
Cognitive Science @ Yale

Prospective Majors Informational Meeting

December 1st, 2010

For further information, you can contact:

DUS	: Brian Scholl	(Psychology; brian.scholl@yale.edu)
Acting Chair (Fall 2010)	: Larry Horn	(Linguistics; laurence.horn@yale.edu)
Acting Chair (Spring 2011)	: Brian Scassellati	(Computer Science, scaz@cs.yale.edu)
Senior Colloquium Director	: Tamar Gendler	(Philosophy, tamar.gendler@yale.edu)

Contents

1. Introductory handout (2 pages)
2. 2010-2011 Bluebook information (1 page)
3. "Applying to the Major" FAQs (5 pages)
4. Additional online FAQs (2 pages)

Cognitive Science @ Yale

What is Cognitive Science?

Cognitive science is an interdisciplinary field devoted to exploring the nature of cognitive processes such as perception, reasoning, decision-making, memory, attention, language, imagery, motor control, and problem-solving. The goal of cognitive science is to understand (1) the representations and processes in our minds that underwrite these capacities, (2) how they are acquired, and how they develop, and (3) how they are implemented in underlying hardware (biological or otherwise). Stated more simply, the goal of cognitive science is to understand **how the mind works!** Trying to understand our own minds is one of the most ambitious and exciting projects in all of science, and requires insights drawn from many different traditional academic disciplines. As a result, cognitive science is an inherently interdisciplinary endeavor, drawing on tools and ideas from fields including psychology, computer science, linguistics, philosophy, and neuroscience (among others).

What do students study in the cognitive science major?

The major was initiated in part because existing majors in the contributing disciplines did not allow for a full interdisciplinary investigation of the mind. Students, for example, might be interested in studying the nature of visual experience or language, and find relevant courses distributed across many different disciplines. The cognitive science major allows such students to develop a program of study which is focused on underlying *problems* rather than on the *methods* used to address those problems.

There are several courses in Yale College which are primarily based in the cognitive science major — including *Introduction to Cognitive Science*, *Brain & Thought*, *The Modern Unconscious*, *Computational Models in Cognitive Science*, *Philosophy and the Science of Human Nature*, a *Junior Seminar* and *Senior Colloquium*, and various one-time or occasional seminars (e.g. *The Cognitive Science of Causality* and *The Cognitive Science of Good and Evil*, both to be taught in 2010-2011). The bulk of courses that contribute to the cognitive science major are then drawn from the various contributing disciplines. These include various courses in Computer Science (e.g. *Artificial Intelligence* and *Social Robotics*), Linguistics (e.g. *Evolution of Language* and *Language Acquisition*), MCDB (e.g. *Neurobiology* and *Brain Development and Plasticity*), Philosophy (e.g. *Philosophy of Mind* and *Mathematical Logic*), and Psychology (e.g. *Infant Cognition* and *Sex, Evolution, and Human Nature*). Beyond these core disciplines, there is also a smaller collection of relevant courses drawn from other majors and departments, including Anthropology (e.g. *Evolution and Human Behavior*), Economics (e.g. *Game Theory*), EP&E (e.g. *Philosophy of Social Science*), the School of Management (e.g. *Behavioral Decision Making*), and even Music (e.g. *Music Cognition*) and Art (e.g. *Visual Thinking*).

What can you do with a major in cognitive science?

Lots of things! For some students, studying cognitive science is an exercise in 'pure' science — with the goal of understanding the nature of human nature. These students often continue their studies in graduate school — either in a department of cognitive science, or in a traditional department of computer science, psychology, philosophy, linguistics, or neuroscience. Our majors have excellent track records of being admitted into the top programs in such disciplines.

Other students use their training in cognitive science in the service of directly applied interests. In fact, for almost every cognitive process that some scientists study in a 'pure' way, others are attempting to capitalize on this newfound understanding by building artificial devices to either

replicate these processes, or to aid their execution in humans. For example: (1) understanding object recognition may help to design satellites that can recognize what they're looking at; (2) understanding language processing may help to design computers that can interact efficiently with their users via verbal interfaces; or (3) understanding attention may help to design aircraft cockpits which minimize distractions while simultaneously capturing pilots' attention during emergencies. Students with such interests may thus head into industry research jobs after majoring in cognitive science.

Still other students may apply their training in cognitive science in a wide range of careers to other human activities which involve various cognitive processes, for example (1) using knowledge about how memory works to inform and reform practices in courtroom trials or witness lineups; (2) using knowledge about reasoning and problem solving to improve education and educational testing; or (3) using knowledge about attention and decision making to design more effective advertising and marketing.

