

Behavioral Neuroscience Minor: Concept Paper

A Proposal for a Minor in Behavioral Neuroscience

I. Behavioral Neuroscience Minor Overview

A. Definitions:

Neuroscience is the empirical study of brain anatomy and physiology, as well as the relationship between the brain and overt behavior, cognitive processes, and emotional experiences, among others. Understanding the complex processes of the brain requires integration between fields including, but not limited to, psychology, biology, physics, philosophy, computer science, and mathematics. Neuroscientific findings impact practices in criminal justice, social work, psychology, health and medicine, education, gerontology, and other applied fields.

Behavioral neuroscience is a subdiscipline within the general field of neuroscience and is directed toward understanding the neural components (systems and cellular) that support human behavior, both normal and abnormal. Neuroscience generally focuses on the study of the nervous system, whereas behavioral neuroscience is concerned with how neural components result in behavior (e.g., cognitive, emotional, etc.).

B. Rationale and Goals:

A behavioral neuroscience minor provides an opportunity for the in-depth exploration of the field of behavioral neuroscience to better prepare students for future study and careers in natural and social science. Although advanced knowledge of the structure and function of the brain would augment the coursework in many majors (e.g., speech pathology and audiology, nursing, criminal justice, and biology), it is not always possible to offer sufficient coursework within any one of these majors to provide the level of training that a minor in behavioral neuroscience could provide. This minor would enable students with similar interests from various disciplines within the college to collaborate on projects, broaden their perspectives, and increase their knowledge in this growing field.

The goal is to establish a minor that enables students to complete a portion of their liberal arts requirements in a coherent, connected manner that encompasses basic- to senior-level behavioral neuroscience concepts. Further, the applications of the information gained are extraordinarily diverse, as noted above, opening doors to careers that students would have otherwise not known about nor have been qualified to pursue. The behavioral neuroscience minor will contribute a biological and scientific perspective to many disciplines we already offer.

II. Needs Assessment

A. National Trends:

Advances in cellular, structural, and functional neuroscience have enhanced our understanding of the neural underpinnings of many developmental and behavioral changes that occur throughout the lifespan (e.g., social development, learning differences, aging, and mood disorders; see Gazzaniga, Ivry, & Mangun, 2008, for a review). Our expanding knowledge of brain structure and function has allowed behavioral and pharmacological interventions, among others, to become more targeted and comprehensive, considering both environmental and organic contributions. The increased understanding of the neural components associated with developmental (autism, dyslexia), movement (Parkinson's disease and apraxia), cognitive (neglect, aphasia), and clinical (schizophrenia, mood disorders) processing

differences, has enhanced the quality and effectiveness of treatments in these areas (e.g., Baron-Cohen & Belmonte, 2005; Blair et al., 1999; Hagoort, 2005; Hillis, 2006; Rodrigues-Oroz et al., 2005). Further, training in neuroscience principles and techniques will continue to foster improved interventions and a more holistic look at factors influencing cognitive, social, and emotion functioning (Society for Neuroscience, 2003).

In recognition of the need to increase the extent of neuroscience education in a more diverse group of students, The National Institutes of Health (NIH) in conjunction with the Society for Neuroscience (SfN), has launched an education initiative with the primary objective of increasing student access to neuroscience topics in secondary and post-secondary education forums (Cameron & McNerney, 2006). Further, given the technical nature of the discipline, NIH and SfN have placed heightened importance on finding ways for scientists to communicate this valuable information to disciplines in which it can have a direct impact on outcomes (e.g., education, clinical, medical; National Research Council, 2000).

In response to this initiative, the focus on and resources for undergraduate neuroscience education have increased exponentially in recent years. Journals and faculty-resource sites have been established to support education in this area (e.g., The Journal of Undergraduate Neuroscience Education (JUNE); Faculty for Undergraduate Neuroscience (FUN)). Interdisciplinary neuroscience minors, as well as minors with research or clinical emphases, have become an addition to the curriculum at many colleges and universities (e.g., Chase, Stewart, & Barney, 2006; Wiertelak & Ramirez 2008). As neuroscience research and practices continue to expand in their influence in social and applied settings, the value of neuroscience education for students in a variety of disciplines will increase.

B. Student Interest:

Informal discussions and preliminary surveying of Stockton students have revealed considerable appeal and value of additional course opportunities in behavioral neuroscience. In the spring semester, 2009, 223 students from a variety of majors were surveyed regarding their general interest in a behavioral neuroscience minor and their specific interests in courses that could be included as part of the minor's curriculum. The sample was comprised of students of the following class statuses: 18.8% freshmen, 13.5% sophomores, 31.4% juniors, 33.6% seniors, and 2.7% other. Of these students, 52.9% were transfer students. Those surveyed reported the following distribution of majors: 13% biology, 18.8% psychology, 17.5% education, 20.6% speech pathology and audiology, 12.1% criminal justice, 4.5% business, and 13.5% other.

Overall, 29.6% of those surveyed reported that were likely to complete the minor if it was offered at Stockton. Another 35.0 % indicated that they were unsure if they would complete the minor and would need more information regarding the minor to make that decision. Interest in the behavioral neuroscience minor varied by major. A complete breakdown of interest by major is provided in Figure 1.

In addition to the general appeal of the minor, students were surveyed regarding their interests in particular courses that could be offered as part of the minor. Column 1 of Figure 2 reflects students' interest in specific courses separately for students who self-reported as likely to complete the minor (i.e., 29.6% of those surveyed). Column 2 of Figure 2 contains the course interests for all students surveyed, regardless of whether they were likely to complete the minor or not.

C. Target Groups:

Prior discussions with students and faculty (and recent student and faculty surveying) have identified majors with direct benefits and likely outcomes for students completing the minor:

Majors with direct benefits from this coursework include but are not limited to:

- a. Psychology.
- b. Criminal Justice.
- c. Speech Pathology and Audiology.
- d. Nursing.
- e. Biology (general).
- f. Biology (pre-professional).
- g. Special Education.
- h. Social Work.

Completing a minor in behavioral neuroscience should increase success in applying to graduate programs in:

- i. Medicine and related professional programs.
- j. Neuroscience programs (clinical, behavioral, cognitive, and cellular).
- k. Biology.
- l. Clinical Neuropsychology.
- m. Forensic Psychology.
- n. Criminal Justice.
- o. Law.
- p. Physical Therapy.
- q. Occupational Therapy.
- r. Substance Abuse.

Specialized training in the brain would be an asset for students entering into or completing professional programs in which an advanced understanding of the brain's structure and function would aid students in applying interventions aimed at rehabilitation:

- s. Speech Pathology and Audiology.
- t. Physical Therapy.
- u. Occupational Therapy.
- v. Nursing.
- w. Substance Abuse/Addictions.
- x. Art Therapy.
- y. Education/Special education.
- z. Social Work.

III. Curriculum

A. Goals/Outcomes:

Students will be required to complete 24 credit hours, divided into three levels of study. This flexibility reflects the dynamic nature of the behavioral neuroscience field. Central to the minor are basic principles and advanced topics. These courses are intended to provide students with a foundation in cellular and systems components of the brain. Introductory courses in related fields (i.e., biology and psychology; see *Foundations*) are required to enhance students' understanding of behavioral neuroscience concepts. We note that courses in basic principles and advanced topics build on each other, limiting the number of pre-

requisites students would be required to complete that would not be part of the minor – this should make the minor appealing and realistic for majors throughout the college.

The advanced topics requirement is intended to foster additional student-faculty research in this area and to give students an opportunity to apply the basic principles noted above through the analysis of existing research in behavioral neuroscience and the participation in research in this exciting area. Research opportunities in behavioral neuroscience could allow students and faculty throughout the college to collaborate on projects – collaborations that would not have otherwise occurred.

Electives in behavioral neuroscience allow students to make the minor specific to their goals and interests. Students can merge knowledge accumulated in their disciplines with knowledge from completed behavioral neuroscience courses. The electives category will offer faculty throughout the college an opportunity to offer courses of interest that are special topics in, or related to, behavioral neuroscience.

The three levels of the minor are defined by learning objectives or goals, and are presented generally below. This list includes courses that appear applicable based on their catalog descriptions, and interests expressed by members of the faculty. This preliminary list is by no means exhaustive and will be expanded to include other courses as they become available. As new paradigms and applications emerge, or as individual faculty members show interest, new courses can be added seamlessly to the curriculum. To demonstrate the existing feasibility of the minor, the tentative curriculum includes only courses currently offered as part of the coursework at Stockton.

B. Associated Faculty:

Mark Berg, PSYC
Vincent Cicirello, CSIS
Josh Duntley, CRIM
Jessica Fleck, PSYC
Amy Hadley, SPAD
Tim Haresign, BIOL
Carra Hood, GENS
Ron Hutchison, BIOL
Rodger Jackson, PHIL
Kathleen Klein, MSOT
Elizabeth Shobe, PSYC
Julia Sluzenski, PSYC
Marcello Spinella, PSYC
John White, CRIM

The above-listed faculty are making scholarly and/or applied contributions to the field of behavioral neuroscience (see Appendix), and are currently teaching courses on the topic and/or developing new courses in this area. This group of faculty members makes up a diverse, interdisciplinary body that is capable of providing research and educational experiences in the field of behavioral neuroscience for our students, while at the same time communicate the breadth of the neuroscience field (from systems neuroscience to cellular neuroscience). The existing coursework offered by this group is sufficient to launch the behavioral neuroscience minor without additional funds.

