Department of Psychology

Michael Tarr, Department Head
Erik Thiessen, Director of Undergraduate Education in Psychology
Chante Cox-Boyd, Associate Director of Undergraduate Education in Psychology
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Crista Crittenden, Academic Advisor in Psychology
www.cmu.edu/dietrich/psychology (http://www.cmu.edu/dietrich/psychology/)

The Major in Psychology

Psychology is a discipline that embraces both biological and social sciences. It is a science concerned with establishing principles and laws regarding the ways in which people think and behave through the scientific study of human behavior.

The orientation of the Carnegie Mellon Psychology curriculum is toward developing highly skilled and knowledgeable graduates. About half of our graduates go on to graduate or professional school. The remainder seek to expand their problem-oriented analytic skills to qualify themselves for job opportunities beyond those typically open to liberal arts students. Using the outcomes tool (https://www.cmu.edu/career/outcomes/post-grad-dashboard.html) created by CMU’s Career & Professional Development Center, students have the opportunity to explore where some of our recent graduates have accepted employment and their positions.

Majors in the department are expected not only to learn about findings already established by psychologists, but also to become proficient in the investigation and analysis of behavior. This includes observing behavior, formulating hypotheses, designing experiments to test these hypotheses, running experiments, performing statistical analysis, and writing reports. The department has many resources for students to use in acquiring these skills. For instance, students interested in child development may be involved in the child development laboratory and observational facilities which are a part of the Carnegie Mellon Children’s School (https://www.cmu.edu/dietrich/psychology/cls/) which operates under the department’s aegis. Students interested in health or clinical psychology might have opportunities to do internships in applied settings, and all Psychology majors have access to extensive computer facilities for data analysis and simulation work. The department also has a set of the art of undergraduate research laboratories and computer clusters, and through the Scientific Imaging & Brain Research Center, a magnet is in use for conducting brain imaging studies using fMRI.

In addition to formal class work, students are encouraged to participate in research projects where they may register and receive credit for freshmen research experience course 85-198 Research Training. Psychology, 85-506 Readings in Psychology, Fall more numerous experiences in 85-507 Research in Psychology or Spring research experience in 85-508 Research in Psychology. In the research in psychology course, the student may work on an ongoing research projects or develop and carry out a new research project with a faculty member. To complement students research experience, the department requires 85-509 Research in Psychology Practicum, a 1 unit, pass/fail course which provides students with an opportunity to frame their research experience in a broader professional and scholastic perspective. More information on research labs that are recruiting can be found here (https://www.cmu.edu/dietrich/psychology/undergraduate/current-students/research-and-internships/research-opportunities/).

There is university and departmental funding (https://www.cmu.edu/dietrich/psychology/undergraduate/current-students/research-and-internships/undergrad-research-grants.html) available to help support student-initiated research projects and student travel to present research results at scientific meetings and conferences. In the Readings courses, the student reads extensively on a particular topic. The faculty member and student meet to discuss the readings, and the student writes a paper on the topic selected. The Psychology Department Website (http://www.cmu.edu/dietrich/psychology/), provides descriptions of faculty research interests (http://www.cmu.edu/dietrich/psychology/research-areas/) that the student can use in determining who should be approached to supervise a particular research or reading project.

Students interested in gaining field work experience via a number of internship opportunities available to them can receive credit through 85-482 Internship in Psychology, 85-480 Internship in Clinical Psychology or 85-484 Practicum in Child Development. Clinical internships are available with a variety of clinical settings including the prestigious Western Psychiatric Institute (https://www.upmc.com/locations/hospitals/western-psychiatric?gclid=aw.dS&utm_kxconfid=swws25spg0&utm_source=GOOGLE&utm_medium=cpc&+western+psychiatric&utm_advertiserid=700000001754524&gclid=EAa1Q0bChM1i7Hg6vyD8gLcV0BNpcnehE1) and Clinic (the teaching hospital of the Department of Psychiatry at the University of Pittsburgh Medical School). During the internship, students get first-hand experience with different clinical populations. Developmental Practicum experience is available in the department-run CMU Children’s School (http://www.cmu.edu/dietrich/psychology/centers-and-facilities/).
If you would like to learn more about the BA and BS in Psychology, please reach out to Crista Crittenden ccritten@andrew.cmu.edu for more information.

**Bachelor of Arts in Psychology**

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>10-20 units</th>
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</thead>
<tbody>
<tr>
<td>21-111-21-112 Calculus I-II</td>
<td>20</td>
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<tr>
<td>or</td>
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</tr>
<tr>
<td>21-120 Differential and Integral Calculus</td>
<td>* 10</td>
</tr>
</tbody>
</table>

*Students who place out of 21-120 with AP credit will have successfully completed the calculus requirement*

**Statistics Sequence** 9 units

- 36-309 Experimental Design for Behavioral & Social Sciences
- or 85-309 Statistical Concepts and Methods for Behavioral and Social Science

**Psychology Surveys** 27 units

- 85-102 Introduction to Psychology * 9
- Survey Courses - Complete Two
  - 85-104 Psychopathology
  - 85-211 Cognitive Psychology
  - or 85-213 Human Information Processing and Artificial Intelligence
  - 85-219 Biological Foundations of Behavior
  - 85-221 Principles of Child Development
  - 85-241 Social Psychology
  - 85-251 Personality

* Introduction to Psychology cannot be substituted; AP credit does not count towards this requirement

**Research Methods** 18 units

Complete two courses.

- 85-310 Research Methods in Cognitive Psychology
- 85-314 Cognitive Neuroscience Research Methods
- 85-320 Research Methods in Developmental Psychology
- 85-330 Analytic Research Methods

**Advanced Courses** 18 units

Advanced psychology courses exist within four areas (cognitive, cognitive neuroscience, developmental, social and health psychology.) Any advanced content course or seminar in psychology or any psychology course higher than 85-349. Exceptions for the advanced course requirement are: 85-480, 85-482, 85-484, 85-506, 85-507, 85-508, 85-601, 85-602, 66-501, 66-502.

**Psychology Breadth, Depth, and Application Electives** 27 Units

Three courses from at least two of the Breadth, Depth and Application Categories. Please Consult the psychology department undergraduate website for approved Breadth Electives.

**Depth**


**Application**

- 85-198 Research Training: Psychology
- 85-294 Teaching Assistantship
- 85-480 Internship in Clinical Psychology
- 85-482 Internship in Psychology
- 85-484 Practicum in Child Development
- 85-507 Research in Psychology
- 85-508 Research in Psychology
- 85-601 Senior Thesis
- 85-602 Senior Thesis
- 66-501 Dietrich College Senior Honors Thesis I

**Bachelor of Science in Psychology**

<table>
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<tr>
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*Students who place out of 21-120 with AP credit will have successfully completed the calculus requirement*

**Statistics Sequence** 9 units

- 36-309 Experimental Design for Behavioral & Social Sciences
- or 85-309 Statistical Concepts and Methods for Behavioral and Social Science

**Psychology Surveys** 27 units

- 85-102 Introduction to Psychology * 9
- Survey Courses - Complete Two
  - 85-104 Psychopathology
  - 85-211 Cognitive Psychology
  - or 85-213 Human Information Processing and Artificial Intelligence
  - 85-219 Biological Foundations of Behavior
  - 85-221 Principles of Child Development
  - 85-241 Social Psychology
  - 85-251 Personality

* Introduction to Psychology cannot be substituted; AP credit does not count towards this requirement

**Research Methods** 18 units

Complete two courses.

- 85-310 Research Methods in Cognitive Psychology
- 85-314 Cognitive Neuroscience Research Methods

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**Breadth**

Any 200 level Psychology survey course.

- 85-104 Psychopathology
- 85-105 Hack Your Life
- 85-106 Animal Minds
- 85-107 The Psychology of Video Games

Choose from a list of courses found outside of the department with departments including Biological Sciences, History, English, HCI, Philosophy, Social Decision Sciences and Statistics. The elective list may change and for the most up to date list please contact either Crista Crittenden ccritten@andrew.cmu.edu or Emilie O’Leary at emilier@andrew.cmu.edu.

**Computer Science Requirement**

15-110 Principles of Computing

- or 88-300 Programming and Data Analysis for Social Scientists
- or 15-112 Fundamentals of Programming and Computer Science

**Natural Science Requirement (B.A. 18 units of which include 9 units of Gen Ed Science)**

The B.A. in psychology requires one course beyond the General Education requirement in natural science.

These courses can be selected from the following areas:

- 03-XXX Biology
- 09-XXX Chemistry
- 33-XXX Physics

* Given the growing relevance of biology to psychology, it is strongly recommended to take a course in Biological Sciences
Advanced Courses 27 units
Advanced psychology courses exist within four areas (cognitive, cognitive neuroscience, developmental, social and health psychology.) Any advanced content course or seminar in psychology or any psychology course higher than 85-349. Exceptions for the advanced course requirement are: 85-480, 85-482, 85-484, 85-506, 85-507, 85-508, 85-601, 85-602, 66-501, 66-502.

Psychology Breadth, Depth, and Application Electives 27 Units
Three courses from at least two of the Breadth, Depth and Application Categories. Please Consult the psychology department undergraduate website for approved Breadth Electives.

Depth

Application

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>85-198 Research Training: Psychology</td>
<td>9</td>
</tr>
<tr>
<td>85-294 Teaching Assistanship</td>
<td>Var.</td>
</tr>
<tr>
<td>85-480 Internship in Clinical Psychology</td>
<td>Var.</td>
</tr>
<tr>
<td>85-482 Internship in Psychology</td>
<td>Var.</td>
</tr>
<tr>
<td>85-484 Practicum in Child Development</td>
<td>Var.</td>
</tr>
<tr>
<td>85-507 Research in Psychology</td>
<td>Var.</td>
</tr>
<tr>
<td>85-508 Research in Psychology</td>
<td>Var.</td>
</tr>
<tr>
<td>85-601 Senior Thesis</td>
<td>9</td>
</tr>
<tr>
<td>85-602 Senior Thesis</td>
<td>9</td>
</tr>
<tr>
<td>66-501 Dietrich College Senior Honors Thesis I</td>
<td>9</td>
</tr>
<tr>
<td>66-502 Dietrich College Senior Honors Thesis II</td>
<td>9</td>
</tr>
</tbody>
</table>

