Overview

What is cognition? It is what happens in our brains when we think, enabling us to learn and act adaptively, survive and reproduce. Cognitive science tries to explain the mechanism that generates that know–how. The brain is the natural place to look for the explanation, but that's not enough. Unlike the mechanisms generating the capacities of other bodily organs such as the heart or the lungs, the brain's capacities are too vast, complex and opaque to be read off by direct observation or manipulation: Computational modeling and robotics try, alongside behavioral neuroscience, to design and test mechanisms that can generate our cognitive capacities, thereby explaining them. The challenge of the celebrated "Turing test" is to scale up to the point where we can no longer distinguish the model's performance from our own. Our model must generate not only our sensorimotor capacity -- able to do with the objects and agents in the world exactly what we can do with them -- but it must also be able to produce and understand language, as we do. What is language, and what was its adaptive value such that we are the only species that possesses it? And consciousness?

Objectives

This course will outline the main challenges that cognitive science, still inchoate, faces today, focusing on the capacity to learn sensorimotor categories, to name and describe them verbally, and to transmit them to others, concluding with cognition distributed on the Web.

Time: Fri 12:30-3:30
Place: Stewart W7/21
Office: TBA
Office hours: TBA
Phone: 514-285-4948

Prerequisite: U2 or above. Open to students interested in Cognitive Science from the Departments of Linguistics, Philosophy, Psychology, Computer Science, or Neuroscience.
Description

1. Introduction
What is cognition? How and why did introspection fail? How and why did behaviourism fail? What is cognitive science trying to explain, and how?

2. The computational theory of cognition (Pylyshyn, Turing)
What is (and is not) computation? What is the power and scope of computation? What does it mean to say (or deny) that "cognition is computation"?

   Readings:

3. Searle's Chinese room argument (against the computational theory of cognition)
What's wrong and right about Searle's Chinese room argument that cognition is not computation?

   Readings:

4. The Turing test
What’s wrong and right about Turing’s proposal for explaining cognition?

   Readings:

5. What about the brain?
Why is there controversy over whether neuroscience is relevant to explaining cognition?

   Readings:
6. The symbol grounding problem
What is the “symbol grounding problem,” and how can it be solved? (The meaning of words must be grounded in sensorimotor categories.)

Readings:

7. Categorization and cognition
That categorization is cognition makes sense, but “cognition is categorization”? (On the power and generality of categorization.)

Readings:

8. Evolution and cognition
Why is it that some evolutionary explanations sound plausible and make sense, whereas others seem far-fetched or even absurd?

Readings:
Bolhuis JJ & Wynne CDL (2009) Can evolution explain how minds work? Nature 458, 832–833 [online version will be provided]

9. The evolution of language
What’s wrong and right about Steve Pinker’s views on language evolution? And what was so special about language that the capacity to acquire it became evolutionarily encoded in the brains of our ancestors – and of no other surviving species – about 300,000 years ago? (It gave our species a unique new way to acquire categories, through symbolic instruction rather than just direct sensorimotor induction.)

Readings:

10. Chomsky and the poverty of the stimulus
A close look at one of the most controversial issues at the heart of cognitive science: Chomsky’s view that Universal Grammar has to be inborn because it cannot be learned from the data available to the language–learning child.

Readings:
Pinker, S. Language Acquisition. http://users.ecs.soton.ac.uk/harnad/Papers/Py104/pinker.langacq.html
11. The mind/body problem and the explanatory gap

Once we can pass the Turing test -- because we can generate and explain everything that cognizers are able to do -- will we have explained all there is to explain about the mind? Or will something still be left out?

Readings:
http://cogprints.org/1615/

12. Distributed cognition and the World Wide Web

Can a mind be wider than a head? Collective cognition in the online era: the Cognitive Commons.

Readings:

13. Overview

Drawing it all together.

Method: Three hours of lecture and discussion per week. After the first session each of the readings (all papers, usually two per week) for the following eleven weeks will be assigned to at least one student to comment on orally and one student to comment on via email quote/commentary (see "Student Skywriting" below). Depending on the size of the enrollment, there may be more than two students per paper, but every student will get at least 2 papers to comment on orally and at least 4 to comment on electronically. The electronic discussion will be circulated to the class list and archived in the course online web archive.

Evaluation: Evaluation credit is apportioned as follows: .1 for the midterm exam given in the beginning of March, .3 for the final exam given in the April exam period, .1 for the two oral presentations, and .5 for the four electronic quote/commentaries. Grading uses the McGill four-point scale, not any kind of percent scale. Note that late assignments are penalized one level (about .3) on the McGill four-point grading scale for every day an assignment is late. There is a small bonus for any electronic
quote/commentary you do on other students electronic quote/commentary (or on 
the instructor’s quote/commentary). These optional bonuses will each be graded 
from 0 to .2 on the McGill four-point scale, and these bonus grades are added to the 
regular grade.

**Supplemental:** A supplemental exam worth .6 is available for those who have a D, F, 
or J in the course. A deferred exam worth .3 is available for students who miss the 
final exam for an accepted reason. Application to take the supplemental or deferred 
exam must be made to the Office of the Associate Dean in Dawson Hall. There are no 
other provisions for additional work. The supplemental/deferred exams are in the 
same format as the final exam. Students who miss the midterm exam for a valid and 
accepted reason may apply to the instructor to have the final exam count for .4. 
Valid and accepted reasons for missing exams normally include only documented 
ilness or family tragedy.

**Course website:** Contains the URLs for all the reading material, as well as all the 
course e-mail, etc. Use a contemporary web browser to go to the McGill WebCT site 
and follow the instructions for logging in. You automatically have an account on the 
course website if you are registered for the course. Check the course website 
regularly for updates.

**Academic integrity:** McGill University values academic integrity. Therefore, all 
students must understand the meaning and consequences of cheating, plagiarism 
and other academic offences under the Code of Student Conduct and Disciplinary 
Procedures (see [www.mcgill.ca/students/srr/honest/](http://www.mcgill.ca/students/srr/honest/))

**Language of graded written work:** In accord with McGill University’s Charter of 
Students’ Rights, students in this course have the right to submit in English or in 
French any written work that is to be graded. The instructor is completely bilingual 
and you can ask questions, give your presentation and do your skywriting 
quote/commentary in either language.

**Student Skywriting:** All the readings are online ("skyreadings"). Each enrolled student 
will be assigned six of the c. 24 readings, two on which to comment orally and four 
to quote/comment on online. This means taking the text, reading it, deleting the 
passages on which you have no comment, 

and quote/commenting the remaining portions on which you have comments to make (BBS-style); the quoted text should amount to a total of about 10–25% of each 
skyreading paper, followed by your comments, amounting to about 50% of the 
length of the original paper. In addition to your own four quote/commented papers, 
you are encouraged to comment on the quote/commentaries from other students 
(length of posts on posts is up to you, and there can be a few iterations of back and 
forth student skywriting) for extra credit. I will also intervene in the skywriting, to
provide feedback and keep the skywriting going. The skywriting will not occur at the end of the course, but during the week following each module as it is presented in class.

A sample of some past student skywriting archives from Southampton (psychology as well as computer science) is here:

http://users.ecs.soton.ac.uk/harnad/Hypermail/

And here is some background reading on “skywriting” if you are interested:


