

**PSYCHOLOGY**

**Directors of undergraduate studies:** Yarrow Dunham (yarrow.dunham@yale.edu), 205 K, 432-0699; psychology.yale.edu

Psychology is the scientific study of the mind, the brain, and human behavior. The Psychology department offers coursework and research opportunities in the fields of clinical, cognitive, developmental, neuroscientific, and social psychology. By studying psychology, students better understand human behavior, including who we are, how we do the things we do, and how we enhance our lives and society. The Psychology major provides a foundation for careers in education and research; law; medicine and public health; politics and public policy; and in business fields such as marketing, finance, and management.

**COURSE NUMBERING**

Courses in the department are organized so that they are best taken in several parallel sequences. Courses numbered from 120–190 and ending in a zero are core survey courses that introduce students to major areas of psychology and provide additional background for more advanced courses. These courses represent major content areas of psychology; students should sample broadly from them before specializing. Courses numbered from 200–299 focus on statistics. Courses numbered from 210–299 teach general methodology or data collection in various areas of psychology. Courses numbered from 300–399 are more advanced courses in a particular specialization. Senior seminars, whose enrollment is limited to twenty students, are numbered from 400–489. These seminars are best taken once a student has appropriate background. Courses numbered from 490–499 are special tutorial courses that require permission of the adviser and the director of undergraduate studies (DUS).

**PREREQUISITE**

PSYC 110, a general survey course, is prerequisite to several 100-level and all 200-level and above courses. This prerequisite may alternatively be satisfied by a score of 5 on the Psychology Advanced Placement test or a score of 7 on the IB Psychology exam.

**REQUIREMENTS OF THE MAJOR**

**Standard major** The standard major in Psychology for both the B.A. degree program and the B.S. degree program requires twelve credits beyond PSYC 110, including the senior requirement.

1. Because psychology is so diverse a subject, every student is required to take two courses from the social science point of view in psychology and two from the natural science point of view in psychology. Listed below are examples of courses that fulfill these requirements. A complete list of courses, updated each term, may be found on Yale Course Search (YCS) by searching "Any Course Information Attribute.” At least one from each group must be a course designated as Core in the course listings and below. Students are expected to take their two core courses as early as possible in the major, normally within two terms after declaring their major.

    **Social science core** (YC PSYC: Social Science Core): PSYC 140, 150, 180
    
    
    **Natural science core** (YC PSYC: Natural Science Core): PSYC 120, 130, 135, 160
    

2. Because statistical techniques and the mode of reasoning they employ are fundamental in psychology, a course in statistics (PSYC 200) is required, preferably prior to the senior year. A student may substitute S&D 103 for PSYC 200 or may substitute an examination arranged with the instructor of PSYC 200 for the course requirement. Students may take the examination only one time, and an additional course in psychology should be taken if the examination substitutes for PSYC 200. A student who has taken S&D 103 may not take PSYC 200 for credit.

3. To assure some direct experience in collecting and analyzing data, students must elect at least one course, preferably prior to the senior year, in which research is planned and carried out. Courses numbered between 210–299 fulfill this research methods requirement.

4. Students may, with permission of the DUS, count up to three term courses in other related departments toward the major. Appropriate courses are rare and students should consult with the DUS in Psychology about selecting outside courses.

Students interested in research are encouraged to take an independent study course (PSYC 493) as early as the sophomore year. Students may also take PSYC 495 for one-half course credit of independent research per term with prior permission of the faculty adviser and the DUS. To obtain permission, download the tutorial form from the department website, and submit it by the seventh calendar day before classes begin. These independent study courses are graded P/F. No more than a total of three credits from PSYC 490–499 combined may count toward the major.

**Neuroscience track** Students with a major interest in neuroscience may wish to elect the neuroscience track. Such students are considered Psychology majors for whom the requirements have been modified to accommodate their interests, and to reflect the multidisciplinary nature of modern neuroscience and psychology. Given the broad nature of the field of neuroscience, students may wish to concentrate
their studies in one area of the field (e.g., behavioral, cellular and molecular, cognitive, affective, social, clinical, or developmental). Interested students are encouraged to meet with the track adviser, B.J. Casey (bj.casey@yale.edu), 414D SSS, 432-7790. Majors in the neuroscience track meet with the track adviser at the beginning of each term in their junior and senior years.

Requirements for the neuroscience track are the same as for the standard major, with the additional requirements listed below. A complete list of courses, updated each term, may be found on Yale Course Search (YCS) by searching "Any Course Information Attribute."