Breadth
Any 200 level Psychology survey course.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>85-104 Psychopathology</td>
<td>9</td>
</tr>
<tr>
<td>85-106 Animal Minds</td>
<td>9</td>
</tr>
<tr>
<td>85-107 The Psychology of Video Games</td>
<td>9</td>
</tr>
</tbody>
</table>

or

Choose from a list of courses found outside of the department with departments including Biological Sciences, History, English, HCI, Philosophy, Social Decision Sciences and Statistics. The elective list may change and for the most up to date list please contact either Crista Crittenden ccrittenden@andrew.cmu.edu or Emilie O’Leary at emilier@andrew.cmu.edu

Computer Science Requirement 10 units

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>15-110 Principles of Computing</td>
<td>10</td>
</tr>
<tr>
<td>or 88-300 Programming and Data Analysis for Social Scientists</td>
<td></td>
</tr>
<tr>
<td>or 15-112 Fundamentals of Programming and Computer Science</td>
<td></td>
</tr>
</tbody>
</table>

NATURAL SCIENCE REQUIREMENT (B.S. 27 UNITS OF WHICH INCLUDE 9 UNITS OF GEN ED SCIENCE)
The B.S. in psychology requires two courses beyond the General Education requirement in natural science.

- 03-xxx Biology*
- 09-xxx Chemistry
- 33-xxx Physics

* Given the growing relevance of biology to psychology, it is strongly recommended to take at least one course in Biological Sciences

Additional Major in Psychology
In order to complete an additional major in Psychology, a student must fulfill all of the Psychology major requirements within the department -- in other words, the breadth requirement, computing requirement, three survey courses, two research methods courses, and two advanced courses. These courses must include at least 81 units, plus calculus prerequisites and the 36-200 statistics course or equivalent and 36-309/85-309. In addition, psychology additional major candidates must complete one science course beyond the GenEd requirement if required for college.

Concentrations within the Psychology Major
Students who wish to focus their Psychology program on a specific area can do so either by the careful selection of Psychology elective courses focusing on their area of interest or by pursuing one of the following concentrations. Concentrations are not a required part of the major. Please reach out to Crista Crittenden ccrittenden@andrew.cmu.edu to declare the concentration. The declared concentration will appear in Stellic. The completion of a concentration will be recognized in the Psychology Graduation Program.

Health-Psychology Concentration
For Psychology majors who wish to have a focus of their study on Health Psychology, the following courses should be selected as part of their Psychology Major in conjunction with their Psychology advisor's approval. As part of the natural science requirement, choose two of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-121 Modern Biology</td>
<td>9</td>
</tr>
<tr>
<td>03-132 Basic Science to Modern Medicine</td>
<td>9</td>
</tr>
<tr>
<td>03-133 Neurobiology of Disease</td>
<td>9</td>
</tr>
<tr>
<td>03-135 Structure and Function of the Human Body</td>
<td>9</td>
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</tbody>
</table>

As part of the psychology breadth requirement:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>85-219 Biological Foundations of Behavior</td>
<td>9</td>
</tr>
<tr>
<td>85-241 Social Psychology</td>
<td>9</td>
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</tbody>
</table>

As part of the psychology Research Methods requirements:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>85-340 Research Methods in Social Psychology</td>
<td>9</td>
</tr>
</tbody>
</table>

As part of the advanced coursework in psychology requirement, at least two of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>85-358 Pro-Social Behavior</td>
<td>9</td>
</tr>
<tr>
<td>85-422 Clinical Psychology: Science and Practice</td>
<td>9</td>
</tr>
<tr>
<td>85-442 Health Psychology</td>
<td>9</td>
</tr>
<tr>
<td>85-443 Social Factors and Well-Being</td>
<td>9</td>
</tr>
<tr>
<td>85-446 Psychology of Gender</td>
<td>9</td>
</tr>
</tbody>
</table>

As part of the Breadth, Depth and Application requirement, at least one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>85-480 Internship in Clinical Psychology</td>
<td>9</td>
</tr>
<tr>
<td>85-507 Research in Psychology</td>
<td>9</td>
</tr>
<tr>
<td>85-508 Research in Psychology</td>
<td>9</td>
</tr>
<tr>
<td>85-482 Internship in Psychology</td>
<td>9</td>
</tr>
</tbody>
</table>

and for the most up to date list please contact either Crista Crittenden ccrittenden@andrew.cmu.edu or Emilie O’Leary at emilier@andrew.cmu.edu

Cognitive-Neuroscience Concentration
For Psychology majors who wish to have a focus of their study on Cognitive Neuroscience, the following courses should be selected as part of their Psychology Major in conjunction with their Psychology advisor's approval.

