



GOALS OF SCAN

The SCAN Certificate program enables graduate and professional students preparing for a wide range of careers to work knowledgeably with neuroscience. Rather than training future neuroscientists, the program's aim is to supplement the education of people with expertise in areas other than neuroscience, enabling them to incorporate some of the concepts and methods of neuroscience into their work. The curriculum focuses on the aspects of neuroscience that have the most direct application to the understanding of human behavior, specifically social, cognitive and affective neuroscience.

More specifically, the SCAN certificate program fosters:

Understanding: Offering students from a wide variety of science and non-science disciplines a basic grasp of neuroscience, at a stage of their educational career (i.e. post-undergraduate) when opportunities for in-depth learning in another field are rare.

Productivity and creativity: Enabling students to recognize topics and findings within neuroscience that can be incorporated into their work.

Critical thinking: Equipping students with the knowledge and skills to critically evaluate both neuroscience research itself and the relevance of that research to their field.

Broadened teaching portfolios: Preparing those students planning an academic career with the expertise needed to teach a course on the intersection of neuroscience and their field.

Intellectual community: Situating students in an interdisciplinary community of individuals from diverse academic backgrounds, all seeking new insights about human behavior and human experience from the study of the brain.



SCAN STUDENTS

The program serves a wide variety of students, who have in common the need to understand the implications of contemporary neuroscience for their field of study. Although there will of course be differences in the aspects of neuroscience that are most relevant to different fields, there is a surprisingly large common core of knowledge that is essential for many of the disciplines and professions. This common core encompasses the neuroscience of human psychology and behavior, in other words social, cognitive and affective neuroscience.

Likely students include:

Annenberg students interested in the neuroscience of communication and persuasion.

Computer Science, Engineering and Applied Math students interested in modeling and analysis of neural networks, neuroimaging methods including image analysis, artificial intelligence and human-computer interaction.

GSE students interested in the implications of neuroscience for the teaching and learning of average, gifted and special needs students; or interested in science teaching with a focus on neuroscience.

Humanities doctoral students including those in **Linguistics** (with a focus on neurolinguistics), **Literature** (with a focus on cognition and neuroscience in literary theory), **Philosophy** (with a focus on philosophy of mind, philosophy of science, or on neurophilosophical approaches to metaphysics, epistemology or ethics) and **Religious Studies** (neurotheology).

Law school students interested in the many ways in which neuroscience relates to legal issues, e.g., the brain bases of self-control, criminal behavior and rehabilitation, regulatory issues in biotechnology/neurotechnology, the use of brain imaging evidence concerning competence, responsibility, and truthfulness.

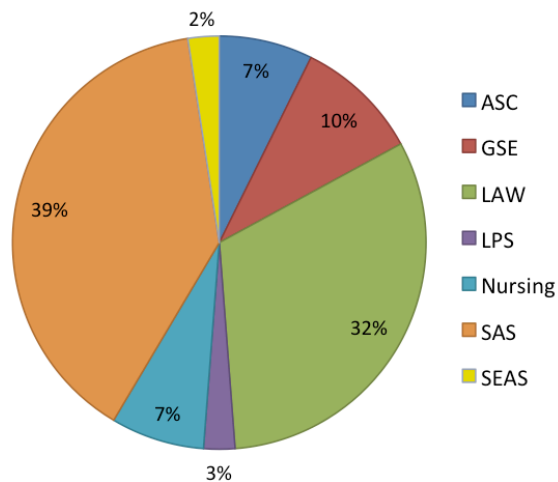
Medical, Nursing and Bioethics students interested in specialties such as cognitive neurology, neuropsychiatry, behavioral pediatrics, geriatrics and neuroethics.