Finally, several majors each year also complete Yale's pre-med requirements, intending to complement their later training in medical school with the 'big picture' insights about human nature that they gain while studying cognitive science.

Why must students apply and be accepted to this major?

Unlike most majors at Yale, Cognitive Science requires students to apply and be accepted to the major (during the end of their third semester). There are several reasons for this: (1) By encompassing so many disciplines, cognitive science presents fantastic opportunities for interdisciplinary studies, but also some dangers. In particular, with so much breadth comes the danger that students' study programs will lack cohesiveness, being a somewhat haphazard collection of unrelated courses. The application process ensures that this is not the case. (2) Similarly, the cognitive science major can appeal to students for the wrong reasons — e.g. because students don't know what to major in, and cognitive science seems to afford more flexibility than usual. In contrast, we seek majors who have specific ideas about how to craft a focused interdisciplinary plan of study in this area that cannot be satisfied by one of the standard majors. (3) Because cognitive science requires mastery of so many different approaches and disciplines, it fits best with students who are able to perform well in many different kinds of classes. The application process thus includes an evaluation of students' academic performance so far at Yale. (4) Finally, the major is structured in a way that presents special opportunities for seniors in the Senior Colloquium, and spaces are limited.

What are some sample themes that help to structure students' course plans?

Irrationality; Visual neuroscience; The self and moral cognition; Cognition and the arts; Language; Human-Robot Interaction; Connections between brain and behavior; Automaticity in cognition

What are some of the labs where students can get CogSci research experience?

Affective Sensory Neuroscience Lab, Automaticity in Cognition, Motivation & Emotion Lab, Center for Customer Insights, Cognition & Development Lab, Comparative Cognition Lab, Computational Lab of Cortical Dynamics, Computational Linguistics Group, Computational Vision Lab, Consumer Decision Making Lab, Cultural Cognition Project, Developmental Disabilities Clinic, Developmental Neurobiology Lab, Developmental Neuroimaging Lab, Fear Learning Lab, Graphics Lab, Haskins Laboratories, Infant Cognition Lab, Language & Cognition Lab, Memory & Cognition Lab, Neuron Lab, Neuroscience of Learning & Memory Lab, Perception & Cognition Lab, Psycho-Neuro-Linguistics Lab, Psychopathology & Cognitive Processing Lab, Sense Lab, Sensory Information Processing Lab, Social Cognitive & Affective Neuroscience Lab, Social Robotics Lab, Systems Neurophysiology and Neuroengineering Lab, Thinking Lab, Visual Cognitive Neuroscience Lab, Visual Neuroscience Lab, ...

Want more information?

<http://www.yale.edu/cogsci/>

Cognitive Science Bluebook Information (2010-2011)

Cognitive science explores the nature of cognitive processes such as perception, reasoning, memory, attention, language, decision making, imagery, motor control, and problem solving. The goal of cognitive science, stated simply, is to understand how the mind works. Cognitive science is an inherently interdisciplinary endeavor, drawing on tools and ideas from fields such as psychology, computer science, linguistics, philosophy, and neuroscience. Approaches include empirical studies of the ontogenetic and phylogenetic development of cognitive abilities, experimental work on cognitive processing in adults, attempts to understand perception and cognition based on patterns of breakdown in pathology, computational and robotic research that strives to simulate aspects of cognition and behavior, neuroscientific investigations of the neural bases of cognition using neural recording and brain scanning, and the development of philosophical theories of the nature of mind.

Introductory courses An introductory survey course, CGSC 110a, is normally taken by the end of the fall term of the sophomore year and prior to admission to the major. An introductory survey course in psychology, linguistics, computer science, neuroscience, or philosophy should also be taken by the end of the fall term of the sophomore year.

Requirements of the major Fifteen course credits are required for the major, including the two introductory courses and the senior colloquium and project. The remaining twelve term courses are chosen from an approved list that includes courses in psychology, linguistics, computer science, neuroscience, and philosophy bearing on the study of the mind and its relation to the brain. Beyond these core areas, the program also draws on relevant courses in anthropology, art, biology, economics, and music. Majors take four courses in one core field, three in another, two in a third, and one in a fourth, with the remaining two courses selected (with the approval of the director of undergraduate studies) from courses relevant to the student's program in Cognitive Science. The particular selection of courses must be approved by the director of undergraduate studies in order to assure overall coherence and breadth. Courses taken Credit/D/Fail may not be counted toward the requirements of the major, except with permission of the director of undergraduate studies.

Specific programs will vary considerably depending on the student's choice of areas of concentration, as well as the offerings of participating departments from year to year. Themes that have structured course work in the major in recent years include irrationality, visual neuroscience, the self and moral cognition, language, cognition and the arts, and connecting the brain and behavior.

Senior requirement In the senior year, majors take the senior colloquium and project, CGSC 490a and 491b. In the fall term students begin researching and writing a senior essay under the guidance of an appropriate faculty member in an area of cognitive science. In the spring term students complete the senior essay. Throughout the senior year, students meet regularly with one another and with the faculty in the context of this course to discuss current work in cognitive science and their own developing research projects.

Application to the major Students must apply to enter the major at the end of the fall term of the sophomore year. Applications must be made in writing to the director of undergraduate studies no later than Friday, December 10, in 109 K. Applications must include both an official or unofficial transcript of work at Yale that lists fall-term 2010 courses and a brief statement of purpose, which serves to indicate academic interests and expected focus within the areas of the Cognitive Science major. Application forms and answers to frequently asked questions are available on the [program's Web site](#). Applicants will be notified of decisions concerning admission to the major in January 2011.

REQUIREMENTS OF THE MAJOR

Prerequisites CGSC 110a or equivalent; 1 intro survey course in related discipline, as specified

Number of courses 15 course credits (incl prereqs and senior req)

Distribution of courses 4 term courses from one core field, 3 from another, 2 from a third, and 1 from a fourth; 2 addtl term courses from relevant area

Senior requirement CGSC 490a, 491

Applying to the Major

(from <http://www.yale.edu/perception/cogsci/>)

Why do students need to apply to the major?

Unlike most majors at Yale, Cognitive Science requires students to apply and be accepted to the major. There are several reasons for this:

1. By encompassing so many disciplines, cognitive science presents fantastic opportunities for interdisciplinary studies, but also some dangers. In particular, with so much breadth comes the danger that students' study programs will lack cohesiveness, being a somewhat haphazard collection of unrelated courses. The application process ensures that this is not the case (see [*How are applications evaluated?*](#)).
2. Similarly, the cognitive science major can appeal to students for the wrong reasons -- e.g. because students don't know what to major in, and cognitive science seems to afford more flexibility than usual. In contrast, we seek majors who have particular ideas about how to craft a focused interdisciplinary plan of study in this area that cannot be satisfied by one of the standard majors. The application essay is designed to assess such things.
3. Though many courses may count for the major, these choices can only be evaluated in the context of an overall course plan, in order to avoid several pitfalls. These course plans are evaluated as part of the application (again, see [*How are applications evaluated?*](#)).
4. Because cognitive science requires mastery of so many different approaches and disciplines, it fits best with students who are able to perform well in many different kinds of classes. The application process thus includes an evaluation of students' academic performance so far at Yale.
5. Finally, the major is structured in a way that presents special opportunities for seniors in the Senior Colloquium, and spaces are limited. Thus, in the end, some students may not be admitted to the major not because their plans and essays were lacking, but just because there is competition for the available slots.

How do I apply? Where can I find the application form?

Students must apply to the major at the end of the fall semester of their sophomore year. Such students can apply by (1) reading this entire page carefully, and then (2) following the instructions in the official application form:

- [Download the application form as a PDF file](#) (to fill in by hand)
- [Download the application form as an RTF file](#) (to fill in electronically, using your favorite word processor)

As explained on the application form, all application forms should be turned in by delivering 3 hardcopies to Lynn Butler in Kirtland 207.

When are applications due?

Applications are due to Lynn Butler in Kirtland 109 (that's the Psychology department's business office, at 2 Hillhouse Avenue) by **Friday, December 10th, 2010, at 4 pm.**

When do I find out if I was accepted into the major?

Applicants will be notified by mid-January.

How are applications evaluated?