As part of the natural science requirement, choose two of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-121 Modern Biology</td>
<td>9</td>
</tr>
<tr>
<td>03-363 Systems Neuroscience</td>
<td>9</td>
</tr>
<tr>
<td>03-366 Neuropsycharmacology: Drugs, Brain and Behavior</td>
<td>9</td>
</tr>
</tbody>
</table>

As part of the psychology breadth requirement:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>85-211 Cognitive Psychology</td>
<td>9</td>
</tr>
<tr>
<td>85-219 Biological Foundations of Behavior</td>
<td>9</td>
</tr>
</tbody>
</table>

As part of the Research Methods requirements:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>85-310 Research Methods in Cognitive Psychology</td>
<td>9</td>
</tr>
<tr>
<td>85-314 Cognitive Neuroscience Research Methods</td>
<td>9</td>
</tr>
</tbody>
</table>

As part of the advanced coursework in psychology requirement, at least two of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>85-351 What is Attention?</td>
<td>9</td>
</tr>
<tr>
<td>85-356 Expertise: The cognitive (neuro)science of mastering almost any skill</td>
<td>9</td>
</tr>
<tr>
<td>85-359 Introduction to Music Cognition Research</td>
<td>9</td>
</tr>
</tbody>
</table>
Cognitive Psychology and/or Cognitive Modeling, the following courses should be selected as part of their Psychology Major in conjunction with their Psychology advisor's approval.

As part of the B.S. science requirement: Units
03-121 Modern Biology 9

As part of the psychology Breadth requirement: 9
85-211 Cognitive Psychology

As part of the psychology Research Methods requirement: 9
85-310 Research Methods in Cognitive Psychology

As part of the advanced coursework in psychology requirement, at least two of the following: 9
85-351 What is Attention?
85-356 Expertise: The cognitive (neuro)science of mastering almost any skill
85-359 Introduction to Music Cognition Research
85-360 Origins of Intelligence
85-363 Attention, Its Development and Disorders
85-370 Perception
85-385 Auditory Perception: Sense of Sound
85-395 Applications of Cognitive Science
85-407 How the Brain Makes Meaning
85-408 Visual Cognition
85-412 Cognitive Modeling
85-414 Cognitive Neuropsychology
85-419 Introduction to Parallel Distributed Processing
85-421 Language and Thought
85-435 Biologically Intelligent Exploration

As part of the Breadth, Depth and Application requirement, at least one of the following:
85-507 Research in Psychology Var.
85-508 Research in Psychology Var.
88-342 The Neuroscience of Decision Making 9
Or an additional advanced psychology seminar from the list above

Learning and Developmental Psychology Concentration

For Psychology majors who wish to have a focus of their study be on Behavior and Developmental Psychology, the following courses should be selected as part of their Psychology Major in conjunction with their Psychology advisor's approval.

As part of the B.S. science requirement, choose one of the following: Units
03-125 Evolution 9
03-121 Modern Biology 9
03-364 Developmental Neuroscience 9
03-365 Neural Correlates of Learning and Memory 9

As part of the psychology Breadth requirement: 9
85-211 Cognitive Psychology
85-221 Principles of Child Development

As part of the psychology Research Methods Requirement: 9
85-310 Research Methods in Cognitive Psychology
85-320 Research Methods in Developmental Psychology

As part of the advanced coursework in psychology requirement, at least two of the following: 9
85-343 Children, Race, and Racism
85-351 What is Attention?
85-354 Infant Language Development
85-360 Origins of Intelligence
85-363 Attention, Its Development and Disorders
85-375 Crosscultural Psychology
85-394 Development in Context: Applying Theory and Research to Support Thriving
85-407 How the Brain Makes Meaning
85-408 Visual Cognition
85-418 Infant development: Inside the mind of babies

As part of the Breadth, Depth and Application requirement, at least two of the following: 9
85-294 Teaching Assistantship Var.
85-484 Practicum in Child Development Var.
85-507 Research in Psychology Var.
85-508 Research in Psychology Var.
76-420 The Cognition of Reading and Writing: Introduction to a Social/Cognitive Process 9
05-291 Learning Media Design 12
05-418 Design Educational Games 12
57-331 Principles of Education 9
Or an additional advanced psychology seminar from the list above

Social-Personality Psychology Concentration

For Psychology majors who wish to have a focus of their study be on Social and/or Personality Psychology, the following courses should be selected as part of their Psychology Major in conjunction with their Psychology advisor's approval.

As part of the Psychology Breadth requirement: Units
85-104 Psychopathology 9
85-241 Social Psychology 9
85-251 Personality 9

As part of the Psychology Research Methods requirement: 9
85-340 Research Methods in Social Psychology

As part of the advanced coursework in psychology requirement, at least two of the following: 9
85-350 Psychology of Prejudice
85-358 Pro-Social Behavior
85-375 Crosscultural Psychology
85-377 Attitudes and Persuasion
85-442 Health Psychology
85-443 Social Factors and Well-Being
85-444 Relationships
85-446 Psychology of Gender

As part of the Breadth, Depth and Application requirement, at least one of the following: 9
85-507 Research in Psychology Var.
85-508 Research in Psychology Var.
85-482 Internship in Psychology Var.
05-320 Social Web 12
Clinical/Counseling Psychology Concentration

For Psychology majors who wish to have a focus of their study be on Clinical/Counseling Psychology, the following courses should be selected as part of their Psychology Major in conjunction with their Psychology advisor's approval.