Social Science doctoral students including those in **Anthropology** (with interests in social studies of science, technology and health; medical anthropology), **Criminology** (with interests in neural contributions to criminal behavior or corrections), **Economics** (behavioral economics and neuroeconomics), **History and Sociology of Science** (HSS of neuroscience and neurotechnology) and **Sociology** (biological mechanisms underlying societal phenomena such as health disparities or bias and the role of biology in social and political discourse).

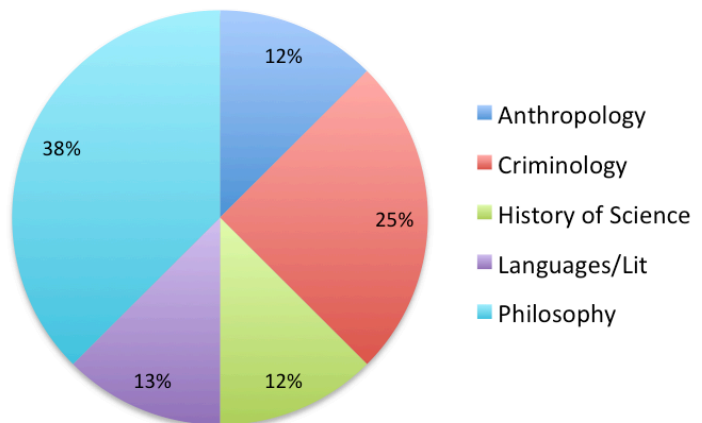
Wharton students interested in the neuroscience of decision-making and marketing, or the business of brain-related medications and devices.

Here is where SCAN students have come from so far:

SCAN Students by School



SCAN Students by SAS Dept



We have so far enrolled 48 students from 16 departments and 8 schools at Penn.

A small number of individuals not currently working toward a graduate degree may be admitted to the program. We are awaiting formal approval of a stand-alone SCAN certificate.

CURRICULUM

SCAN is a 4-course program, which students can complete in 1-2 years in parallel with study toward their graduate degree. The required courses provide a strong grasp of neuroscience for non-neuroscientists, emphasizing those aspects of the field that are most relevant to understanding human behavior.



TWO REQUIRED COURSES:

The **Foundations** course is designed to give you a basic textbook understanding of social, cognitive and affective neuroscience, and the **Contemporary Research Issues** course extends that understanding to a familiarity with primary research literature, enabling students to critically read primary sources.

PSYC 547 (G). Foundations of Social Cognitive and Affective Neuroscience. Offered every fall; to be taken in the fall of first year.

This course is designed to introduce students to the interdisciplinary field of social, cognitive and affective neuroscience. We begin with the basics of neurons, synapses and neurotransmission and the functional anatomy of the human brain. We then move on to neuroscience methods including cellular recordings, EEG/ERP, lesion methods, structural and functional neuroimaging and brain stimulation. The remainder of the course will cover the neural systems involved in emotion, social cognition, executive function, learning and memory, perception, and development, with a focus on how our understanding of these systems has emerged from the use of the methods studied earlier. Classes will combine lecture and discussion, as well as frequent tests. Homework will include written assignments reinforcing the reading and lecture content.

PSYC 747 (G). Contemporary Research Issues in Social, Cognitive and Affective Neuroscience. Offered every fall; often taken in parallel with the Foundations course but can also be taken afterward.

In this seminar students will engage with the primary research literature and deepen their understanding of a variety of topics in social, cognitive and affective neuroscience. The two required courses are carefully synchronized so that students taking them together will not encounter topics in 747 until they have been covered in 547. We begin with the basics of research design and data interpretation, including recent controversies concerning replicability in the neural and behavioral sciences. Classes will combine lecture and discussion, along with collaborative reading and analysis of articles published in the last 2-3 years, many of which apply neuroscience to problems in students' home fields. Students will take one brief quiz on the early weeks' material, present one article to the class and write a referee's report on another article.



