period of time for proper emotional and neurological development. In females, the onset of puberty initiates the release of estradiol (E2): an important sex hormone in females that contributes to the maturation of brain regions important for emotional regulation. Pre-pubertal psychosocial stressors, however, could compromise this development by delaying the release of E2. Furthermore, genetic predisposition can exacerbate the effects of adverse environmental conditions placing these individuals at increased risk for developing psychiatric disorders. Together, this ongoing investigation is exploring how hormonal, genetic and environmental interactions combine to influence emotional development and brain maturation in female adolescent rhesus monkeys.

GRADUATE STUDENTS

Andrew Brooks: Third Year Graduate Student, Graduate Division of Biological and Biomedical Sciences, Program in Neuroscience

Research Description: My interests lie at the interface between behavioral finance, economics, and neuroscience. More specifically, I'm interested in how brain structures involved in decision making encode information about financial choices, and how these choices are affected by hormonal signals.

What I've done: As a SPINR fellow for one year, I've attended SPINR functions including the neuroimaging ethics seminar, brain & the court seminar, as well as several SPINR trainee meetings. I also attended the largest neuroscience conference in the world, the 2009 Society for Neuroscience conference. I've submitted an individual pre-doctoral research proposal to the NIH (NRSA), where I propose studying a behavioral finance phenomenon from an interdisciplinary perspective, which combines economic paradigms with neuroimaging to better understand the neurobiology behind this decision-making phenomenon. Furthermore, I've already designed and implemented an experiment to study the disposition effect. To facilitate my interdisciplinary research, I've taken courses in economics, including graduate-level quantitative methods I (ECON 526), intermediate microeconomics (ECON 201), and stocks, bonds, and financial markets (ECON 215).

Publications: Brooks, A. M., Pammi, V.S.C., Noussair, C., Capra, C., Berns, G. S. From Bad to Worse: Striatal Coding of the Relative Value of Painful Decisions. *Submitted for review*.

Honors/Awards: Voted onto the curriculum committee for the Graduate Program in Neuroscience at Emory (2010 – 2012).

Grants: NRSA proposal submitted to the NIH: "A Neuroscientific Investigation into the Disposition Effect" (August 2010).

Ming-fai Fong: Third Year Graduate Student, Graduate Division of Biological and Biomedical Sciences, Program in Neuroscience

Neural networks are dynamical systems that can function in a variety of behavioral contexts. Individual cells within these networks can regulate their own excitability in order to keep overall network activity within a healthy dynamic range. I am developing new electrophysiological approaches for examining the mechanisms by which these cells compensate for aberrant or pathological network activity.

Since receiving this award, I have completed several concurrent patch clamp + multielectrode array recordings using the rig I built (described in my proposal). I have also designed a perfusion system for the recording chamber in order to allow for fast switching between pharmacological agents. I am currently writing software for automatic detection and sorting of postsynaptic currents.

Grants Received:
NSF Graduate Research Fellowship (NSF 09-603). I applied for an international travel funds through my current fellowship (NSF IGERT, DGE-0333411) and received $6000 to conduct research in Switzerland. The proposed research project is on studying therapeutic methods for axonal regrowth after spinal cord injury with Dr. Juerg Streit at the University of Bern.

Advisors: Pete Wenner and Steve Potter

Website: http://userwww.service.emory.edu/~mfong2/

POSTDOCTORAL FELLOWS

Alexandre Franco: Postdoctoral Fellow
Dr. Franco is primarily interested in developing methods to analyze allocation of resources in the human brain. He is also interested developing signal processing methods to analyze functional MRI data.

Brief summary of what you have done since receiving the fellowship
This has been my first year in Dr. Mayberg's lab, where the main focus is the study of clinically depressed patients through brain imaging. In this first year of the postdoctoral position I have been responsible on reevaluating and developing novel methods to analyze Functional MRI (FMRI) data acquired from patients and healthy controls. In this context, I have been responsible for developing and implementing both standard and novel analyses of baseline data for a project on deep brain stimulation, and have been supervising and training two neuroscience graduate students on basic and advanced signal/imaging processing methods. I have been attending weekly meetings at the BITC and CBIS enhancing the collaboration between these

labs with Dr. Mayberg's lab.