There is no single answer to this question, since different members of the application committee may stress different things. However, the committee as a whole will surely be asking the following questions about you and your application materials, so it would be a good idea for you to consider these things when preparing them:

1. Do your essay and course plan successfully articulate a focus that will bring cohesiveness to your experience in the major? Does your course plan suggest more than a random smattering of courses? Will your course plan allow you claim some mastery of a part of cognitive science, after you graduate?
2. Does your course plan suggest that you've carefully studied the available options for courses that fit your theme in all of the relevant departments? (Depending on your focus, keep in mind that some relevant courses may come from outside of the traditional contributing disciplines -- e.g. *Game Theory* in the Economics department, or *Music Cognition* in the Music department.)
3. Do your essay and course plan suggest that your interests could not be satisfied by a major in one of the traditional contributing disciplines? In particular, does your course plan involve a true breadth of different approaches? (Because many courses are cross-listed, some students end up with schedules that *look* like they have breadth, but don't really. For example, a student might list 4 psychology courses and 3 neuroscience courses, but those three might all be taught from within the psychology department -- e.g. *Cognitive Neuroscience*, *Fundamentals of Neuroscience*, etc. -- rather than incorporating courses from other departments such as *Neurobiology*. In such cases -- especially if the electives

are also drawn from psychology -- the course plan as a whole might really involve only 3 courses outside of Psychology, suggesting that Psychology might be a better major.) So, when choosing your courses, look not only at the department(s) that a course is listed in, but also the approach of the professor teaching the course, the field(s) from which they hail, the field(s) from which most of the readings in the course are drawn, etc.

6. Does your course plan include a reasonable number of higher-level courses (e.g. the number that would characterize course plans in most other majors)? This can be a particular problem in cognitive science: whereas most traditional majors only have a few introductory-level courses, cognitive science encompasses *Introduction to Linguistics*, *Introduction to Computer Science*, *Introduction to Psychology*, etc. -- as well as many other relevant 100 level courses in the contributing departments. For this reason, the major can sometimes look attractive to students who want to get through Yale without taking many more challenging upper-level courses. So be sure that your plan includes the right breadth of course numbers (as a proxy for differing degrees of depth and challenge) in addition its breadth of fields and approaches.
7. Do your grades so far at Yale suggest that you will perform well in the major?

Can Directed Research or Directed Reading courses count for the major?

Yes -- but only for the two electives (i.e. not for the 'core' 4/3/2/1 courses).

What are some sample themes that help to structure students' course plans?

- Irrationality
- Visual neuroscience
- The self and moral cognition
- Cognition and the arts
- Language
- Human-Robot Interaction
- Connections between brain and behavior
- Automaticity in cognition

Can I talk about my plan with the DUS before I apply?

Certainly! Just stop by open [office hours](#), or [send an email](#) to set up an appointment to chat at some other time.

I haven't taken *Introduction to Cognitive Science* yet. Can I still apply?

Depending on the size and character of the applicant pool in any given year, it *may* be possible to join the major without having first taken this key introductory course. When this is possible:

- Your course plan should indicate that you plan to take this course at your next available opportunity.
- Your acceptance into the major may be provisional on performing well in the course when you do take it.
- Ideally your transcript so far, along with your application essay, will demonstrate that you know what cognitive science is, and what it has to offer (knowledge that many students acquire from taking this course).

Is it possible to major in cognitive science and also complete pre-med requirements?

Completing the pre-med requirements is always a challenge, regardless of your major, since they require so many other classes -- including classes which are only offered during specific times, and several labs which will devour entire afternoons each week. That said, because cognitive science affords a considerable amount of flexibility (e.g. in that there are very few specific courses that are required, in contrast to many other majors), many students in the past have found that this combination works well. (Of course, students in this situation should also run their full course plan by [Yale's Premedical Advising Office](#), which has considerable experience with such questions.)

Can I double-major in cognitive science and _____?

Yes, some students do end up double-majoring in cognitive science and other disciplines -- both related disciplines (e.g. Philosophy) and mostly-unrelated disciplines (e.g. Art). However:

- Keep in mind that double majors (of any variety) must always complete two distinct senior projects, except in exceptional circumstances (when a single project is truly interdisciplinary and is twice as involved as usual, which is vanishingly rare). This is a significant constraint, since I have never met a student who *overestimated* the amount of time and work that their senior project would require! As a result, many senior double-majors end up dropping one or the other at the last minute -- often with some regrets (e.g. having taken courses in the dropped major that they otherwise wouldn't have pursued).
- Also keep in mind that there are constraints built into the regulations of Yale College on how many courses can overlap between two majors. To quote [these regulations](#):

Each major must be completed independently of the other, with no more than two term courses overlapping. Prerequisites in either major are not considered to be overlapping courses. Other than such prerequisites, all courses taken in a major -- including those taken in excess of the minimum requirements of the major -- are counted in the consideration of overlapping courses unless such courses are in excess of the minimum requirements for both majors.

