



Doctoral Program Brochure

2009-2010

Doctoral Program in Cognitive Psychology at Colorado State University

Cognitive psychology is an active area of study at Colorado State University, as one of five doctoral programs offered by the Department of Psychology. We are committed to maintaining a nationally recognized program in cognitive psychology and to training first-rate researchers and scholars in the science of the human mind. Although the research conducted by cognitive faculty members spans a variety of topics, common interests in human learning and memory form a core focus for the Program. Several faculty members are also interested in cognitive aging.

A relatively small group of students participate in the Program (typically 2-3 students per faculty member) so as to provide highly individualized graduate education, allow close collaboration with faculty, and promote frequent formal and informal interaction with faculty and peers. At the same time, the Program benefits from the facilities and resources of a large and thriving department at a Carnegie Foundation level-one research institute. There are, for example, opportunities for interdisciplinary education in other academic units, including the Department of Computer Science, College of Engineering, and Program in Molecular, Cellular and Integrative Neurosciences.

The Program is administered according to a mentorship model. New students are matched with a specific faculty member according to area of interest and by mutual consent of the student and faculty member. The faculty advisor serves as a mentor to the student, and with the student's advisory committee, guides the student through the Program.



Colorado State University is located in Fort Collins, Colorado, a city with about 120,000 people that is rated as one of the best places to live in the country.

PROGRAM OBJECTIVES

The general goal of the Doctoral Program in Cognitive Psychology is to train students for productive careers as teachers and researchers in academic settings, or as research scientists and/or applied cognitive psychologists in business and industry. This training goal is achieved through coursework, research experience, teaching experience, and scholarly interaction within and outside of the Department.

All students in the Doctoral Program develop sophistication in research methods, experimental design, and statistical analysis by virtue of courses completed during their first year of graduate study. Additional coursework provides a comprehensive foundation in cognitive psychology, and participation in specialty seminars and research provide specialization within cognitive psychology. In addition, our commitment to interdisciplinary study means that all students take two courses in other areas of psychology, with numerous opportunities for additional interdisciplinary coursework within and outside of the Department.

To foster the development of research skills, students are actively involved in research throughout their time in the Program. Students typically begin research under the supervision of their faculty mentor and then become increasingly more independent as they progress through the Program. Students are expected to publish their work in professional journals, and the typical student authors or co-authors several articles by the time they graduate.

To foster the development of teaching skills, all students obtain direct teaching experience through the supervised teaching of two different laboratory courses. One strength of the Program is that there are many additional opportunities to develop teaching skills, if desired. Graduate students may be invited to teach lecture-oriented courses during regular semester sessions or condensed summer sessions. The Department of Psychology also administers a Teaching Fellow Program that involves the supervised instruction of General Psychology. In addition, the School of Education and the Office of Teaching and Learning sponsor lectures, seminars, and workshops on college teaching.

Scholarly communication and presentation skills are developed through participation in our weekly brownbag meeting. Students are also highly encouraged and may be awarded financial support to attend and present their work at local, national, and international conferences.



The “oval” on the Colorado State University campus.

Students applying to the Doctoral Program in Cognitive Psychology should be firmly committed to the completion of the Ph.D. Although a master’s (M.S.) degree is awarded once all M.S. requirements have been met, it is included only as part of the Doctoral Program. The Program is designed to be completed in four to five years of full-time fall and spring semester enrollment. Students admitted with a master’s degree in psychology can expect to take about three years to complete doctoral requirements.

PROGRAM OF STUDY

To attain a firm grounding in experimental methodology, statistical analysis, and cognitive psychology, all students in the Doctoral Program are required to complete a research methods course, a two-semester sequence in statistics, and two foundational (“core”) courses in cognitive psychology. To attain in-depth education and specialization in cognitive psychology and related disciplines, students must also complete at least three specialty seminars in cognitive psychology. Seminars are typically discussion-oriented and cover specific topics of mutual interest to faculty and students or topics of current interest in the field (e.g., *Illusory Memory*, *Implicit Learning*, *Cognition and Instruction*, *Working Memory*, etc.). Students also fulfill a distribution requirement through completion of two core psychology courses from two different areas outside of cognitive psychology. It is expected that most course requirements will be completed during the student’s first three years of graduate study.