Prior to arriving to the lab, a large dataset (N>300 patients) of FMRI data had been acquired, and the plan was that these data would be used for my project. However, it was discovered that most of the data contained an imaging acquisition error. With the joint help of Dr. Xiaoping and his lab members, we were able to detect the source of the error and through statistical and signal processing techniques I developed a method to correct these corrupted data (paper currently being written).

The resource allocation model proposed for the fellowship using task data has been presented at an OHBM (organization for human brain mapping), and was received with great enthusiasm (full manuscript is under review by other co-authors). In order to extend the model to resting state data, I have developed a new dynamic method to evaluate resting state functional connectivity, which looks at changes in connectivity of the brain in a 7.5 minute period. More specifically, we are observing the difference in the dynamics of resting state networks between patients and controls (poster will be presented in September at the International Resting State Brain Connectivity conference).

Furthermore, I have helped on organizing the infrastructure for storing large imaging datasets using XNAT. This will facilitate for data sharing with collaborating labs and also facilitate the transition of future lab members. Finally, I have also been advising other Emory researches on data processing techniques.

Publications

International Conference on Resting-State Function Brain Connectivity 2010 – Milwaukee
Dynamic Resting State Connectivity in Major Depression Disorder, **Alexandre R. Franco**, Paul E. Holtzheimer, Helen S. Mayberg.

Society for Neuroscience 2010 – San Diego
Predictors of antidepressant response: multivariate analysis of FDG-PET, C. L. McGraph, M. E. Kelley, **A. R. Franco**, P. E. Holtzheimer, W. E. Craighead, B. W. Dunlop, H. S. Mayberg

Human Brain Mapping 2010 – Barcelona
A competitive equilibrium approach to model resource allocation of the human brain. **Alexandre R. Franco**, Andrew R. Mayer, Vince D. Calhoun, Helen Mayberg, Gregory L. Heileman

Biological Psychiatry 2010 – New Orleans
Pre-operative resting state functional connectivity is associated with intraoperative response to subcallosal white matter deep brain stimulation for treatment-resistant depression, Paul E. Holtzheimer III, **Alexandre Franco**, R. Cameron Craddock, Mary E. Kelley, Callie McGrath, David A. Gutman, Megan M. Filkowski, Robert Gross; Helen S. Mayberg.

Wendy Hasenkamp: Postdoctoral Fellow

My research interests center around understanding how meditation may lead to improved mental and physical health. Specifically, my goal is to understand which brain networks may be altered with repeated practice, and whether these changes are related to increased well-being in people who meditate. I use functional magnetic resonance imaging (fMRI) technology to investigate these questions, and am developing methodology to incorporate first-person subjective information into analysis of brain imaging data. I am currently exploring the neural correlates and temporal dynamics of changing brain states (such as mind-wandering and focused attention) that are experienced during meditation.

Activities since receiving the fellowship: I have finished running subjects and data analysis for Aim 1 of my project. I have presented this work at two conferences and have submitted a manuscript for publication to NeuroImage. Another peripheral publication is under review from this project at NeuroImage as well. I am currently working on writing a K99/R00 grant to extend my work and transition to independence after this fellowship terminates. I am also working on an R21 grant with my mentor.

I have no additional grants or publications since receiving the fellowship.

Honors: I was invited to give a talk during the Emory Postdoc Symposium in May.

Paul J. Marvar: Postdoctoral Fellow, Lab

My project examines the role of T lymphocytes in hypertension caused by chronic stress. Since the start of my NSI fellowship in October 2009 I have conducted a series of pilot experiments to develop a stress-induced hypertension rodent model. Upon successfully developing this model I have begun to test my hypothesis and have obtained some promising preliminary results for specific aim 1 and 2. These data show that chronic stress leads to mild elevations in blood pressure which is accompanied by T lymphocyte mediated inflammation in both the kidneys and vasculature. In addition, I have found that these changes in blood pressure and T lymphocytes are significantly augmented when combined with a non-pressor dose of angiontensin II. Additional studies are currently underway to further characterize the neuroimmune mechanism for the activation of T lymphocytes in stress-induced hypertension and to begin to identify potential neural signaling pathways in the brain that contribute to this response.