1. Two terms of introductory biology are required for the major, BIOL 101-104. Students who have scored 5 on the Advanced Placement test in Biology or scored 7 on the IB Biology exam may place out of these courses.

2. Students must take PSYC 160 or 170 and a data-collection course (YCS attribute: YC PSYC: NSCI Track Rsrch Mthds) chosen from PSYC 230, 238, 250, 258 or 270. PSYC 229L, 260 or MCDB 320 may substitute for the PSYC 160 or 170 requirement, or MCDB 320 and 321L may substitute for the PSYC 229L or 260 requirement, but not both. If MCDB 320 is substituted for a Psychology course, it cannot be counted as one of the two advanced science courses outside the department (see item 4 below).

3. As required for the standard major, students in the neuroscience track must take two courses from the social science list above, at least one of which must be designated as Core in the course listings. Students in the neuroscience track must also take a course from the natural science list in addition to the courses specified in item 2 above.

4. At least two advanced science courses (YCS attribute: YC PSYC: NSCI Track Adv Scie) must be chosen from Molecular, Cellular, and Developmental Biology and Ecology and Evolutionary Biology courses numbered 200 and above that deal with human and/or animal biology; recommended courses include MCDB 200, 202, 205, 210, 250, 300, 315, 320, E&EB 220, 225, and 240. Certain courses outside of these departments may also meet the advanced science requirement, including BENG 350, 421, CPSC 475, MB&EB 300, 301, 420, 435, 443, 452, MATH 222, 225, 230, 231, and 241. Other courses may qualify for this requirement with permission of the neuroscience track adviser. Laboratory courses do not count toward the advanced science requirement. Students should note that many advanced science courses have prerequisites that must be taken first.

**Credit/D/Fail** No more than two term courses taken Credit/D/Fail may be applied toward the major; no 200-level course taken Credit/D/Fail may be applied toward the major.

**Roadmap** See visual roadmap of the requirements.

**SENIOR REQUIREMENT**

**Standard major** Majors are required to earn two course credits from courses numbered PSYC 400–499. At least one of these courses (excluding PSYC 490–495, which can only be taken P/F) must be taken during the senior year, for which a student must write a substantial final paper (a minimum of 5,000 words) and receive a letter grade. The B.A. degree is typically awarded to students who conduct a nonempirical literature review during senior year. There are no restrictions in the research format for the B.A. The B.S. degree is awarded to students who conduct empirical research through PSYC 499 during senior year. An empirical research project normally includes designing an experiment and collecting and analyzing the data.

**Neuroscience track** The senior requirement for the neuroscience track is the same as for the standard major, except that the two required course credits from PSYC 400–499 must have neuroscience content (PSYC 419, 420, 428, 431, 432, 436, 449, 479, 493, 495, as well as any courses listed in YCS with the attribute, YC PSYC: NSCI Track Senior Sem). Students pursuing the B.S. degree in the track must carry out a neuroscientific empirical project in PSYC 499 and must be supervised by a faculty member within the neuroscience area of the Psychology department. Students who wish to work with an affiliated faculty member studying neuroscience outside the department must obtain permission from the neuroscience track adviser.

**Distinction in the Major** To be considered for Distinction in the Major, students must submit a senior essay to the Psychology department at least one week before the last day of classes in the term when the course used for the senior essay is taken. Senior essays that are submitted after the deadline will be subject to grade penalties. Senior essays considered for Distinction in the Major are graded by a second reader and the essay adviser.

**ADVISING**

Schedules for all majors must be discussed with, and approved by, the DUS or the adviser for the neuroscience track in Psychology. Only then may a schedule be submitted to the residential college dean’s office. For questions concerning credits for courses taken at other institutions or at Yale but outside the Department of Psychology, students should consult with the DUS. For questions concerning the neuroscience track, students should consult with the adviser for the neuroscience track in Psychology.

**Computer Science and Psychology major** The interdepartmental major in Computer Science and Psychology may be considered by students with interests lying squarely between the two disciplines. See Computer Science and Psychology for more information.