- Ask yourself carefully *why* you want to double major. What advantages will that bring? Keep in mind that in most departments you're completely free to take as many courses as

you wish without being a major. Also keep in mind that a double-major won't necessarily help you with your career after Yale: many jobs (or graduate schools) will care only about your degree as a whole, and what specific courses you've taken. (There are exceptions to this, though; if you have questions about this, come talk to the DUS!)

- Note that it will typically not be possible to add Cognitive Science as a second major later in your undergraduate career. As such, all interested students should be sure to apply toward the end of the fall semester of their sophomore year.

How can I incorporate neuroscience into my 4/3/2/1 plan?

Some neuroscience courses (e.g. *Neurobiology*) are taught through the MCDB department. Others (e.g. *Fundamentals of Neuroscience*) are taught through the Psychology department. And, of course, *Brain & Thought* is cross-listed as both a Psychology and a Cognitive Science course, but it is taught by a Professor of Neurobiology in the medical school (Amy Arnsten). Depending on the details of your course plan, these can all be combined into a single "Neuroscience" group for the purpose of your 4/3/2/1 plan.

Yale CogSci FAQs

(from <http://www.yale.edu/perception/cogsci/>)

A list of frequently asked questions about the Cognitive Science major at Yale

Written and maintained by the DUS, [Brian Scholl](#)

Please send along suggestions for additions or improvements.

Be sure to also check out the [CogSci @ Yale Homepage!](#)

Huh?

- [What is cognitive science?](#)
- [What do students study in the cognitive science major?](#)
- [What can you do with a major in cognitive science?](#)

Getting to Know the Major

- [What are the requirements for the major?](#)
- [Which faculty are formally associated with the major?](#)
- [I've read this page carefully, but still have questions. Who should I contact?](#)
- [What's the best way to make an appointment to talk with the DUS?](#)

Applying to the Major

- [Why do students need to apply to the major?](#)
- [How do I apply? Where can I find the application form?](#)
- [When are applications due?](#)
- [When do I find out if I was accepted into the major?](#)
- [How are applications evaluated?](#)
- [Can *Directed Research* or *Directed Reading* courses count for the major?](#)
- [What are some sample themes that help to structure students' course plans?](#)
- [Can I talk about my plan with the DUS before I apply?](#)
- [I haven't taken *Introduction to Cognitive Science* yet. Can I still apply?](#)
- [Is it possible to major in cognitive science and also complete pre-med requirements?](#)
- [Can I double-major in cognitive science and _____?](#)
- [How can I incorporate neuroscience into my 4/3/2/1 plan?](#)

Information for Current Majors

- [Can I change my course plan? If so, how do I do that?](#)
- [Why can't there just be a fixed list of courses that do or do not count?](#)
- [How do you decide what courses count for the major?](#)

- [Can I count this particular course for the major?](#)
- [Can I use Cr/D/F credits for the major?](#)
- [How can I set up a *Directed Reading* course?](#)
- [Will my favorite course be offered next year?](#)
- [I *really* want to get in to a particular seminar. Is there a way the program can help?](#)
- [How does credit work for my senior project and the Senior Colloquium?](#)
- [What is the Senior Colloquium like?](#)
- [Can courses I take while studying abroad count for the major?](#)
- [Are there any sample past senior theses I could look at?](#)

Specific Courses

- [What is covered in *Introduction to Cognitive Science*?](#)
- [What is covered in *Brain & Thought*?](#)
- [What discipline does *Brain & Thought* count for?](#)
- [What will be covered in the *Junior Seminar in Cognitive Science*?](#)
- [What's this new course on *Philosophy and the Science of Human Nature*?](#)
- [How much overlap is there between *Introduction to Cognitive Science* and *Brain & Thought*?](#)
- [How much overlap is there between *Intro to Cognitive Science* and *Intro to Psychology*?](#)
- [How much overlap is there between *Brain & Thought* and *Neurobiology*?](#)

Research

- [I'm interested in getting research experience in cognitive science. Where do I start?](#)
- [How can I go about getting *Directed Research* credit for my work?](#)
- [How many *Directed Research* \(and/or *Directed Reading*\) courses can I take?](#)
- [How can I find funding to support my research?](#)
- [What summer programs are available for undergraduates in cognitive science?](#)
- [Where can I find information on the departments at Yale that participate in cognitive science?](#)
- [What cognitive science laboratories does Yale have?](#)