These data have been accepted for an oral presentation at the 2010 American Physiological Society Conference: Inflammation, Immunity and

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Cardiovascular Disease Dates: August 25-28, 2010 Westin Westminster, Colorado Publications Abstract for the 2010 American Physiological Society Conference: Inflammation, Immunity and Cardiovascular Disease **Stress-induced hypertension promotes T lymphocyte activation and vascular inflammation** Paul J. Marvar[1], Antony Vinh[1], Salim Thabet[1], Duke Geem[2], Kerry Ressler[2] and David G. Harrison[1] Department of Medicine Division of Cardiology and Department of Psychiatry Center for Behavioral Neuroscience[2] Emory University, Atlanta, GA 30322 Grants None, but I submitted K99/00 June 14th 2010.	

MENTORS

Lawrence Barsalou

[barsalou3@emory.edu]

Lawrence Barsalou is Samuel Candler Dobbs Professor of Psychology at Emory University. He received a bachelors degree in Psychology from the University of California, San Diego in 1977 (working with George Mandler), and a Ph.D. in Psychology from Stanford University in 1981 (working with Gordon Bower). Since then, he has held faculty positions at Emory University, the Georgia Institute of Technology, and the University of Chicago, returning to Emory in 1997. Barsalou's research addresses the nature of human knowledge and its roles in perception, memory, language, and thought. The current theme of his research is that the human conceptual system is grounded in the brain's modal systems. Specific topics of interest include whether (and if so how) modal systems implement symbolic operations and abstract concepts. Other lines of research address the situated character of knowledge, the dynamic online construction of conceptual representations, the development of ad hoc categories to support goal achievement, the structure of knowledge, and category learning. Barsalou's research has been funded primarily by the National Science Foundation. He has held a Guggenheim fellowship; served as the chair of the Cognitive Science Society; won an award for graduate teaching from the University of Chicago; is a Fellow of the American Psychological Association, the Association for Psychological Science, the Cognitive Science Society, and the Mind and Life Institute.
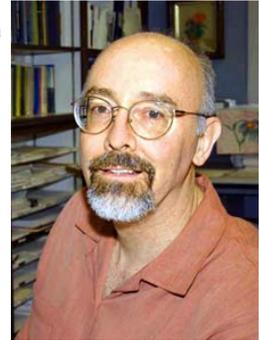
>> Additional Profile

Gregory Berns

[gberns@emory.edu]

My research is aimed at understanding the neurobiological basis for individual preferences and how the biology places constraints on the decisions people make -- a field now known as neuroeconomics. To achieve this goal, we use functional MRI to measure the activity in key parts of the brain involved in decision making. We then link these activity traces to various phenotypes of decision making. For example, we have linked the pattern of activity in the striatum with the receipt of unexpected, salient information with the tendency to alter one's behavior. More recently, we have used the timecourse of activity as a proxy for experiential utility, in the process, bridging the gap between experience and choice. Ongoing research projects are developing these methods to probe decision-making in adolescents as well as group decision-making and the influence of peer pressure at the neurobiological level.

>> Lab Website

DuBois Bowman

[dbowma3@sph.emory.edu]

Dr. Bowman's research involves the development of statistical models that are used to analyze brain imaging data. He has developed statistical models that are applicable to functional magnetic resonance imaging (fMRI), diffusion tensor imaging (DTI), and positron emission tomography (PET) data. He collaborates with neuroimaging scientists at Emory University to conduct research examining neural processing associated with a variety of outcomes, generally related to psychopathology, learning, emotion, and behavior. Specific examples of Dr. Bowman's research include studies that evaluate neural correlates of social anxiety disorder, schizophrenia, major depression, drug craving, and moral and strategic reasoning in corporate decision-making.

>> Lab Website
>> Additional Profile

Monica Capra

[mailto:mcapra@emory.edu]

My areas of interest are Experimental and Behavioral Economics. Put broadly, I use laboratory experiments to study decision making in economic environments. One of my main interests is decision processes. In recent projects, I use fMRI technology to study brain activation in an effort to better understand the process of choice. This area of research is called Neuroeconomics. I am also interested in developing laboratory environments that would be useful for policy. Currently, I am working on the application of laboratory methodologies for the study of entrepreneurship.