One of the following:
- 03-133 Neurobiology of Disease 9 units
- 03-366 Neuroparmacology: Drugs, Brain and Behavior 9 units
- 09-303 Hooked: The Molecular Basis of Addiction 6 units

As part of the Psychology Breadth requirement at least two of the following:
- 85-221 Principles of Child Development 9 units
- 85-241 Social Psychology 9 units
- 85-251 Personality 9 units

Required coursework:
- 85-104 Psychopathology 9 units
- 85-422 Clinical Psychology: Science and Practice 9 units
- 85-480 Internship in Clinical Psychology 9 units

As part of the Psychology Research Methods requirements at least one of the following:
- 85-320 Research Methods in Developmental Psychology 9 units
- 85-340 Research Methods in Social Psychology 9 units

As part of the advanced coursework in psychology requirement, at least two of the following:
- 85-343 Children, Race, and Racism 9 units
- 85-358 Pro-Social Behavior 9 units
- 85-363 Attention, Its Development and Disorders 9 units
- 85-375 Crosscultural Psychology 9 units
- 85-377 Attitudes and Persuasion 9 units
- 85-442 Health Psychology 9 units
- 85-443 Social Factors and Well-Being 9 units
- 85-444 Relationships 9 units
- 85-446 Psychology of Gender 9 units

Neuroscience Major

The Psychology Department at Carnegie Mellon University has a major focus on the role of the brain and nervous system in cognition and behavior, including biological approaches involving the health impact that arises from the interaction of behavior with the nervous, endocrine, and immune systems. These interests are manifested in faculty research (http://www.cmu.edu/dietrich/psychology/research-areas/), departmental and university centers that operate from or heavily involve the department (e.g., the Center for Cognitive Brain Imaging (http://www.ccbi.cmu.edu/)) as well as undergraduate coursework (http://www.cmu.edu/dietrich/psychology/undergraduate/) and graduate coursework.

For undergraduates, there are a number of ways in which students with an interest in these approaches can pursue that interest in an organized fashion. Major requirements for the Bachelor of Science in Neuroscience can be found under Intercollege Programs (http://coursescatalog.web.cmu.edu/intercolleg programs/ #bachelorscienceinneurosciencetext).

Carnegie Mellon University recently launched BrainHub – an initiative designed to leverage its core strengths in cognitive science, engineering, and computer science, and our emerging excellence in biological sciences, to harness the technology that helps the world explore brain and behavior. Students will be able to take advantage of exciting opportunities such as lectures hosted on various topics, newly funded CMU campus research projects trying to answer pressing questions in brain science and the many global partnerships with other institutions all with the same motivating goal to enhance and increase research in brain sciences.

Finally, for any interested student, there is a Minor in Cognitive Neuroscience (p. 7) available through the Psychology department.

The Major in Cognitive Science

The Psychology Department offers a B.S. degree in Cognitive Science. The field of cognitive science has grown out of increasingly active interaction among psychology, linguistics, artificial intelligence, philosophy, and neuroscience. All of these fields share the goal of understanding intelligence. By combining these diverse perspectives, students of cognitive science are able to understand cognition at a deep level. Because this major is administered by the Psychology Department, it focuses on human cognition and the experimental study of the human mind as illuminated by the techniques of the above disciplines.

Cognitive Science Curriculum

The Cognitive Science major is only offered as a B.S. degree. Candidates should complete before the junior year the calculus requirement 21-120 (or alternatively 21-111/21-112) and a statistics sequence (36-200 or equivalent and if possible, 36-309/85-309). In addition, candidates complete 15-112 Fundamentals of Programming and Computer Science, as their departmental computing course.

Because of the number and sequential nature of required courses, prospective Cognitive Science majors are encouraged to begin course work for the major prior to junior year. In particular, completion of calculus, 36-200, and 85-211 or 85-213 before the junior year will enable students to complete one of the following 85-310/85-314/85-330 and 36-309/85-309 and by the Fall semester of their sophomore or junior year and, if interested, to then take advantage of research opportunities in the department. The Psychology Department (https://www.cmu.edu/dietrich/psychology/undergraduate/current-students/research-and-internships/research- opportunities/) website has more information regarding research for credit opportunities available to undergraduates.

Computing Prerequisite 10 units
- 15-112 Fundamentals of Programming and Computer Science 12 units

Mathematics 29-30 units
- 21-111-21-112 Calculus I-II 20 units
- or 21-120 Differential and Integral Calculus 10 units
- 21-127 Concepts of Mathematics 10 units

*Students who place out of 21-120 will have fulfilled the calculus requirement.

Statistics Sequence 18 units
- 36-200 Reasoning with Data 9 units
- 36-309 Experimental Design for Behavioral & Social Sciences 9 units
- or 85-309 Statistical Concepts and Methods for Behavioral and Social Science 9 units

Computational/Cognitive Modeling Core 29-31 units
- Two of the following:
  - 15-122 Principles of Imperative Computation 10 units
  - 15-150 Principles of Functional Programming 10 units
  - 15-251 Great Ideas in Theoretical Computer Science 12 units

- Plus one of the following:
  - 85-412 Cognitive Modeling 9 units
  - 85-419 Introduction to Parallel Distributed Processing 9 units
  - 85-435 Biologically Intelligent Exploration 9 units

Cognitive Psychology Core 27 units
- 85-211 Cognitive Psychology 9 units
- or 85-213 Human Information Processing and Artificial Intelligence 9 units

- Plus two of the following, one of which need to be 85-xxx:
  - 85-219 Biological Foundations of Behavior 9 units
Cognitive Science Concentration

(3 courses, concentration approval required)

These three courses are chosen in conjunction with your advisor to form a coherent area of concentration from the course list under "Cognitive Science Concentration" in the current Undergraduate Catalog. Before proceeding with the choice of courses, students must fill out the concentration form, obtained from Emilie O'Leary in Baker Hall 339, with a description of the concentration area and the planned set of three courses. Courses not represented on the list may, with pre-approval of advisor and department, be used to satisfy part of this requirement. **The three courses are not required to be within any single category below but be coherent within the major and the focus may vary across disciplinary boundaries.** Courses taken for the major requirements can not be double counted in the concentration.