C. Courses:

Behavioral Neuroscience Minor (24 credits)

Foundations (These courses are prerequisites to those in Basic Principles but are not included in the minor's credit total):

Foundations courses provide students with exposure to introductory courses in disciplines that will enhance their behavioral neuroscience experiences.

Courses:

- BIOL 1200/1205: Cells and Molecules; Cells and Molecules Lab
Staff; offered every spring and fall
 - PSYC 1100/1105: Introductory Psychology
Staff; offered every spring and fall
-

Basic Principles (8 credits required; note prerequisites):

Basic principles provide all students in the minor with uniform training in introductory behavioral neuroscience principles. This training covers systems and cellular components.

Courses:

- Systems Core:
PSYC 3331: Physiological Psychology; Prerequisite: PSYC 1100
Spinella (PSYC); offered every spring and fall
OR
GSS 3114: The Dynamic Brain
Fleck (PSYC); offered every fall
- Cellular Core:
PSYC 3300: Neurons and Networks; Prerequisite: PSYC 1100
Shobe (PSYC); offered every spring
OR
BIOL 3360: Neurobiology; Prerequisite BIOL 2110; 2115 (Genetics)
Haresign (BIOL); offered every other spring

Advanced Topics (8 credits required; note prerequisites):

Courses in Advanced Topics will allow students to apply/extend the coursework completed in Basic Principles through the study of research in behavioral neuroscience. These experiences may come in the form of seminars that focus on the critical analysis and discussion of primary research in a behavioral neuroscience subfield or through training in behavioral neuroscience research methods.

Courses (choose two):

- CRIM 36??: The Criminal Brain; Prerequisite: CRIM 1100
White (CRIM); offered annually
- PSYC 3641: Cognitive Neuroscience; Prerequisites: PSYC 3331 or PSYC 2215
Fleck (PSYC); offered every spring
- PSYC 3636: Human Memory; Prerequisite: PSYC 1100 or GERO 1100
Sluzenski (PSYC); offered every fall
- PSYC 3708: Research on Creativity (neuroscience emphasis); Prerequisite: PSYC 3242 (Experimental Psychology); POI
Fleck (PSYC); offered every fall

PSYC 37???: Research Tutorial in Psychology (neuroscience emphasis)
Staff; varies annually

PSYC 4800: Research in Cognitive Neuroscience/Neuropsychology; POI
Staff; offered as needed

PSYC 4820: Project for Distinction (neuroscience/neuropsychology emphasis required);
POI
Staff; offered as needed

CSIS 2800/3800/4800: CSIS Special Project (neuroscience emphasis -- machine learning,
computational intelligence, etc); POI
Cicirello (CSIS); offered as needed

** Other research practica, tutorials, or independent studies with a behavioral neuroscience emphasis in any program can be taken for credit in this section with approval from the minor coordinator.

Electives (8 credits required):

Electives reflect the diversity of the behavioral neuroscience field and allow students to pursue courses that supplement coursework in their major program of study or to tailor the minor to meet their own goals/interests.

Courses (choose two):

PSYC 2215: Cognitive Psychology; Prerequisite: PSYC 1100
Staff; offered every spring and fall

PSYC 3332: Perception; Prerequisite: PSYC 1100
Berg (PSYC); offered every spring and fall

PSYC 3900: Field Placement in Psychology or related field (neuroscience emphasis required); POI
Staff; offered every spring and fall

CSIS 4510: Topics in Computer Science (neuroscience emphasis -- machine learning, computational intelligence, etc)
Cicirello; offered as needed

CSIS 4463: Artificial Intelligence; Prerequisites: CSIS 2101 and 2102
Cicirello (CSIS); offered every fall

PHYS 3030/BIOL 3030: Biomedical Physics; Prerequisite: MATH 1100 (Precalculus)
Liu (PHYS); offered every other year

BIOL 3110: Animal Behavior; Prerequisite: BIOL 2110 (Genetics)
Haresign (BIOL); offered every other spring

GNM 2209: Intelligent Machines/Human Beings
Liu (PHYS); offered annually

GNM 2216: Medical Technology
Liu (PHYS); offered annually

GNM 2248: Artificial Intelligence in Society
Cicirello (CSIS); offered every fall