I am an affiliated faculty of Emory's new Center for Neuropolicy. I am also affiliated with the Latin American and Caribbean Studies Program (LACS), the Institute for Human Rights (IHR) at Emory, and the EXCEN lab at Georgia State University.

>> Additional Profile

Erica Duncan

The acoustic startle response (ASR) is a reflex seen across mammalian species in response to a sudden acoustic stimulus. Because the neuroanatomy and neuropharmacology of this reflex are well known and because there are ASR abnormalities in several psychiatric disorders, it is an excellent translational paradigm for investigating the pathophysiology of brain disorders. Clinical neuroscience research in our lab is using the ASR and its modulations as a probe of brain circuit function in subjects with schizophrenia, cocaine dependence, and posttraumatic stress disorder. We are also extending these studies into the areas of genetics and epigenetics. An additional area of our research involves the VISN7 Corporate Database as a repository of clinical data from our VA patients. We are using this resource in order to conduct retrospective studies of outcomes and metabolic changes in patients treated with antipsychotic medications.

John Dunne

He was educated at Amherst College and Harvard University, where he received his Ph.D. from the Committee on the Study of Religion. Before joining the Emory community, he served on the faculty of the University of Wisconsin-Madison, and he previously conducted research at the University of Lausanne, Switzerland and Central Institute of Higher Tibetan Studies (India). His work focuses on Buddhist philosophy and contemplative practice, and he is a co-director of Emory's Collaborative for Contemplative Studies as well as the Encyclopedia of Contemplative Practices. His current research focuses especially on the concept of "mindfulness" in both theoretical and practical contexts.

David Harrison

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The research in our lab lies in the development of biomedical imaging techniques, particularly those based on magnetic resonance imaging (MRI), and their application to the understanding of anatomy, function and physiology of brain in its normal state and diseased state. Specifically, we are focusing on functional MRI and diffusion tensor imaging and interested in furthering and using these techniques for understanding how brain works at a system level. Current projects include improvement of image acquisition and processing methods, investigation of underlying biophysics and physiology of imaging measurements, and elucidation of neurobiological underpinning of neuropsychiatric and neurodegenerative disorders.
>> Additional Profile

Xiaoping Hu

[xhu@bme.emory.edu]

The research in our lab lies in the development of biomedical imaging techniques, particularly those based on magnetic resonance imaging (MRI), and their application to the understanding of anatomy, function and physiology of brain in its normal state and diseased state. Specifically, we are focusing on functional MRI and diffusion tensor imaging and interested in furthering and using these techniques for understanding how brain works at a system level. Current projects include improvement of image acquisition and processing methods, investigation of underlying biophysics and physiology of imaging measurements, and elucidation of neurobiological underpinning of neuropsychiatric and neurodegenerative disorders.
>> Lab Website

Helen S. Mayberg

[hmayber@emory.edu]

My research group utilizes multimodal neuroimaging approaches (PET blood flow, glucose metabolism; fMRI/DTI resting state, task-based studies) to define and characterize neural circuits mediating both clinical symptoms and illness recovery in patients with major depression. We have systematically examined depression pathophysiology in both psychiatric and neurological patients, as well as mechanisms mediating antidepressant response to various modes of treatments (medications, psychotherapy, somatic). Current projects emphasize development of novel imaging biomarkers predictive of treatment response and optimal treatment selection for individual depressed patients at all stages of illness. Our long-term interest in neural network models of mood regulation in health and disease was the basis for a new intervention for treatment resistant patients using deep brain stimulation, a continued focus on ongoing research and a foundation for reverse translational studies in animal models. Active collaborators include psychiatrists, neurologists, neurosurgeons, psychologists, and cognitive neuroscientists as well as neuroanatomists, neurophysiologists, biomedical engineers and biostatisticians. Our ongoing studies are multidisciplinary and members of the lab and our collaborators reflect my research and clinical philosophy that broad-based, translational science is and will be essential to understanding, preventing and curing depression and other neuropsychiatric disorders.