<table>
<thead>
<tr>
<th>Computer Science</th>
<th>Psychology</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-385 Computer Vision</td>
<td>85-219 Biological Foundations of Behavior</td>
</tr>
<tr>
<td>15-453 Formal Languages, Automata, and Computability</td>
<td>85-354 Infant Language Development</td>
</tr>
<tr>
<td>15-213 Introduction to Computer Systems</td>
<td>85-360 Origins of Intelligence</td>
</tr>
<tr>
<td>85-370 Perception</td>
<td>85-363 Attention, Its Development and Disorders</td>
</tr>
<tr>
<td>85-375 Crosscultural Psychology</td>
<td>85-385 Auditory Perception: Sense of Sound</td>
</tr>
<tr>
<td>85-351 What is Attention?</td>
<td>85-356 Expertise: The cognitive (neuro)science of mastering almost any skill</td>
</tr>
<tr>
<td>85-359 Introduction to Music Cognition Research</td>
<td>85-382 The Psychology and Neuroscience of Consciousness</td>
</tr>
<tr>
<td>85-408 Visual Cognition</td>
<td>85-407 How the Brain Makes Meaning</td>
</tr>
<tr>
<td>85-412 Cognitive Modeling</td>
<td>85-414 Cognitive Neuropsychology</td>
</tr>
<tr>
<td>85-419 Introduction to Parallel Distributed Processing</td>
<td>85-421 Language and Thought</td>
</tr>
<tr>
<td>85-423 Cognitive Development</td>
<td>85-426 Learning in Humans and Machines</td>
</tr>
<tr>
<td>85-429 Cognitive Brain Imaging</td>
<td>85-432 Data Science for Psychology and Neuroscience</td>
</tr>
</tbody>
</table>

**Philosophy**

| 80-210 Logic and Proofs | 80-211 Logic and Mathematical Inquiry |
| 80-220 Philosophy of Science | 80-249 AI, Society, and Humanity |
| 80-254 Analytic Philosophy | 80-255 Pragmatism |
| 80-270 Problems of Mind and Body: Meaning and Doing | 80-271 Mind and Body: The Objective and the Subjective |
| 80-310 Formal Logic | 80-311 Undecidability and Incompleteness |
| 80-280 Linguistic Analysis | 80-315 Modal Logic |
| 80-316 Meaning in Language | 76-385 Introduction to Discourse Analysis |

**Decision Sciences**

| 88-275 Bubbles: Data Science for Human Minds | 88-302 Behavioral Decision Making |
| 88-380 Dynamic Decisions | 88-231 Thinking in Person vs. Thinking Online |
| 88-230 Human Intelligence and Human Stupidity | 88-223 Decision Analysis |
| 88-120 Reason, Passion and Cognition | 88-120 Reason, Passion and Cognition |

**Neurosciences**

| 03-133 Neurobiology of Disease | 03-365 Neural Correlates of Learning and Memory |
| 03-366 Neuropharmacology: Drugs, Brain and Behavior | 03-370 Principles of Biotechnology |
| 86-375 Computational Perception | 03-362 Cellular Neuroscience |
| 03-363 Systems Neuroscience | 42-202 Physiology |
| 15-386 Neural Computation | 15-883 Computational Models of Neural Systems |
Science Requirement
The Cognitive Science program requires two additional science courses beyond the college's one course Science General Education requirement. These can be selected from any one of the following areas.

03-xxx Biology
09-xxx Chemistry
33-xxx Physics

* Those interested in a cognitive neuroscience focus are recommended to take biology courses, including if possible, 03-362, or 03-363.

Additional Major in Cognitive Science
In order to complete a double major in Cognitive Science, a student must fulfill the major requirements as listed under the Cognitive Science major. These include the programming requirement (15-112), the Mathematics and Statistics prerequisites, Computational/Cognitive Modeling Core, The Cognitive Psychology Core, the Cognitive Science Concentration Requirement, and the Supplementary Science Requirement. Students will be assigned a department advisor to help plan their program of studies in Cognitive Science.

Unified Double Major in Psychology & Biological Sciences
Veronica Hinman, Department Head, Biological Sciences
Michael Tarr, Department Head, Psychology

This major is intended to reflect the interdisciplinary nature of current research in the fields of biology and psychology, as well as the national trend in some professions to seek individuals broadly trained in both the social and natural sciences.

Note: Students entering from the Dietrich College of Humanities and Social Sciences will earn a Bachelor of Science in Psychology and Biological Sciences. Students in the Mellon College of Science will earn a Bachelor of Science in Biological Sciences and Psychology.