GNM 3105: Psychopharmacology
Welliver (NURS); offered every spring and fall

GNM 3386: Medical Narrative
Hood (GENS); offered every spring

GSS 2351: Herbal Psychopharmacology
Spinella (PSYC); offered every fall

GIS 3633: States of Consciousness
Lyke (PSYC); offered annually

GIS 4614: Human Behavioral Genetics
Sedia (BIOL); offered every fall

** Additional courses in Advanced Topics can be applied to the electives category.

IV. Possible Concerns and Solutions

- **There is a heavy concentration of PSYC courses, so why is this not a minor in PSYC?**

Because the field of behavioral neuroscience is inherently interdisciplinary, the minor should conceptually be represented as such. If we were to house this minor in PSYC, then the appearance will be that behavioral neuroscience is a subfield of psychology. While it is true that some psychologists specialize in behavioral neuroscience, so do some biologists, chemists, zoologists, computer scientists, criminologists, social workers, nurses, physical/occupational therapists, philosophers, and physicians. As such, it is more accurate to think about behavioral neuroscience as a major field, where applications in different realms (most heavily in psychology or biology) are subfields. Further, neuroscience training within any subfield is necessarily cross-disciplinary, and a portion of the coursework that requires an understanding of cells and systems is standard information that is taught independently of particular subfields. It is the application of this information that creates each sub field. To reflect the interdisciplinary nature of Behavioral Neuroscience, electives in the minor draw from general studies, PSYC, BIOL, PHYS, and CSIS.

- **If this is an interdisciplinary area, why are there so many PSYC courses?**

We simply do not currently have faculty members in each subfield of behavioral neuroscience that can offer a course, and we probably never will. In addition, faculty outside of PSYC with interest and capability to teach courses for the minor do so as their contribution to General Studies because most of them are members of programs that do not offer relevant neuroscience courses as part of the program curriculum. Should those programs offer more neuroscience relevant courses? Of course. We hope that establishing the minor will encourage the adoption of neuroscience courses in additional programs throughout the college.

PSYC, on the other hand, offers several behavioral-neuroscience-related courses because we have several faculty members with expertise in the area. Because psychology is predominately the study of human and

animal behavior, neurological explanations for behavior are of great interest to psychologists. As such, behavioral neuroscience has become entrenched in psychological science (experimental and clinical divisions), and so it is commonly a significant portion of training in psychological specialties. These specialties include cognition, perception, physiology, social cognition, psychological testing, and learning. The PSYC curriculum represents each of these specializations, and the minor has capitalized on their availability.

- **Since most of the courses are already in existence, will the demand for seats in those classes increase beyond what can be reasonably expected?**

Students enrolled in the minor may place additional demands for seats on the already over-burdened courses of BIOL 1200/1205 (Cells and Molecules), PSYC 1100 (Introduction to Psychology), and other PSYC courses. It is not expected that implementation of this minor will dramatically increase these demands. Instead, it is predicted that individuals who are interested in the behavioral neuroscience minor have already taken or plan to take basic NAMS and PSYC courses. Data collected in the spring, 2009, semester revealed that over 50% of students who would be interested in completing the minor had already completed BIOL 1200/1205. This does not take into account additional students who had planned to complete the course in the future. There is the possibility of an additional, unaccounted for few. One possible solution is that NAMS and SOBL jointly hire additional staff to teach BIOL 1200/1205 for non-NAMS majors. This will ease the burden on NAMS faculty, but will not ease the burden on laboratory space/equipment.

- **Advanced Topics courses are PSYC and CRIM 3600 and 3700 level courses. How can non-PSYC or non-CRIM majors meet the prerequisites?**

Pre-requisites for senior seminars and research tutorials in PSYC are always PSYC 1100 (already required for the minor), and sometimes PSYC 2241 (Statistical Methods) and PSYC 3242 (Experimental Psychology). Additional pre-requisites in place for Seminar in Cognitive Neuroscience include PSYC 3331 (Physiological Psychology) or PSYC2215 (Cognitive Psychology), both of which satisfy the 8 credit electives requirement. We agree that the Behavioral Neuroscience minor is challenging, and we expect that most of the students completing the major will be science-minded. It is expected that many students electing to complete the minor will already be PSYC, CRIM, or BIOL majors because these fields draw heavily on behavioral neuroscience findings. As such, certainly PSYC and CRIM majors will have already had the pre-requisites. Those NAMS students that are interested in human behavior are also already expected to have had the pre-requisites or have completed equivalent courses and could be added to these courses with POI.

For non-SOBL and non-NAMS majors, this minor offers students who have a keen interest in science, but prefer to major in the arts and humanities or business or professional studies, an opportunity to satisfy their science curiosity in an organized, goal-oriented manner. This minor also provides non-SOBL and non-NAMS students with alternate (perhaps, opposite) perspectives, a record of diverse training, and flexibility in post-baccalaureate career paths. Any additional courses that students need to take to satisfy pre-requisites can be counted as cognates or at-some-distance courses.

Moreover, it is possible to satisfy the Advanced Topics requirements through other research practica or independent studies (e.g., Philosophy of Mind). These may appeal most to those who, due to time or credit restraints, cannot take any additional courses to satisfy the pre-requisites for most of the advanced topics courses. Independent studies that satisfy the Advanced Topics requirements can be supervised by any faculty associated with the minor, and have the added advantage of being tailored to application in the student's specific field of interest.

- **Is there enough science to call this neuroscience?**

A major in neuroscience should include heavy concentrations in life science courses, but we are proposing a minor, not a major. Further, based on collected data, those students who would be most interested in the minor are already in a NAMS major, in a major that requires a significant amount of NAMS courses (pre PT/OT), or are in a major that can benefit from additional life sciences courses (e.g., Psychology, Criminal Justice, SPAD). Further, the psychology courses are based heavily (if not completely) on rigorous scientific methods and results. However, to assuage those with reservations about labeling this as a neuroscience minor when housed in SOBL, we have re-titled the minor to Behavioral Neuroscience. Clearly, an emphasis on behavior makes the minor aptly suited to its SOBL housing.

- **Do we have enough faculty to sustain a minor in neuroscience?**

Yes. The courses harnessed into the minor are already in existence. Most of them are offered by tenured professors.

- **Given the research requirement, will this overwhelm the Internal Review Board?**

It is possible that there will be an influx of proposals for research using human subjects by students enrolled in advanced topics courses. However, because these courses are already in existence, the influx should not be more than is typically expected. This could increase if the courses are offered more frequently than they are currently. If this happens, then professors could limit the number of research proposals going forward to the IRB by encouraging group projects among students or student-faculty collaborations.

V. Housing and Timeline

Because the goal to make the minor equally accessible to students throughout the college, we propose that the most logical place to house the minor is in the School of Social and Behavioral Sciences. Jessica Fleck (PSYC) has been chosen by the Behavioral Neuroscience Minor Committee to serve as the minor coordinator.

We hope to launch the minor in the fall of 2010. We see this timeline as feasible for a number of reasons. First, with the exception of two new courses, Neurons and Networks and the Criminal Brain, all courses listed in the minor's curriculum are already part of the regular course offerings at Stockton. Second, this minor will not require hiring new faculty and, therefore, is ready to be launched at any time. Finally, the structure of the minor has the inherent potential to add valuable courses to the curriculum in the future (in major disciplines and general studies), and could enhance students' exposure to a comprehensive liberal-arts education by exposing students to courses that they would not previously have considered.

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Figure 1

Minor Interest by Major (Percentages)

Major	Interested	Unsure	Not Interested
Biology – General	40.0	40.0	20.0
Biology – Medical	100.0	0.0	0.0
Biology – Marine	0.0	42.9	57.1
Pre PT/OT	66.7	33.3	0.0
Psychology	35.7	35.7	28.6
Education	23.1	33.3	43.6
SPAD	32.6	39.1	28.3
Criminal Justice	33.3	25.9	40.7
Business	0.0	20.0	80.0
Other	13.3	46.7	40.0
Overall	29.6	35.0	35.4

Figure 2

Course Interest (Percentages)

Course	Students	
	Interested in Minor	Overall
Brain Structure and Function	54.5	37.7
Neural Components of Social Interaction/Emotion	71.2	61.4
Philosophy of Mind	47.0	40.4
Psychopharmacology	45.5	27.8
The Criminal Brain	68.2	71.3
Neuroscience Techniques (EEG, fMRI)	34.8	21.1
Neuroscience of Clinical Disorders	65.2	57.4
Neural Components of Memory and Thought	69.7	63.7
Cellular Neuroscience	21.2	8.1
The Developing Brain	68.2	46.2
Neural Components of Speech and Language	53.0	46.6
Neuropsychological Assessments	43.9	21.1
The Aging Brain	48.5	39.5

Appendix

Selected Faculty Activity

Mark Berg (Psychology)

Professional Talks/Presentations:

Berg, M. E., & Grace, R. C. (2007, May). Visual Categorization in Pigeons: Comparing Rule-Based, Information Integration, and Associative Models. International Paper Session, invited presentation # 206 at the annual meeting of the Association for Behavior Analysis. San Diego, California.