**REQUIREMENTS OF THE MAJOR**

**STANDARD MAJOR**

**Prerequisite** PSYC 110

**Number of courses** 12 courses beyond prereq (incl senior req)

**Specific course required** PSYC 200
Distribution of courses  B.A. or B.S. — 2 social science courses and 2 natural science courses, as specified; 1 course numbered PSYC 210–299

Substitution permitted  For PSYC 200, S&DS 103 or exam arranged with instructor; up to 3 relevant courses in other depts, with DUS permission

Senior requirement  B.A. — 1 course credit from PSYC 400–489 or 499 taken during senior year; 1 additional course credit from PSYC 400–499; B.S. — PSYC 499 taken during senior year; 1 additional course credit from PSYC 400–499

NEUROSCIENCE TRACK
Prerequisite  PSYC 110
Number of courses  12 courses beyond prereq (incl senior req); same as for the standard major with the additional requirements listed below
Specific courses required  BIOL 101–104 unless students place out; PSYC 160 or 170; PSYC 200; PSYC 229L, 230, 238, 250, 258 or 270.
Distribution of courses  B.A. or B.S. — 2 social science courses and 1 natural science course, as specified; at least 2 advanced science courses, as specified
Substitution permitted  MCDB 320 for PSYC 160 or 170; or MCDB 320 and 321L for PSYC 229L, 230 or 260; S&DS 103 or exam arranged with instructor for PSYC 200
Senior requirement  B.A. — 1 course credit from PSYC 400–489 or 499 with neuroscience content taken during senior year; 1 additional course credit from PSYC 400–499 with neuroscience content; B.S. — PSYC 499 taken during senior year, with neuroscience content in a research project; 1 additional course credit from PSYC 400–499 with neuroscience content

The field of psychology scientifically studies the mind and behavior. Psychologists study a number of specific topics including perception, cognition, emotion, motivation, personality, development, mental health, social processes, and organizational behavior. Understanding these topics requires multiple perspectives, and the field uses a number of different levels of analysis. Psychologists investigate mental processing from the level of the neurons and brain function up to the level of how behavior is shaped by complex social processes. Because of this interdisciplinary breadth, psychology is by nature a diverse discipline that spans the natural and social sciences.

The Psychology major aims to provide students with a strong academic foundation in the science of psychology. Students who major in Psychology often differ widely in their reasons for choosing the major and in their post-graduation plans. Some students go on to graduate training in Psychology, while others enter professional schools (e.g., medicine and law) or choose from a variety of professions such as education or business and finance. The specific requirements of the major ensure that students with a variety of goals can achieve the necessary background in psychology within the context of a general liberal arts education.

The prerequisite to many courses in the major is PSYC 110. Students interested in the major are encouraged to take PSYC 110 during the first year. This prerequisite may be waived for students who present a score of 5 on the AP test in Psychology or a score of 7 on the IB Psychology exam.

The following introductory courses also have no prerequisites and are open to first-year students:

PSYC 126, Attraction and Relationships
PSYC 130, Introduction to Cognitive Science
PSYC 140, Developmental Psychology
PSYC 141, The Criminal Mind
PSYC 150, Social Psychology
PSYC 160, The Human Brain
PSYC 165, Personality Psychology
PSYC 170, Fundamentals of Neuroscience
PSYC 180, Clinical Psychology

FACULTY OF THE DEPARTMENT OF PSYCHOLOGY

Professors  Woo-kyoung Ahn, John Bargh, Tyrone Cannon, B. J. Casey, Marvin Chun, Margaret Clark, Melissa Ferguson, Jutta Joormann, Frank Keil, Joshua Knobe, Gregory McCarthy, Jennifer Richeson, Peter Salovey, Laurie Santos, Brian Scholl, Nick Turk-Browne

Associate Professors  Arielle Baskin-Sommers, Steve Wohn Chang, Molly Crockett, Yarrow Dunham, Avram Holmes

Assistant Professors  Dylan Gee, Maria Gendron, Julian Jara-Ettinger, Julia Leonard, Sam McDougle, Robb Rutledge, Ilker Yildirim

Lecturers  Jennifer Hirsch, Stephanie Lazzaro, Kristi Lockhart, Mary O’Brien, Matthias Siemer

View Courses
Courses

**PSYC 110a or b, Introduction to Psychology**  Staff
A survey of major psychological approaches to the biological, cognitive, and social bases of behavior.  **SO**

**PSYC 116b / CGSC 216b / LING 116b, Cognitive Science of Language**  Robert Frank
The study of language from the perspective of cognitive science. Exploration of mental structures that underlie the human ability to learn and process language, drawing on studies of normal and atypical language development and processing, brain imaging, neuropsychology, and computational modeling. Innate linguistic structure vs. determination by experience and culture; the relation between linguistic and nonlinguistic cognition in the domains of decision making, social cognition, and musical cognition; the degree to which language shapes perceptions of color, number, space, and gender.  **SO**

* **PSYC 125a / CHLD 125a / EDST 125a, Child Development**  Ann Close and Carla Horwitz
The reading of selected material with supervised participant-observer experience in infant programs, a day-care and kindergarten center, or a family day-care program. Regularly scheduled seminar discussions emphasize both theory and practice. An assumption of the course is that it is not possible to understand children—their behavior and development—without understanding their parents and the relationship between child and parents. The focus is on infancy as well as early childhood. Enrollment limited to juniors and seniors.  **WR, SO**