Depending on a student's home college (DC or MCS), General Education (GenEd) requirements will be different. GenEd requirements for DC (http:// coursescatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/#hampssgeneraleducationprogram160) and MCS (http://coursescatalog.web.cmu.edu/schools-colleges/melloncollegeofscience/) are found on their respective Catalog pages.

Degree Requirements:

<table>
<thead>
<tr>
<th>Biological Sciences</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-151 Honors Modern Biology</td>
<td>10</td>
</tr>
<tr>
<td>or 03-121 Modern Biology</td>
<td></td>
</tr>
<tr>
<td>03-220 Genetics</td>
<td>9</td>
</tr>
<tr>
<td>or 03-221 Genomics, Evolution, and Disease: Introduction to Quantitative Genetic Analysis</td>
<td></td>
</tr>
<tr>
<td>03-231 Honors Biochemistry</td>
<td>9</td>
</tr>
<tr>
<td>03-320 Cell Biology</td>
<td>9</td>
</tr>
<tr>
<td>03-343 Experimental Techniques in Molecular Biology</td>
<td>12</td>
</tr>
<tr>
<td>03-411 Topics in Research</td>
<td>1</td>
</tr>
<tr>
<td>03-412 Topics in Research</td>
<td>1</td>
</tr>
<tr>
<td>03-xxx General Biology Elective</td>
<td>9</td>
</tr>
<tr>
<td>03-3xx Advanced Biology Elective</td>
<td>18</td>
</tr>
</tbody>
</table>

Total Biology units 78

1 Please see description and requirements for electives under the B.S. in Biological Sciences section of this Catalog.

36-309 Experimental Design for Behavioral & Social Sciences
36-309 Statistical Concepts and Methods for Behavioral and Social Science
33-121 Physics I for Science Students 2
33-141 Physics I for Engineering Students
15-110 Principles of Computing
15-112 Fundamentals of Programming and Computer Science
99-101 Computing @ Carnegie Mellon

Total Science units 63-65

2 MCS students must also complete 33-122 Physics II for Biological Sciences & Chemistry Students.

Chemistry

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>09-105 Introduction to Modern Chemistry I</td>
</tr>
<tr>
<td>09-106 Modern Chemistry II</td>
</tr>
<tr>
<td>09-217 Organic Chemistry I</td>
</tr>
<tr>
<td>09-218 Organic Chemistry II</td>
</tr>
<tr>
<td>09-207 Techniques in Quantitative Analysis</td>
</tr>
<tr>
<td>09-208 Techniques for Organic Synthesis and Analysis</td>
</tr>
</tbody>
</table>

Total Chemistry units 56

85-102 Introduction to Psychology
85-219 Biological Foundations of Behavior
85-2xx Survey Psychology Courses
85-310 Research Methods in Cognitive Psychology
85-314 Cognitive Neuroscience Research Methods
85-320 Research Methods in Developmental Psychology
85-330 Analytic Research Methods
85-340 Research Methods in Social Psychology
85-3xx Advanced Psychology Electives

Total Psychology units 63

* Excluding 85-261 Psychopathology

Additional Advanced Elective 9 units
(Choose one of the following courses)
85-3xx Advanced Psychology Elective 9 units
or 03-3xx Advanced Biology Elective 9 units

Additional Laboratory or Research Methods 9-12 units
(Choose one of the following courses)
03-344 Experimental Biochemistry
03-345 Experimental Cell and Developmental Biology
03-346 Experimental Neuroscience
85-310 Research Methods in Cognitive Psychology
85-314 Cognitive Neuroscience Research Methods
85-320 Research Methods in Developmental Psychology
85-340 Research Methods in Social Psychology

Elective Units
Free Electives 33-36
MCS Nontechnical Breadth or DC General Education requirements 36-48

Total Elective units 69-84

Minimum number of units required for degree: 360

Minors in Psychology and Cognitive Neuroscience

Minor in Psychology 72 units
I. Introductory course
85-102 Introduction to Psychology * 9 units

* A survey course can be taken in place of 85-102.
II. Area Survey courses
Complete two courses.
85-104 Psychopathology
85-211 Cognitive Psychology
or 85-213 Human Information Processing and Artificial Intelligence
85-219 Biological Foundations of Behavior
85-221 Principles of Child Development
85-241 Social Psychology
85-251 Personality

III. Statistics
36-200 Reasoning with Data
36-309 Experimental Design for Behavioral & Social Sciences
or 85-309 Statistical Concepts and Methods for Behavioral and Social Science

27 units Uper Level Courses
Complete three courses from categories IV and V, with at least one course from each.

IV. Research Methods Courses * (minimum 9 units)
85-310 Research Methods in Cognitive Psychology
85-314 Cognitive Neuroscience Research Methods
85-320 Research Methods in Developmental Psychology
85-330 Analytic Research Methods
85-340 Research Methods in Social Psychology

* Prerequisites for all Research Methods courses: 36-309/85-309 and the appropriate survey course.

V. Advanced courses (minimum 9 units)
Advanced psychology courses exist within four areas (cognitive, cognitive neuroscience, developmental, social and health psychology.) Any advanced content course or seminar in psychology or any psychology course higher than 85-350. Exceptions for the advanced course requirement are: 85-460, 85-462, 85-484, 85-484, 85-506, 85-507, 85-508, 85-601, 85-602, 66-501, 66-502.