The Program is also designed so that students complete and defend a master’s thesis by the end of their second (and no later than their third) year of graduate study. Students who successfully complete the thesis plus at least 32 credits of graduate coursework are granted a Master of Science (M.S.) degree in Psychology. During the third (and no later than the fourth) year of graduate study, students complete a Comprehensive Examination to demonstrate their readiness for continuing with the dissertation. The fourth year of

graduate study (and fifth, if necessary) is primarily devoted to completion of the doctoral dissertation. The dissertation and any remaining Program, Department, and University requirements should be completed within two to three years of completion of the M.S. degree. Upon completion of all requirements, students are granted a Doctor of Philosophy (Ph.D.) degree in Psychology.

Research involvement and the development of research skills are an integral part of doctoral training in cognitive psychology. Students must be actively involved in research each semester that they are in the Program and are expected to present (at a colloquium or professional conference) and/or submit (to a professional journal) research in addition to that conducted as part of their thesis and dissertation. Students typically author or co-author several publications and presentations by the time they graduate. New students usually begin research under the supervision of their advisor and then become more independent as their development progresses. *Independent Study*, *Thesis*, and *Dissertation* courses are the mechanism by which academic credit is given for research.

Students also develop teaching skills and get direct teaching experience by virtue of the Program’s teaching requirement. All students are required to teach one semester of two different laboratory courses from our undergraduate offerings in cognitive psychology, physiological psychology, and sensation and perception. The student is given primary responsibility for the day-to-day teaching of the course, but is supervised and mentored by a faculty member.

To promote the development of communication and presentation skills and to encourage scholarly interaction with faculty and peers, students are expected to participate in our weekly brownbag meeting each semester throughout their graduate training. Credit for this activity is attained through enrollment in a course entitled *Current Issues in Cognitive and Neural Sciences*.

COURSE REQUIREMENTS

All students admitted to the Doctoral Program in Cognitive Psychology are expected to complete the following course requirements:

1. A two-semester sequence in statistics.
2. An advanced research methods course entitled *Research Issues and Models*.
3. Two foundational (“core”) courses selected from *Cognitive Processes*, *Human Learning and Memory*, and *Human Performance*.
4. Two core courses taken from two different areas outside of cognitive psychology (e.g., *Cognitive Neuroscience*, *History & Systems*, *Neuropsychology*, *Sensation & Perception*, *Social Psychology*).

5. A minimum of three specialty seminars in cognitive psychology.
6. A third core course in cognitive psychology (other than the two used to fulfill Requirement #3), a fourth seminar in cognitive psychology, or some other course approved by the Program.
7. Enrollment in *Current Issues in Cognitive and Neural Sciences* each semester to receive credit for participation in our weekly brownbag meeting.

A typical course schedule is shown below. Note that this schedule is for illustrative purposes only. The specific set and sequence of courses may be tailored to a student's interests and goals. For example, the courses used to fulfill Requirements #3 through #6 commonly vary from student to student. Further tailoring is possible based on the student's selection of electives. In addition, although students usually complete the statistics and research methods courses during their first year, the semester and sequence of enrollment in other courses may vary. Finally, students may petition Program faculty for course substitutions or waivers in order to pursue individual training goals.

STUDENT EVALUATION

As specified by the Graduate School, each student in the Program forms a graduate advisory committee that consists of the faculty advisor and two to three other faculty members. Committee members are selected by mutual

consent of the student and faculty member. The advisory committee assists the faculty advisor in guiding the student through the Program and is also responsible for evaluating competency on the master's thesis and dissertation. In addition, Program faculty members meet to discuss the progress of new students at the end of each semester during the first year. After the first year, students are evaluated on a yearly basis. The purpose of these meetings is to provide written, constructive feedback about the student's performance with regard to coursework, teaching, research, and timely progress. A formal evaluation is performed after completion of the master's degree to assure that the student is a suitable candidate for doctoral study.