**PSYC 126a, Attraction and Relationships**  Jennifer Hirsch
Theory and empirical research on the antecedents and consequences of attraction, and on intra- and interpersonal processes that either facilitate or interfere with the formation and maintenance of close relationships. Methodological bases for rigorous study of these topics.  **SO**

* **PSYC 127b / CHLD 127b / EDST 127b, Theory and Practice of Early Childhood Education**  Carla Horwitz
Development of curricula and responsive educational environments for young children—in light of current research and child development theory. The course focuses on critical analysis of programs for young children and the ways in which political context contributes to the practice of education. Regularly scheduled seminar discussions emphasize both theory and practice. Supervised participant-observer experience in an early childhood classroom. Components of the course include behavior and development, planning, assessment and standards, culture, teacher preparation, and working with families. Priority given to seniors, juniors and Ed Studies students.  **WR, SO RP**

* **PSYC 128b / CHLD 128b / EDST 128b, Language, Literacy, and Play**  Ann Close and Carla Horwitz
The complicated role of play in the development of language and literacy skills among preschool-aged children. Topics include social-emotional, cross-cultural, cognitive, and communicative aspects of play.  **WR, SO RP**

**PSYC 130a / CGSC 110a, Introduction to Cognitive Science**  Brian Scholl
An introduction to the interdisciplinary study of how the mind works. Discussion of tools, theories, and assumptions from psychology, computer science, neuroscience, linguistics, and philosophy.  **SO**

**PSYC 140a / EDST 140a, Developmental Psychology**  Julia Leonard
An introduction to research and theory on the development of perception, action, emotion, personality, language, and cognition from a cognitive science perspective. Focus on birth to adolescence in humans and other species. Prerequisite: PSYC 110.  **SO**

**PSYC 150b / EDST 160b, Social Psychology**  Jennifer Hirsch
Theories, methodology, and applications of social psychology. Core topics include the self, social cognition/social perception, attitudes and persuasion, group processes, conformity, human conflict and aggression, prejudice, prosocial behavior, and emotion.  **SO**

**PSYC 157b, Psychology and the Good Life**  Laurie Santos
Psychological insights into how to live a better life and build a better world. Topics include scientifically-validated strategies for becoming happier, achieving behavior change, handling cognitive biases, and picking a meaningful career. Discussion of psychological insights into protecting the environment, improving education, promoting charitable giving, and inspiring healthier lifestyles. Students will practice strategies taught in the course to promote their own positive behavior change.  **SO**

**PSYC 160b / NSCI 160b, The Human Brain**  Gregory McCarthy
Introduction to the neural bases of human psychological function, including social, cognitive, and affective processing. Preparation for more advanced courses in cognitive and social neuroscience. Topics include memory, reward processing, neuroeconomics, individual differences, emotion, social inferences, and clinical disorders. Neuroanatomy, neurophysiology, and neuropharmacology are also introduced.  **SC**

**PSYC 161b / NSCI 161b, Drugs, Brain, and Behavior**  Hedy Kober
An introduction to psychoactive drugs and their effects on both brain and behavior. Review of pharmacological and brain mechanisms of different classes of legal, illegal, and medicinal drugs, including alcohol, caffeine, tobacco, stimulants, depressants, antidepressants, and hallucinogens. Individual drugs' pharmacokinetics, mechanisms of action, dosing, routes of administration, and patterns and effects of use and misuse. Some attention to substance use disorders/addictions, prevention, and treatment.  **SC**
PSYC 179a, Thinking  Woo-Kyoung Ahn
A survey of psychological studies on thinking and reasoning, with discussion of ways to improve thinking skills. Topics include judgments and decision making, causal learning, logical reasoning, problem solving, creativity, intelligence, moral reasoning, and language and thought.  SO

PSYC 180a / EDST 180a, Clinical Psychology  Jutta Joormann
The major forms of psychopathology that appear in childhood and adult life. Topics include the symptomatology of mental disorders; their etiology from psychological, biological, and sociocultural perspectives; and issues pertaining to diagnosis and treatment.  SO

PSYC 182b / CGSC 282b / PHIL 182b, Perspectives on Human Nature  Joshua Knobe
Comparison of philosophical and psychological perspectives on human nature. Nietzsche on morality, paired with contemporary work on the psychology of moral judgment; Marx on religion, paired with systematic research on the science of religious belief; Schopenhauer paired with social psychology on happiness.  SO