Minor in Cognitive Neuroscience 63 units
The minor in Cognitive Neuroscience offered by the Department of Psychology is similar to the Neuroscience Minor offered by the Department of Biological Sciences. The differences between the two forms of the minor are determined by one required course, and additionally, by the students' choice of distribution electives. The requirements for the Cognitive Neuroscience Minor include 7 courses: four required courses, and three distribution and elective courses.
Because of the curriculum within this minor may overlap with some degree requirements, no more than 2 courses fulfilling Neuroscience or Cognitive Neuroscience Minor requirements may count towards a student's major or other minor requirements.

Cognitive Neuroscience Curriculum
Required Coursework
02-121 Modern Biology
03-363 Systems Neuroscience
85-219 Biological Foundations of Behavior
or 03-161 Molecules to Mind
85-211 Cognitive Psychology
or 03-362 Cellular Neuroscience

Distribution Requirements
Three courses, including at least 1 from each of the following categories
Approaches to Cognitive Neuroscience
85-104 Psychopathology
85-106 Animal Minds
85-314 Cognitive Neuroscience Research Methods
85-382 The Psychology and Neuroscience of Consciousness
85-407 How the Brain Makes Meaning
85-408 Visual Cognition
85-412 Cognitive Modeling
85-414 Cognitive Neuropsychology
85-419 Introduction to Parallel Distributed Processing
85-435 Biologically Intelligent Exploration
15-386 Neural Computation
15-883 Computational Models of Neural Systems
36-746 Statistical Methods for Neuroscience and Psychology
86-375 Computational Perception

The Honors Program
The Honors Program provides recognition of outstanding performance by students in the Psychology department. Participation enables students to pursue their own research ideas through completion of an honors thesis. The honors thesis is completed during the senior year. By completing a thesis, the student earns 18 units of credit and qualifies for graduation with “College Honors.” To qualify for the Honors Program, the student must maintain a quality point average of at least 3.50 in the major and 3.25 overall. More information on the honor program can be found here (http://www.cmu.edu/dietrich/undergraduate/programs/shp/).
A year long departmental senior thesis course exists (66-501 and 66-502) for students interested in pursuing a sizable research project who do not qualify for the honors program. More information can be obtained by contacting Emilie O'Leary at emiliere@andrew.cmu.edu.

Faculty
JOHN R. ANDERSON, Richard King Mellon University Professor of Psychology and Computer Science – Ph.D., Stanford University; Carnegie Mellon, 1978–
JESSICA CANTLON, Ronald J. and Mary Ann Zdrojekowsi Associate Professor of Developmental Neuroscience – Ph.D., Duke University; Carnegie Mellon, 2007–
SHARON CARVER, Teaching Professor, Psychology; Associate Dean of Student Affairs, Dietrich College – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1993–
CHANTE COX-BOYD, Associate Teaching Professor – Ph.D., University of North Carolina at Chapel Hill; Carnegie Mellon, 1999–
DAVID CRESWELL, Professor – Ph.D., University of California, Los Angeles; Carnegie Mellon, 2008–
KASEY CRESWELL, Associate Professor – Ph.D., University of Pittsburgh; Carnegie Mellon, 2012–
BROOKE C. FEENEY, Professor – Ph.D., State University of New York at Buffalo; Carnegie Mellon, 2001–
ANNA FISHER, Associate Professor – Ph.D., The Ohio State University; Carnegie Mellon, 2006–
VICKI S. HELGESON, Professor – Ph.D., University of Denver; Carnegie Mellon, 1990–
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MARCEL A. JUST, D. O. Hebb University Professor of Psychology – Ph.D., Stanford University; Carnegie Mellon, 1972–
ROBERTA KLATZKY, Charles J. Queenen Jr. University Professor of Psychology – Ph.D., Stanford University; Carnegie Mellon, 1993–
KENNETH R. KOEDINGER, Hillman Professor & METALS Program Director – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2001–
MARSHA C. LOVETT, Teaching Professor – Ph.D., Carnegie Mellon University; Carnegie Mellon, 2000–

BRIAN MACWHINNEY, Teresa Heinz Professor of Cognitive Psych – Ph.D., University of California, Berkeley; Carnegie Mellon, 1981–

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DAVID PLAUT, Professor of Psychology – Ph.D., Carnegie Mellon University; Carnegie Mellon, 1994–

DAVID RAKISON, Associate Professor – D.Phil., University of Sussex; Carnegie Mellon, 2000–

MICHAEL TARR, Professor & Dept Head and Kavčič-Moura Professor of Cognitive and Brain Science – Ph.D., Massachusetts Institute of Technology; Carnegie Mellon, 2009–

ERIK D. THIESSEN, Associate Professor, Director of Undergraduate Education in Psychology – Ph.D., University of Wisconsin, Madison; Carnegie Mellon, 2004–

MICHAEL TRUJILLO, Assistant Professor - PhD, Virginia Commonwealth University; Carnegie Mellon, 2018–

TIMOTHY VERSTYNEN, Associate Professor and Co Director of the CMU-Pitt BRIDGE Center - Ph.D., University of California, Berkeley ; Carnegie Mellon, 2006–