Articles:

Grace, R. C., Berg, M. E., Kyonka, Elizabeth G. E. (2006). Choice and timing in concurrent chains: Effects of initial-link duration. *Behavioral Processes*, 71(2-3), 188-200.

Berg, M. E., Grace, R. C. (Under Review, 2009). Categorization of multidimensional stimuli. *Journal of the Experimental Analysis of Behavior*.

Vincent Cicirello (Computer Science and Information Systems)

Publications:

Machine Learning:

Cicirello VA. and Smith SF. (2005). The max k-armed bandit: A new model of exploration applied to search heuristic selection. In Veloso MM and Kambhampati S (Eds.), *The Proceedings of the Twentieth National Conference on Artificial Intelligence*, volume 3, (pp. 1355–1361). Menlo Park: AAAI Press. (Winner of the AAAI '05 Outstanding Paper Award)

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Evolutionary Computation and Swarm Intelligence:

- Cicirello VA. (2006). Non-wrapping order crossover: An order preserving crossover operator that respects absolute position. In Keijzer M, et al (Eds.), *Proceedings of the Genetic and Evolutionary Computation Conference*. (pp. 1125–1131). New York: ACM Press.
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Other Computational Intelligence:

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Multi-Agent Systems:

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Artificial Intelligence Pedagogy:

- Cicirello, V.A. (2009). Collective bin packing: An active learning exercise. *Journal of Computing Sciences in Colleges*. June. 24(6):117–123.
- Cicirello, V.A. (2008). An interdisciplinary course on artificial intelligence designed for a liberal arts curriculum. *Journal of Computing Sciences in Colleges*. January. 23(3):120–127.

Professional Activity and Presentations:

- Cicirello VA. (Research Contract). “Index of Cognitive Activity and Characteristics of the Air Traffic Control Task”. Cooperative Research and Development Agreement (08-CRDA-0252) with the Federal Aviation Administration William J. Hughes Technical Center. Effective dates: January 2009 through January 2011.

Lifetime Member of the Association for the Advancement of Artificial Intelligence (AAAI)
Member of the ACM Special Interest Group on Artificial Intelligence
Member of the IEEE Robotics and Automation Society
Cicirello VA. (Invited Speaker). "Heuristic Problem Solving and Multi-Robot Coordination".
Joint Meeting of the Southern Jersey Professional Societies: American Institute of
Aeronautics and Astronautics (AIAA), Institute of Electrical and Electronics Engineers
(IEEE), and the IEEE Computer Society. April 2007.
Cicirello VA. (Invited Speaker). "Coordinating Multiple Heuristic Problem Solvers". The
William J Hughes FAA Technical Center Speaker Series. May 2006.
Cicirello VA. (Invited Speaker). "Study of Crossover Operators for the GA Permutation
Representation". Drexel University, Autonomous Agents Seminar. December 2005.
Cicirello VA. (Invited Speaker). "The Max K-Armed Bandit: A New Model of Exploration
Applied to Search Heuristic Selection". Drexel University, Computer Science
Department Research Seminar. July 2005.
Cicirello VA. (Invited Speaker). "Boosting Stochastic Problem Solvers Through Online Self-
Analysis of Performance". Sarnoff Corporation. April 2004.
Member of the Program Committee for the IEEE Symposium on Computational Intelligence in
Scheduling (2009, 2007).
Member of the Program Committee for the International Genetic and Evolutionary Computation
Conference (2007, 2006, 2005).
Member of the Program Committee and Chair of the Local Organizing Committee for the IEEE
Second Symposium on Multi-Agent Security and Survivability (2005, 2004).
Member of the Program Committee for the International Joint Conference on Autonomous
Agents and Multi-Agent Systems (2005, 2004)

Joshua Duntley (Criminal Justice)

Publications:

Duntley, J. D., & Buss, D. M. (2008). Evolutionary Psychology is a Meta-Theory for
Psychology. *Psychological Inquiry*, 19, 30-34.
Duntley, J. D., & Shackelford, T. K. (2008). *Evolutionary Forensic Psychology*. New
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Buss, D. M., & Duntley, J. D. The evolution of aggression. (2006). In M. Schaller, J. A.
Simpson, & D. T. Kenrick (Eds.), *Evolution and Social Psychology* (pp. 263-286). New
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Jessica Fleck (Psychology)

Publications:

Fleck, J. I., & Weisberg, R. W. (2004). The use of verbal protocols as data: An analysis of
insight in the Candle Problem. *Memory & Cognition*, 32(6), 990-1006.