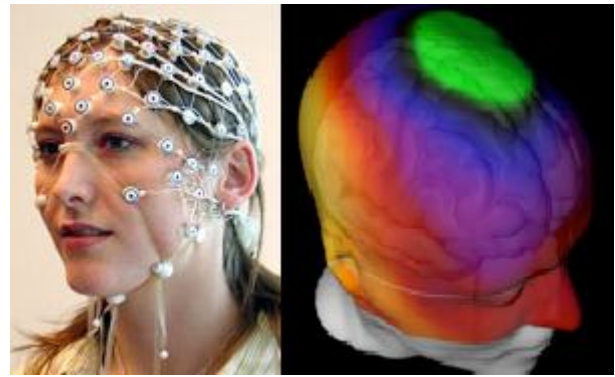
RESEARCH FACILITIES

Each of the faculty members in the Cognitive Psychology Program has their own dedicated research laboratory with modern equipment that is suitable for experimentation in cognitive psychology. Most research facilities have been recently renovated. Individual testing rooms are equipped with computers and other hardware and software for running experiments, with additional computing resources available for experimental design and analysis.

The Program also has access to several shared-use, state-of-the-art laboratory facilities. These laboratories are maintained and upgraded annually using special university funds for enhancing technology and may be used when mentoring undergraduate research assistants and honor's students.

COURSE	CREDITS	COURSE	CREDITS
Fall I		Spring I	
Methods of Research in Psychology I (Statistics)	4	Methods of Research in Psychology II (Statistics)	4
Research Issues and Models	3	Cog. Core (e.g., Human Learning & Memory)	3
Current Issues in Cognitive & Neural Sciences	2	Current Issues in Cognitive & Neural Sciences	2
Electives (optional)		Electives (optional)	
Fall II		Spring II	
Cognitive Core (e.g., Cognitive Processes)	3	Non-Cognitive Core (e.g., History & Systems)	3
Seminar	3	Seminar	3
Current Issues in Cognitive & Neural Sciences	2	Current Issues in Cognitive & Neural Sciences	2
Electives (optional)		Electives (optional)	
Fall III		Spring III	
Non-Cognitive Core (e.g., Neuropsychology)	3	Seminar	3
Seminar	3	Independent Study	6
Current Issues in Cognitive & Neural Sciences	2	Current Issues in Cognitive & Neural Sciences	2
Electives (optional)		Electives (optional)	
Fall IV		Spring IV	
Seminar	3	Seminar	3
Dissertation	6	Dissertation	6
Current Issues in Cognitive & Neural Sciences	2	Current Issues in Cognitive & Neural Sciences	2
Electives (optional)		Electives (optional)	

One of our new shared-use laboratories is equipped with a research-grade driving simulator for research on the perception and cognition of driving. The simulator includes the full front-seat compartment of a Ford automobile, standard controls and functioning instrumentation, tactile and proprioceptive feedback, surround sound, and high-resolution wrap-around graphics. In addition, we recently completed the renovation of our EEG/ERP facility, which supports research on the electrophysiology of perception and cognition. The facility houses two EEG systems with separate subject-running rooms. One system is a state-of-the-art 128-channel Electrical Geodesic system that supports source localization and uses a technology that allows the cap to be applied and tested in just 10-15 minutes. The second system is a 32-channel NeuroScan system for conducting EEG studies using traditional methods. In addition, we have three shared-use labs set up to run multiple participants in computer-based experiments at the same time. Also available is a modern eye-tracking system for research in areas such as attention, psycholinguistics, web design, and computer usability, and a Biopac system for collecting physiological data such as galvanic skin response, ECG, EMG, EOG, etc.



High-density EEG system for research on the electrophysiology of cognition

FACULTY RESEARCH INTERESTS

Dr. Anne Cleary maintains an active research laboratory that investigates the processes involved in recognition memory. One line of research is aimed at identifying what features of an item or situation can produce familiarity-based recognition. A second line of research is aimed at investigating the role of existing knowledge in recognition memory. A third line of research is aimed at linking feelings of familiarity in recognition with such day to day experiences as the tip-of-the-tongue phenomenon, and déjà vu experiences.