PSYC 200a or b, Statistics  Staff
Measures of central tendency, variability, association, and the application of probability concepts in determining the significance of research findings.  QR

* PSYC 235a or b, Research Methods, Writing Intensive  Staff
Introduction to general principles and strategies of psychological research. Topics include generating and testing hypotheses, laboratory and field experiments, scale construction, sampling, archival methods, case studies, ethics and politics of research, and Internet and cross-cultural methods. Hands-on research experience in laboratories. Prerequisite: PSYC 200 or S&DS 103.  WR, SO

* PSYC 258b / NSCI 258b, Computational Methods in Human Neuroscience  Nick Turk-Browne
This course provides training on how to use computational science for the advanced analysis of brain imaging data, primarily from functional magnetic resonance imaging (fMRI). Topics include scientific programming, high-performance computing, machine learning, network/graph analysis, real-time neurofeedback, nonparametric statistics, and functional alignment. Prerequisites: CPSC 100, CPSC 112 or other course involving terminal commands and programming (Python preferred); course in statistics and/or data science; PSYC 160 or other human neuroscience course; or permission of instructor.  QR, SC

* PSYC 270a / NSCI 270a, Research Methods in Cognitive Neuroscience  Stephanie Lazzaro
This course introduces methods used by cognitive neuroscientists to discover the structural and functional features of the nervous system. A combination of lectures and hands-on lab activities help students understand the structure and function of the human brain.  WR, SC

[ PSYC 303, Social Neuroscience ]

[ PSYC 308, Intergroup Relations: The Psychology of Social Inequality ]

* PSYC 312a / ER&M 412a, Native American Health  Christopher Cutter and Mark Beitel
Issues of health policy, research, and service delivery in Native American communities, with a focus on historical antecedents that shape health outcomes and social policy for indigenous communities. Urgent problems in health and wellness, with special attention to Native American mental health. The roles of the Indian Health Service, state and local agencies, and tribal health centers; comparison of Native American and European American conceptions of health and illness.  SO

PSYC 316b / NSCI 360b, Clinical Neuroscience  Tyrone Cannon
The biological bases of psychopathology, with attention to the interplay of biological and psychological factors. Research and theory regarding the role of biological influences such as genetics, neuronal physiology and signaling, and psychopharmacology in the major classes of mental disorders. Discussion of mood and anxiety disorders, schizophrenia, addictions, personality disorders, eating disorders, and autism.  SC

PSYC 317a / EDST 237a / LING 217a, Language and Mind  Maria Pinango
The structure of linguistic knowledge and how it is used during communication. The principles that guide the acquisition of this system by children learning their first language, by children learning language in unusual circumstances (heritage speakers, sign languages) and adults learning a second language, bilingual speakers. The processing of language in real-time. Psychological traits that impact language learning and language use.  SO, RP

PSYC 318a / LING 220a, General Phonetics  Jason Shaw
Investigation of possible ways to describe the speech sounds of human languages. Acoustics and physiology of speech; computer synthesis of speech; practical exercises in producing and transcribing sounds.  SO

PSYC 329b / LING 146b / WGSS 145b, Language and Gender  Natalie Weber
An introduction to linguistics through the lens of gender. Topics include: gender as constructed through language; language variation as conditioned by gender and sexuality within and between languages across the world; real and perceived differences between male and female speech; language and (non)binarity; gender and noun class systems in language; pronouns and identity; role of language in encoding, reflecting, or reinforcing social attitudes and behavior.  SO
PSYC 331b / LING 231b, Neurolinguistics  Maria Pinango
The study of language as a cognitive neuroscience. The interaction between linguistic theory and neurological evidence from brain damage, degenerative diseases (e.g., Alzheimer’s disease), mental illness (e.g., schizophrenia), neuroimaging, and neurophysiology. The connection of language as a neurocognitive system to other systems such as memory and music.

PSYC 335b / NSCI 340b, Cognitive Neuroscience  Steve Chang
This course covers how cognition is made by the brain. Students learn brain mechanisms underlying human cognition, including making decisions, paying attention, regulating emotion, remembering events, as well as understanding others. The course discusses both established and newly emerging findings based on several landmark experiments in both humans and animals. During this process, students are also introduced to cutting-edge techniques in cognitive neuroscience for studying human cognition. Prerequisite: PSYC 160 or specific chapter readings from the instructor.