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Presentations:

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- Yost, T. A., Hample, G., Bekete, E., & Fleck, J. I. (May, 2007). *Handedness moderates schizotypy-creativity relationship*. Poster session presented at the annual meeting of the Association for Psychological Science, Washington, DC.
- Fleck, J. I., Yost, T. A., & Richiuso, D. (March, 2008). *The role of familial handedness in the schizotypy-creativity relationship*. Poster session presented at the annual meeting of the Eastern Psychological Association, Boston, MA.
- Richiuso, D., Yost, T. A., & Fleck, J. I. (March, 2008). *Schizotypy and hemispheric dominance in strong and weak right-handed individuals*. Poster session presented at the annual meeting of the Eastern Psychological Association, Boston, MA.
- Fleck, J. I., Yost, T. A., & Richiuso, D. (May, 2008). *Resting-state EEG Differences in Positive, Negative, and Disorganized Schizotypal Traits*. Poster session presented at the annual meeting of the Association for Psychological Science, Chicago, IL.

Elizabeth Shobe (Psychology)

Publications:

- Shobe, E., Ross, N., & Fleck, J.I. (2009). The effects of handedness and bilateral eye movements on creativity. *Brain and Cognition*, doi:10.1016/j.bandc.2009.08.017.
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- Ostrofsky, J. & Shobe, E. (2008). Individual differences in cognitive need for closure mediates executive functions of the prefrontal cortex. Presented at the Annual Convention of the Eastern Psychological Association, Boston, MA.
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- Ince [Shobe], E. Shore, W.J., & Christman, S.D. (1998) Contributions of the cerebral hemispheres to partial knowledge of word meanings. Paper presented at the annual conference of the Midwestern Psychological Association. Chicago, Ill.
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Julia Sluzenski (Psychology)

Publications:

- McNamara, T.P., Sluzenski, J., & Rump, B. (2008). Human spatial memory and navigation. In H.L. Roediger, III (Ed.), *Cognitive Psychology of Memory*. Vol. 2 of *Learning and Memory: A Comprehensive Reference* (J. Byrne Editor), Oxford: Elsevier, 157-178.
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Marcello Spinella (Psychology)

Books in Print

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Spinella, M. (2004). *Concise Handbook of Psychoactive Herbs: Medicinal Herbs for Treating Psychological and Neurological Problems*. Binghamton, NY: Haworth Press.

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Luciano, D.J., & Spinella, M. (2005). "Herbal treatment of epilepsy: phytotherapy." in *Complementary And Alternative Therapies For Epilepsy*. edited by Devinsky, O., Schachter, S.C., Pacia, S. New York: Demos Medical Publishing.

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- Spinella, M. (2007). The role of prefrontal systems in sexual behavior. *International Journal of Neuroscience*. 117(3), 369-385.
- Spinella, M. (2007). Normative data and a short form of the Barratt Impulsiveness Scale. *International Journal of Neuroscience*. 117(3), 359-368.
- Spinella, M. Yang, B., & Lester, D. (2007). Prefrontal systems in financial processing. *The Journal of Socio-Economics*. ,36, 480-489
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Lester, D. & Spinella, M. (2007). The Executive Personal Finance Scale: Item analyses. *Psychological Reports, 101*(3), 722.

Book Review

Spinella, M. (2008). Subduing inner demons. 53(38). Review of Grant, J. E. (2008). *Impulse control disorders: A clinician's guide to understanding and treating behavioral addictions*. New York: Norton.

Professional Presentations

Spinella, M. "Drugs of Abuse in Spinal Cord Injury." at The Sixth Annual Spinal Cord Injury Retreat: Enriching Our Lives. Kessler Institute for Rehabilitation. West Orange, NJ. June 1996.

Spinella, M. "The Use of Psychoactive Herbal Medicines in Addiction and Treatment." Center for Personal Recovery (Raritan Bay Medical Center). Edison, NJ. December 1999.

Spinella, M. "Psychoactive Herbal Medicines for the Treatment of Mental Illnesses." Bachrach Institute for Rehabilitation. Pomona, NJ. March 2000.

Spinella, M. "Designer Drugs: Current Knowledge and Trends." Center for Personal Recovery (affiliate of Raritan Bay Medical Center). Edison, NJ. April 2001.

Spinella, M. "The Neuropharmacology of Psychoactive Herbal Medicines." City University of New York Neuropsychology Doctoral Subprogram - Colloquium. December 2001.

Spinella M. "Psychoactive Herbal Medicines and Brain Injury: Potentials and Pitfalls." New Jersey Neuropsychological Society. Edison, NJ May 2002.