Cleary, A. M. & Specker, L. E. (2007). Recognition without face identification. *Memory & Cognition*, 35, 1610-1619.

Cleary, A. M. (2006). Relating familiarity-based recognition and the tip-of-the-tongue phenomenon: Detecting a word's recency in the absence of access to the word. *Memory & Cognition*, 34, 804-816.

Cleary, A. M. (2004). Orthography, phonology, and meaning: Word features that give rise to feelings of familiarity in recognition. *Psychonomic Bulletin & Review*, 11, 446-451.

Dr. Benjamin Clegg maintains an active research laboratory investigating a variety of aspects of human performance. Much of this work has centered on the general topic of skill acquisition. A core component of this research has been studies of implicit learning – that is, knowledge acquired without any direct intention to learn it, and with limited subsequent awareness of the information that has been learned. Think about what you could tell someone about how to ride a bike, or swing a golf club, or the sequence of

activities to perform as you drive your car through a junction. Dr Clegg's research explores the nature of the representation of the unconscious knowledge used to guide performance. The central issues revolve around how you learn things, and what you then know. This work has included the use of a number of basic research paradigms (such as sequence learning in the serial reaction time task, and the Hebb Digits task), as well as more complex real-world tasks.

Clegg, B. A. (2005). Stimulus-specific sequence representation in serial reaction time tasks. *Quarterly Journal of Experimental Psychology*, 58A, 1087-1101.

Clegg, B. A., Wood, J. A., & Bugg, J. M. (2004). Real and imagined movements in older and younger adults. *Journal of Mental Imagery*, 28, 1-16.

Hopp, P. J., Smith, C. A. P., **Clegg, B. A., & Heggstad, E. D. (2005).** Interruption management: The use of attention-directing tactile cues. *Human Factors*, 47, 1-11.

Dr. Edward DeLosh maintains an active research laboratory investigating basic encoding and retrieval processes in human learning and memory. One focus is on how the act of retrieval enhances subsequent memory as observed in phenomena such as the testing and generation effects. This topic is investigated from both a theoretical and applied perspective, with an eye toward educational applications. Other work examines how the distinctive features of items versus the relationship between items influence memory, as observed in phenomenon such as the word frequency effect. Still other work considers the role of memory for individual instances versus abstraction in conceptual behavior such as prediction, interpolation, and extrapolation. Although much of Dr. DeLosh's work is conducted with young adults, these and related topics in are also considered as they apply to healthy aging.

Bugg, J. M., **DeLosh, E. L., & Clegg, B. A. (2006).** Physical activity moderates time-of-day differences in older adults' working memory performance. *Experimental Aging Research*, 32, 431-436.

Core Faculty in the Cognitive Psychology Program

Anne M. Cleary, Assistant Professor
Ph.D., Case Western Reserve University, 2001
Specialization: Human recognition memory, metamemory, familiarity-based recognition, tip-of-the-tongue experiences.
Web: <http://lamar.colostate.edu/~acleary/AnneCleary.htm>
E-mail: Anne.Cleary@colostate.edu

Benjamin A. Clegg, Associate Professor, Coordinator
Ph.D., University of Oregon, 1998
Specialization: Implicit learning, skill acquisition, applied cognitive psychology.
Web: <http://lamar.colostate.edu/~bclegg/>
E-mail: Benjamin.Clegg@colostate.edu

Edward L. DeLosh, Associate Professor
Ph.D.: Purdue University, 1996
Specialization: Human learning and memory, cognitive aging, concept learning.
Web: <http://lamar.colostate.edu/~delosh/>
E-mail: Ed.DeLosh@colostate.edu

David P. McCabe, Assistant Professor
Ph.D.: Georgia Institute of Technology, 2003
Specialization: Human memory, working memory capacity, cognitive aging, metamemory.
Web: <http://lamar.colostate.edu/~dmccabe/dmccabe.htm>
E-mail: David.McCabe@colostate.edu