PSYC 336a / AFAM 118a / ER&M 249a / SOCY 153a, Is That Racist?: Theory and Methods for Diagnosing and Demonstrating Racism

Staff
How do we know when something is racist? And how do we prove it to those who are skeptical? This course is designed to allow students to go beyond armchair pontificating about racism by exploring a broad range of ways social theorists have defined the term and methods they have used to demonstrate it. Together, we have the opportunity to read, critique, and synthesize scholarship from across disciplines, with the goal of refining our own definition of the term. To accomplish this, we examine the stakes of calling something racist, who benefits and who suffers from a given definition, and how racism functions across contexts (mostly) within the United States. We also learn about popular methods for demonstrating that an idea, feeling, behavior, person, or institution is racist and evaluate how evidence about racism (or lack thereof) can obscure a diagnosis of racism—or lead to an erroneous one. Throughout the course, we take opportunities to translate the theoretical and methodological lessons we learn to the world we live in today, from popular culture to dinner table conversations. While there are no statistical prerequisites, students will be asked to think about the logic of statistical analysis and should be comfortable reasoning about numbers.

PSYC 352a / CGSC 352a / NSCI 352a, Arrested or Adaptive Development of the Adolescent Brain  BJ Casey
Study of empirical and theoretical accounts of adolescent-specific changes in the brain and in behavior that relate to the development of self-control. Discussions will focus on adaptive and arrested adolescent brain development in the context of relevant legal, social, and health policy issues. Prerequisites: PSYC 110, PSYC 160.

[ PSYC 355, Clinical Psychology in the Community ]

PSYC 376b / NSCI 341b, Learning and Memory  Samuel McDougle
The basic facts, general principles, and theories that describe how higher animals, from mice to humans, are changed by their experiences. The historically separate fields of learning and memory research desegregated under a neuroscientific perspective that recognizes the evolutionary continuity among higher animals. Prerequisite: Introductory courses in biology and psychology, or permission of instructor.

[ PSYC 405, Social Emotions ]

* PSYC 408b, Topics in Thinking  Woo-Kyoung Ahn
A survey of psychological studies on thinking and reasoning, with discussion of ways to improve thinking skills. Topics include judgments and decision making, counterfactual reasoning, causal learning, inductive inferences, analogical reasoning, problem solving, critical thinking, and creativity. Students who have taken PSYC 179 are not eligible to enroll in this course.

[ PSYC 411, Systems Neuroscience ]

* PSYC 419b / CGSC 419b / NSCI 419b, Topics in Brain Development, Law, and Policy  BJ Casey
Healthy development is a fundamental right of the individual, regardless of race, ethnicity, socioeconomic status, or gender. Youth require special protections of their rights due to vulnerabilities related to their physical and mental immaturity. These rights include, not only protections, but opportunities for building the cognitive, emotional, and social skills necessary for becoming a healthy adult and a contributing member of society. This seminar examines the extent to which legal policies and practices in the treatment of youths are consistent with scientific knowledge on psychological and brain development. Each class discusses one or more legal cases highlighted in the context of brain and psychological science and current laws and policies. Prerequisite: PSYC 110 and PSYC 160 preferred.

* PSYC 420b / CGSC 420b / NSCI 440b, Topics in Clinical Neuroscience  Avram Holmes
An overview and examination of the neuroscience of psychiatric illness. We focus on cutting-edge research in humans and animals aimed at understanding the biological mechanisms that underlie psychiatric illness. Although these questions date back to early philosophical texts, only recently have experimental psychologists and neuroscientists begun to explore this vast and exciting domain of study. We discuss the evolutionary and developmental origins of individual differences in human personality, measurement issues, fundamental dimensions of psychopathology, stability/plasticity, heritability, and implications therapeutic interventions as well as the associated broader implications for public policy. A major focus is on the neurobiology of fear and anxiety, including brain circuits, molecular genetic pathways, and epigenetics. A secondary focus is on differences in behavior and biology that confer risk for the development of depression and addiction, including the biological systems involved in hedonic pleasure, motivated goal pursuit, and the regulation of impulses in the face of everyday temptation. Students should have some background in psychology; PSYC 110 and PSYC 160 preferred.
* PSYC 424b / CGSC 492b / HUMS 424b / PHIL 492b, Metaphysics Meets Cognitive Science: Objects, Causation, Time, and Self
Laurie Paul and Brian Scholl