Spinella M. "The Use of Psychoactive Herbal Medicines." Atlantic City Free Public Library. Atlantic City, NJ August 2002.

Spinella, M. "Self-Rated Measures of Executive Functions." Kessler Institute for Rehabilitation. West Orange, NJ. May 2006.

Conference Presentations

Spinella M, and Capuano C. (1993). Developmental characterization of the feeding and satiety actions of 5-HT_{1A} and 5-HT_{1B} receptor agonists. *Eastern Psychological Association Proceedings and Abstracts, #93-158*.

Spinella M, and Bodnar RJ. (1993). Potentiation of continuous and intermittent cold-water swim analgesia by nitric oxide synthase inhibition in rats. *Society for Neuroscience - Meeting Abstracts, #736.11*.

Spinella M, Schaffer L, and Bodnar RJ. (1994). NMDA and muscarinic antagonists in the rostroventral medulla inhibit morphine analgesia in the periaqueductal gray in rats. *Society for Neuroscience - Meeting Abstracts, #568.5*.

Hopkins E, Spinella M, Pavlovic ZW, and Bodnar RJ. (1996). Alterations in swim stress-induced analgesia following serotonergic antagonism in the rostroventro medulla. *Society for Neuroscience - Meeting Abstracts. #346.4*.

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Spinella, M., Yang, B., and Lester, D. (2004). Prefrontal system dysfunction and economic behavior and attitudes. Cross Fertilization Between Economics and Psychology. Society

for the Advancement of Behavioral Economics (SABE) / International Association for Research in Economic Psychology (IAREP). Drexel University. Philadelphia, PA. July 15 - July 18.

Martino, S.M, Ferri, C.V. Spinella, M., Pomarico, A. & Pirozzi, J. (August, 2007). Life, Sunsets and My Bed: Gender Differences in Gratitude. Presented at the Annual Meeting of the American Psychological Association.

Spinella, M., Ferri, C. & Martino, S. (2008). Mindfulness and addictive behaviors. Poster presentation at the Annual Conference of the American Psychological Association. Boston, MA.

Clinical Experience

7/91-8/93 Mental Health Associate. **Fair Oaks Hospital**. Summit, NJ. Patient observation and therapeutic contact with inpatient psychiatric, neurological, and substance abuse populations. 450 hours.

9/94-12/94 Externship: **New York University Medical Center/Hospital for Joint Diseases, Comprehensive Epilepsy Center**. New York, NY. Neuropsychological assessment of epilepsy neurosurgical candidates. 240 hours.

2/95-7/95 Externship: **Mount Sinai Medical Center**, Department of Neurology. New York, NY. Neuropsychological assessment of mixed neurological outpatient population. 120 hours.

9/95-12/95 Externship: **JFK Medical Center**, Brain Trauma Unit. Edison, NJ. Neuropsychological assessment of in-patients with stroke, traumatic brain injury. 490 hours.

9/96-8/97 Internship: **Kessler Institute for Rehabilitation**. West Orange, NJ. Full-time, one year pre-doctoral internship in clinical psychology and neuropsychology. Included assessment, monitoring, therapeutic interventions, and discharge recommendations for patients with stroke, orthopedic surgery, dementia, traumatic brain injury, and psychiatric disorders. 2000 hours.

9/97-8/99 Post-doctoral Residency/Fellowship: **Center for Head Injuries and the New Jersey Neuroscience Institute** (JFK Medical Center), Edison, NJ. Neuropsychological assessment and rehabilitation of inpatient and outpatient populations, including traumatic brain injury, stroke, epilepsy, neurodegenerative movement disorders, dementias, and various other neurological and psychiatric disorders. 4000 hours.

Neuroscience and Behavioral Physiology contains translations of papers selected from top Russian journals describing significant results of studies on the nervous system. Priority is given to new experimental findings. Neuroscience and Behavioral Physiology publishes contributions of international importance in the fields of physiology, psychopharmacology, neuroendocrinology and neurochemistry, as well as in the anatomy and pathology of the nervous system. Special attention is given to research relating brain function with behavior. The behavioral neuroscience minor allows all students, including those majoring in biology and psychology, the opportunity to complement their major plans of study with an interdisciplinary minor in behavioral neuroscience. Students are required to take one intermediate course followed by four behavioral neuroscience core courses, two from each of the parent departments of the discipline (i.e., psychology and biology). Intermediate Course. Course List. Credit/GPA Requirement. 20 total semester hours required 2.000 GPA required in the minor. Northeastern University. MyNEU Find Faculty & Staff Find A-Z Emergency Information Search.