Matthew G. Rhodes, Assistant Professor
Ph.D.: Florida State University, 2004
Specialization: Human memory, memory and aging, metacognition.
Web: <http://lamar.colostate.edu/~mrhodes/>
E-mail: Matthew.Rhodes@colostate.edu

Carol A. Seger, Associate Professor
Ph.D.: University of California, Los Angeles, 1994
Specialization: Human learning and memory, visual cognition, cognitive neuroscience.
E-mail: Carol.Seger@colostate.edu

Carpenter, S. K., & **DeLosh, E. L.** (2006). Impoverished cue support enhances subsequent retention: Support for the elaborative retrieval explanation of the testing effect. *Memory & Cognition*, 34, 268-276.

Merritt, P., **DeLosh, E. L.**, & McDaniel, M. A. (2006). Effects of word frequency on individual-item and serial-order retention: Tests of the order-encoding view. *Memory & Cognition*, 34, 1615-1627.

Dr. David P. McCabe maintains an active research laboratory investigating human memory. Questions addressed in the lab include: Is working memory capacity, i.e., the ability to concurrently maintain and manipulate information, related to episodic memory? Can people accurately report when they are experiencing conscious recollection? Are people accurate in their assessments of how much they can remember over the short term? Experimental and individual differences methodologies are used to study episodic memory, working memory capacity, and metamemory. Much of this research focuses on adult age differences in memory performance.

McCabe, D. P. (2008). The role of covert retrieval in working memory span tasks: Evidence from delayed recall tests. *Journal of Memory and Language*, 58, 480-494.

McCabe, D. P., & Geraci, L. (2009). The role of extralist associations in false remembering: A source misattribution account. *Memory & Cognition*, 37, 130-142.

McCabe, D. P., Roediger, H. L., McDaniel, M. A., Balota, D. A., & Hambrick, D. Z. (in press). The relationship between working memory capacity and executive functioning: Evidence for an executive attention construct. *Neuropsychology*.

Dr. Matthew G. Rhodes maintains an active research laboratory in human memory. One line of work examines how subjective experience is related to memory performance, particularly for tasks such as predicting future memory performance. Other work examines subjective experience and its relation to memory accuracy, including how it pertains to aging populations. Dr. Rhodes also maintains lines of work examining memory for faces, predictors of individual differences in memory accuracy, and recognition memory processes.

Rhodes, M. G., & Jacoby, L. L. (2007). Toward analyzing cognitive illusions: Past, present, and future. In J. S. Nairne (Ed.), *The foundations of remembering: Essays in honor of Henry L. Roediger III* (pp. 379-393). NY: Psychology Press.

Rhodes, M. G., & Jacoby, L. L. (2007). On the dynamic nature of response criterion in recognition memory: Effects of base rate, awareness, and feedback. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 33, 305-320.

Rhodes, M. G., & Kelley, C. M. (2005). Executive processes, memory accuracy, and memory monitoring: An aging and individual differences analysis. *Journal of Memory and Language*, 52, 578-594.

Dr. Carol Seger studies how people learn about patterns present in the world, including concepts, categories, visual patterns, sequences, rules, and skills. She is interested in how patterns are represented in the mind and brain, how they affect our behavior, and how their representations are changed by experience. Much of the current research in her lab examines how the basal ganglia interact with cerebral cortex to subserve learning. In addition to behavioral techniques, her lab utilizes functional magnetic resonance imaging and electroencephalography.

Seger, C. A. (1994). Implicit learning. *Psychological Bulletin*, 115, 163-196.

Seger, C. A., & Cincotta, C. M. (2006). Dynamics of frontal, striatal, and hippocampal systems in rule learning. *Cerebral Cortex*, 16, 1546-1555.

Seger, C. A. (in press). How do the basal ganglia contribute to categorization? Their roles in generalization, response selection, and learning via feedback. *Neuroscience and Biobehavioral Reviews*.

ADMISSIONS AND FUNDING

Admission to the Doctoral Program in Cognitive Psychology is highly competitive and is based on transcripts, letters of recommendation, a statement of interest, and GRE scores. Students with research experience and a strong background in science are preferred. Students having either a bachelor's or master's degree will be considered.

Contingent on the availability of funding and a student's progress in the Program, students admitted with a bachelor's degree may typically expect to receive funding through their fifth year of training, and those with a master's degree may typically expect to receive funding through their third year of training. We have a very strong record of financial support: Since the inception of the Program, all students who have requested funding have received it. Financial support comes from several sources: teaching and research assistantships funded by the Department and University; research assistantships funded by grants to individual faculty members, and Department- and University-sponsored fellowships for outstanding students. Students who are not in good standing or are not making timely progress in the program receive a lower priority for funding.

ADDITIONAL INFORMATION

Doctoral Program in Cognitive Psychology:
<http://www.colostate.edu/Depts/Psychology/cognitive/>

Department of Psychology:
<http://www.colostate.edu/Depts/Psychology/>

Colorado State University:
<http://visit.colostate.edu>

Fort Collins, Colorado:
<http://www.ftcollins.com>



Our new driving simulator facility, equipped with a DriveSafety 600c driving simulator. The simulator includes the front half of a Ford automobile, active instrumentation, full driver controls, tactile and proprioceptive feedback, surround sound, and high-resolution graphics.

Application Checklist for the Doctoral Program in Cognitive Psychology

Students interested in applying to the Doctoral Program in Cognitive Psychology should submit the following materials by January 15th:

- On-Line Application:** All applicants to graduate programs at Colorado State University must complete the on-line application at <http://www.graduateschool.colostate.edu/prospective-students/apply/index.aspx>.
- GS Form 4B:** In order to be considered for a fellowship, traineeship, research assistantship, or teaching assistantship, you must complete GS Form 4B. If you requested that information about our program be mailed to you, a hardcopy of GS Form 4B should be included. This form should be mailed to the Department with the rest of your materials. (If you need a copy of this form, send an e-mail to jmoran@lamar.colostate.edu.)
- Transcripts:** Two official transcripts are required from all colleges or universities attended. Where possible, have the institutions furnish official transcripts in sealed envelopes to enclose with your other supporting documents.
- Three letters of recommendation:** Ask three persons to write letters of recommendation concerning your abilities and potential for graduate study. These letters should be written on letterhead by professors or other professionals with whom you have worked recently or who know you well. Where possible, references should be given to you in a sealed envelope with the referee's signature across the sealed flap so that you may enclose them with your other materials. Referee's may also send the letter directly to the Department if they prefer to do so.
- GRE scores:** All applicants must submit official scores from the general test portion of the Graduate Record Examination (GRE). Scores from the GRE Psychology Subject Test are optional. Have the Educational Testing Service (ETS) forward scores directly to the Department.
- Vita or resume:** A vita or resume should be included which lists your educational background, relevant work experience and training, research experience, and any publications or presentations for which you appear as an author.
- Statement of interest:** You should also submit a statement of interest that describes how you became interested in cognitive psychology, your training goals in our Program, and why you are pursuing a career in cognitive psychology. Because we follow a mentorship model, you should be as explicit as possible in indicating your research interests and the faculty member or members with whom you wish to work.
- Scientific writing sample:** It is also recommended (but not required) that you submit a sample of your scientific writing, such as a senior honor's thesis, a term paper from a psychology course, a laboratory report from an experimental course, or some similar material.

All materials should be sent to the following address, postmarked on or before January 15th.

**GRADUATE ADMISSIONS COORDINATOR
DEPARTMENT OF PSYCHOLOGY
COLORADO STATE UNIVERSITY
FORT COLLINS, CO 80523**

Colorado State University is an equal opportunity/affirmative action institution and complies with all federal and Colorado State laws, regulations, and executive orders regarding affirmative action requirements in all programs. The Office of Equal Opportunity is located in Room 21, Spruce Hall. In order to assist Colorado State University in meeting its affirmative action responsibilities, ethnic minorities, women, and other protected class members are encouraged to apply and to so identify themselves.