The premise (and promise) of cognitive science is that we will come to understand ourselves better by integrating the insights and contributions from multiple fields of inquiry. This interdisciplinary project has been especially vibrant when it has explored the intersection of philosophy and psychology (for example when work in ethics integrates empirical work from moral psychology, or when work in the philosophy of mind integrates neuroscience studies of consciousness). But cognitive science has interacted far less with the study of *metaphysics* — the philosophical exploration of topics such as time, causation, and possibility. This may seem surprising, since there has been a great deal of fascinating empirical research on the mental representations and cognitive processes involved in such topics. Accordingly, this seminar attempts to bridge this gap, exploring potential interactions between these fields. In particular, we explore the possibility of a ‘cognitive metaphysics’, in which each field is enriched by consideration of the other. How might metaphysical theories raise questions or identify concepts of interest to working cognitive scientists? How might empirical studies from cognitive science on the nature of seeing and thinking contribute to the study of metaphysics? Specific topics likely include the ways in which we understand the nature (in both the mind and the world) of space, time, objects, events, causality, persistence, and possibility. (And along the way, we also consider some more particular topics, such as the asymmetry between past and future experience, the apparent backwards causation in the context of Newcomb’s puzzle, and why the present seems special.) This course is the Shulman Seminar. A previous course other in either philosophy or psychology is presumed. HU, SO

[ PSYC 425, Social Perception ]

* PSYC 427b / CGSC 427b, The Rise and Fall of Wonder: When Early Passions for Exploration and Discovery Decay with Age
Frank Keil

Research on children's minds reveals early emerging abilities that help explain the developmental origins and early growth of wonder. We consider wonder as the joy of exploration and discovery. Preschoolers and even infants are driven to learn not just facts and statistics, but also underlying causal patterns that are at the heart of many sciences. They learn not just as individual but also as members of knowledge communities and, early on, they sense how to “harvest” knowledge from these communities. Yet, those joyous moments of discovery and exploration often fade as children grow older and cease to wonder. We explore how this decline occurs and its consequences. When people stop wondering, they fail to expand their grasps of the world and become ever more vulnerable to misunderstanding and manipulation by others. We examine possible ways to reverse the decline. Prerequisite: PSYC 110 or CGSC 110. SO

* PSYC 428a / NSCI 442a, Neuroscience of Decision-Making
Molly Crockett

An overview and examination of the neuroscience of decision making. Interdisciplinary course highlighting research from cognitive neuroscience, psychology, behavioral economics, finance, marketing, computer science, and public health. Topics include utility and value, reinforcement learning, risky decision making, impulsivity and self control, social decision making, psychopathology, and commercial applications (e.g., neuromarketing and neurofinance). Permission of the instructor. SC

* PSYC 431a, Human Skill Learning
Samuel McDougle

Humans possess a remarkable ability to learn new skills, and retain memories for those skills throughout their life span (e.g., learning to ride a bicycle). The ease with which humans acquire and sharpen skills belies the complexity involved in selecting and executing the correct actions in a given situation. This course considers both foundational and contemporary psychology and neuroscience research regarding skill learning, with an emphasis on motor and reinforcement learning. The overall goal of the course is to gain an understanding of the different cognitive processes and algorithms that underlie skill acquisition. Prerequisite: PSYC 130, PSYC 160, PSYC 335, PSYC 376. SC

* PSYC 432b / NSCI 455b, Under Pressure: The Psychology of Stress
Dylan Gee

Stress is pervasive in everyday life. Why do humans experience stress, and what causes stress in today’s society? How does stress affect the ways we think, feel, and behave? Why are some people particularly susceptible to the effects of stress on mental and physical health? What factors can buffer against the consequences of stress, and how can we leverage stress management techniques to effectively cope with stress? This course draws from psychological, neurobiological, social, developmental, and clinical perspectives to address these questions. In addition to an in-depth study of theory, research, and intervention in the field of stress, this seminar is designed to translate scientific advances to help students learn how to more effectively manage stress in their own lives. Priority given to juniors and seniors. Prerequisites: There are no formal prerequisites for the course, but one of the following is strongly recommended: PSYC 110, PSYC 160, PSYC 230, PSYC 335, PSYC 352, or PSYC 376. SO

* PSYC 434b, The Psychology of Changing One's Mind
Melissa Ferguson

When and how do we change our minds? We are constantly learning information about other individuals, groups, objects, ideas, and so on, but this new information does not always influence what we think and how we feel. What determines when we update our beliefs and feelings? This course reviews cutting-edge psychological science to answer this question, with special attention to social and cognitive research on how we change our minds about other individuals and groups. Prerequisite: One course in social or cognitive psychology. SO