Steve M. Potter

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New Neuroscience Technologies for Studying Learning in Vitro. We are merging software, hardware, and wetware in a new paradigm for neurobiology research, "Embodied Cultured Networks." It brings together top-down (cognitive, behavioral, ethological) and bottom-up cellular, molecular) approaches to studying the brain. We are applying Multi-electrode array culture dishes, 2-photon time-lapse microscopy, and High-speed imaging of neural activity to study cultured networks of hundreds or thousands of mammalian neurons. We are especially interested distributed activity patterns and information processing in these cultured networks. We give them a body, either simulated or robotic, and an environment in which to behave. We developed a real-time feedback system for 2-way communication between a computer and a cultured neural network. In collaboration with Dr. Robert Gross in Neurosurgery, we are using our closed-loop stimulation and recording technology to develop methods for treating epilepsy with electrical stimulation.

Information for potential students: Click here

>> Lab Website

Charles Raison

Dr. Raison's research program is guided by an interest in potential evolutionary explanations for the form taken by mood disorder symptoms, especially those related to dysregulation of the body's stress response and immune systems. Specifically, he is interested in ways in which activation of the body's inflammatory response system may contribute to the pathophysiology of depression as a result of previous benefits in terms of survival from infection. He is also interested in ways in which positive psychosocial connectivity may decrease inflammatory responses to stress and decrease the risk of depression in the context of medical illness. To address these issues, Dr. Raison serves as co-principle investigator with Dr. Andrew Miller on a large study that seeks to understand how chronic activation of the immune system leads to depression and fatigue. Patients who receive the cytokine interferon-alpha are being examined before and after treatment to explore how cytokine treatment changes functioning in endocrine and central nervous system pathways, as well as whether baseline physiological responses to psychological stress predict who becomes depressed in the context of immune activation. To examine ways in which improved psychosocial connectivity may protect against stress related inflammatory activation, Dr. Raison is collaborating with Geshe Lobsang Tenzin from the Loseling Institute to explore whether training in compassion meditation will reduce depressive symptoms and inflammatory reactivity to stress in Emory college students.

Kerry J. Ressler

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The goal of my laboratory is to create a program which utilizes the enormous power of molecular biology to approach difficult and important questions in systems neuroscience. I use genes known to be involved in synaptic plasticity to examine plasticity in the amygdala and regions which connect with it during the consolidation phase of fear memory formation. I am also initiating a program to create transgenic animal models for visualizing the amygdala neurons, some of its sensory inputs and the neuromodulatory projections which together mediate some of the important behavioral responses of fear and stress. These models will create novel and powerful tools to begin to address systems level neuroscience questions at genetic, molecular and cellular levels in combination with electrophysiological and neuroimaging approaches to neural circuitry.

Mar M. Sanchez

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My lab studies neurobiological systems that control stress physiology and emotion regulation in nonhuman primates. I am particularly interested on the developmental effects of early adverse experiences on stress neuroendocrine systems, emotion regulation and related neurobiological substrates of primates. The long-term research goals are (1) to identify the neural substrates affected and the time course of events, as well as the genetic factors that increase vulnerability to those experiences and (2) to understand the molecular and cellular mechanisms by which early adversity increases vulnerability to psychopathology and pathophysiology.

Peter A. Wenner

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The development of neural circuits requires a progressive series of synaptic decisions that determine whether the network behaves appropriately, or alternatively leads to developmental disorders (autism and childhood epilepsy/seizure). We study a recently identified form of synaptic plasticity that homeostatically regulates the levels of network activity, and provides a guiding principle for the normal maturation of synaptic connections in these nascent circuits. We examine the underlying mechanisms of this plasticity using electrophysiological, molecular, optical, and immunocytochemical techniques.

>> Lab Website

Mark E. Wilson

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Our lab uses both rodent and monkey models to understand how social variables affect a number of neuroendocrine systems and, thus, the regulation of behavior. Our studies in nonhuman primates are directed at understanding the neuroendocrine and metabolic mechanisms that produce stress-induced infertility. Using the ethnologically valid stressor of social subordination characteristic of macaque societies, we studying how corticotropin releasing hormone (CRH) disrupts reproduction and whether this is meditated by specific metabolic signals. This model allows allows us to study how social stressors change diet preference and food consumption as a means to understand the adverse consequences of stress induced obesity. Parallel studies in rodents are using a viral vector that over expresses CRH in selected brain regions to determine the pathways by which this neuropeptide disrupts reproduction and steroid-induced socio-sexual behavior.