TWO ELECTIVE COURSES:

The remaining two courses are intended to strengthen your mastery of specific areas of neuroscience and its relation to other fields. Electives are organized into three course categories, shown below. For these electives, students may take two Advanced Neuroscience courses or one course from any two of the categories below:

i. Advanced Neuroscience course (G or UG/G) Chosen from 400-level or higher courses on specific subfields of neuroscience. Specific courses offered vary from year to year. Examples taken by SCAN students in the past include:

Clinical Research in Neuroscience (BIBB 409-301)

Human Brain Imaging: Functional Imaging of the Human Brain (BIBB 409-301)

Neurobiology of Learning and Memory (BIBB 442-401)

Social Influence, Media Effects & the Brain (COMM 898)

Neurodegenerative Diseases (BIBB 475-301)
 Neuroeconomics (PSYC 473-401)
 Seminar in Cognitive Neuroscience: Consciousness (PSYC 449-301)
 Seminar in Cognitive Neuroscience: Human Motivation and Behavior (PSYC 449)
 Proseminar in Cognitive Neuroscience: Perception (PSYC 600-301)
 Proseminar in Cognitive Neuroscience: Language (PSYC 600-303)
 Violence: A Clinical Neuroscience Approach (CRIM 671)
 Neuroscience for Policymakers, Hilary Gerstein (PSYC 449-301)
 Neuroscience, Ethics & Law, Martha Farah (PSYC 557-301)



ii. Neuroscience and Society course (G) Chosen from graduate courses on the relation of neuroscience to society. Specific courses offered vary from year to year. Examples include:

Neuroethics, Jonathan Moreno (BIOE 555-001)
 Neuroethics, Martha Farah (PSYC 705-401)
 Law and Neuroscience, Stephen Morse and Amy Wax (LAW 981-001)
 Brain Development and Society, Martha Farah and Tony Rostain (PSYC 757)
 Social Influence, Media Effects and the Brain (COMM 898)
 Neuroscience for Policymakers, Hilary Gerstein (PSYC 449-301)
 Neuroscience, Ethics & Law, Martha Farah (PSYC 557-301)

iii. Bridging course (G) Chosen from courses offered by the student's home program or a closely related program that includes *substantial material from neuroscience or extensive consideration of the relation of neuroscience to the course topic*. The availability of bridging courses will vary by program and by year, and course eligibility will depend on the syllabus used in a given year (e.g., PHIL 530 may include substantial material on mind-brain relations one year and may not in a different year, affecting its eligibility). Courses will be approved on a case-by-case basis by the Advisory Board after reviewing the course syllabus. Past examples have included:

Mental Health Law (LAW 705)

Philosophy of Psychology: Philosophy and Theories of Perception (PHIL 526)

Philosophy of Mind (PHIL 530)



OTHER PROGRAM REQUIREMENTS AND OPPORTUNITIES:

Students will meet individually with the program directors in the September of their first year to discuss their goals and possible elective courses. Students are expected to earn a B or higher in every course counted toward the certificate. In addition to the four courses, students should attend the annual half-day retreat while they are enrolled in the program. (They are also welcome to attend afterward, as many do.)

The SCAN program makes available study space near the required course classrooms, with textbooks on reserve. Students may propose local neuroscientists as SCAN-sponsored lunch guests for informal conversation in this same area.

SCAN FACULTY

The SCAN certificate was developed by the faculty of Penn's Center for Neuroscience & Society and is offered by the School of Arts and Sciences.

Program Director

Martha J. Farah (Psychology, Director, Center for Neuroscience & Society)

Associate Director

Hilary Gerstein (Psychology, Associate Director, CNS)

Advisory Board

Geoffrey K. Aguirre (Neurology, Associate Director, CNS)

Russell A. Epstein (Psychology)

Joe Kable (Psychology)

Stephen J. Morse (Law, Associate Director, CNS)

QUESTIONS?

See the SCAN website at:

<http://neuroethics.upenn.edu/scan/> for more information. Please address any questions to: info@neuroethics.upenn.edu