* PSYC 437b / CGSC 437b, Minds, Brains, and Machines
Julian Jara-Ettinger

Exploration of the implications that the brain is a kind of computer that gives rise to the mind. Readings combine classical and cutting-edge research in psychology, philosophy, and artificial intelligence. SO RP
* **PSYC 438a / NSCI 441a, Computational Models of Human Behavior**  Robb Rutledge  
Why do we do the things we do? How do we adapt to changes in the environment? And how does our happiness depend on our choices and what happens to us? How can computational models help us to gain new insights into psychological processes? The goal of this course is to use computational models to understand human behavior and its relationship to our emotions. Data is collected in a variety of tasks including new experiments designed by students, and is analyzed using computational models. CPSC 112 or other course involving programming (e.g., C++, Java, Python, Matlab), or permission of instructor.  sc

* **PSYC 439a / CGSC 439a, The Psychology of Social Construction**  Yarrow Dunham  
We live in a world replete with “forgeries that become genuine”: pieces of paper that become money, words that become promises, lines in the sand that become borders. Nearly every aspect of our lives is shaped and constrained by these kinds of socially constructed entities, things as real as mountains but far more mysterious. How do such entities come to be, and how do (and how should) we understand them? How are they made and how can they be contested when they go astray? Answering these questions requires ranging across diverse literatures beginning with psychology but including philosophy, anthropology, economics, and game theory. Prerequisite: PSYC 110 or CGSC 110.  so

* **PSYC 449a / NSCI 449a, Neuroscience of Social Interaction**  Steve Chang  
This seminar covers influential studies that inform how the brain enables complex social interactions from the perspectives of neural mechanisms. Students thoroughly read selected original research papers in the field of social neuroscience across several animal species and multiple modern neuroscience methodologies. In class, the instructor and students work together to discuss these studies in depth. Focused topics include neural mechanisms behind brain-to-brain coupling, empathy, prosocial decision-making, oxytocin effects, and social dysfunction. Prerequisite: PSYC 160 or permission from the instructor.  sc

* **PSYC 479a / NSCI 479a, Computational Basis of Seeing and Thinking**  Ilker Yildirim  
The goal of this seminar is to discuss the computational basis of seeing and thinking in the mind and brain. We are especially concerned with this question of how perception gets us to cognition: How is it that perception transforms raw, unprocessed, unorganized, incoming sensory signals arising from our physical environments—the light that bounces off surfaces and arrives at your retina, raw audio waves hitting your ears, or the vibro-tactile sensations you feel at your fingertips when you touch a surface—into things like objects and people, into things that we can think about? We somewhat prioritize the field of scene perception, where many fundamental questions about the nature of seeing and aspects of cognition arise prominently, and much of those questions remain open to this date. We draw upon readings and classroom discussions to find out where the literature stands, including behavioral, neural, and computational studies, all in the context of searching for a mechanistic, functional account of how the brain produces percepts and thoughts about objects, scenes, and people.  so

* **PSYC 493a or b, Directed Research**  Yarrow Dunham  
Empirical research projects or literature review. A student must be sponsored by a faculty member, who sets the requirements and supervises the student’s progress. To register, the student must download a tutorial form from http://psychology.yale.edu/undergraduate/undergraduate-major-forms, complete it with the adviser, and submit it to the director of undergraduate studies by the seventh calendar day from the beginning of the term. The normal minimum requirement is a written report of the completed research or literature review, but individual faculty members may set alternative equivalent requirements. May be elected for one or two terms. May not be used for the Psychology senior requirement.

* **PSYC 495a or b, Research Topics**  Yarrow Dunham  
Empirical research project or literature review. A student must be sponsored by a faculty member, who sets the requirements and supervises the student’s progress. To register, the student must download a tutorial form from http://psychology.yale.edu/undergraduate/undergraduate-major-forms, complete it with the adviser, and submit it to the director of undergraduate studies by the seventh calendar day from the beginning of the term. The normal minimum requirement is a written report of the completed research or literature review, but individual faculty members may set alternative equivalent requirements. May be elected for one or two terms. May be repeated for credit. May not be used for the Psychology senior requirement. ½ Course cr

* **PSYC 499a or b, Senior Essay**  Yarrow Dunham  
Independent senior research project (either empirical research or literature review), conducted under the guidance of a faculty adviser who sets the requirements and supervises the research. To register, the student must download a tutorial form from http://psychology.yale.edu/undergraduate/undergraduate-major-forms, complete it with the adviser, and submit it to the director of undergraduate studies by the seventh calendar day from the beginning of the term. The normal minimum requirement is a written report of the completed research or literature review, but individual faculty members may set alternative equivalent requirements. A paper of 5,000 words or more meets the writing needed for the senior requirement. To be considered for Distinction in the Major, the paper should be submitted at least one week before the last day of classes and will be graded by the adviser and a second reader assigned by the DUS.