

The Interdisciplinary Ph.D Program in Cognitive Science

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The Interdisciplinary Ph.D. Program in Cognitive Science

Why you should care about Cognitive Science

- You are all carrying around the lowest-power, lightest weight, general purpose computer in Known Space - your necktop.
- How the brain works is one of the biggest remaining mysteries to science.
- Unlike the human genome, we can't put it in a dish and cut it up (except for non-human species) and still expect it to do anything.
- Hence, building computational models (that we can cut up and still expect them to work) is one of the best ways to study the brain.

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What is Cognitive Science?

- The discipline of understanding how the mind works
- A discipline in its own right, but fundamentally, an *Interdiscipline*:
Includes at least Psychology, AI, Neuroscience, Linguistics, Philosophy.

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The Axioms of Cognitive Science

1. The Mind is what the Brain does.
2. Thinking is a kind of Computation.
3. UCSD addition (from my perspective):
Probability theory in some form (e.g., neural networks, Bayesian networks, etc.) are a good model of the kind of computation the brain does.

Hence, we study *brain-style* computation.

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A Brief History of Cognitive Science at UCSD

- The 1970's: Don Norman, Dave Rumelhart, and Jay McClelland of the UCSD Psych. Dept. help found the new discipline of Cognitive Science.
- 1979: The first Cognitive Science Society Meeting is held at UCSD
- 1986: The first Ph.D. in the new Interdisciplinary PhD Program in Cognitive Science is awarded to Michael Jordan.
- 1987: The Cognitive Science Department is formed.

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A Brief History of Cognitive Science at UCSD

- 2000: The David E. Rumelhart Prize in Cognitive Science (the Nobel Prize of Cognitive Science) is established. It comes with \$100,000 and a medal.
- UCSD-related awardees:
- 2001: First Rumelhart Prize to Geoff Hinton (formerly a postdoc at UCSD).
- 2005: Another former UCSD postdoc, Paul Smolensky
- 2007: UCSD Cognitive Science Faculty Jeff Elman
- 2010: Former UCSD faculty member Jay McClelland
- 2012: Former Sejnowski postdoc Peter Dayan

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A Brief History of Cognitive Science at UCSD

- Hence, the *a priori* chance of a UCSD-related Cognitive Science person winning the Rumelhart prize is 5/12 (Expected Value of \$46,667).
- So you should join the IDP!

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The Interdisciplinary PhD Program

- So, there are now TWO Ph.D. Programs in Cognitive Science at UCSD:
- The Department of Cognitive Science PhD program
- The Interdisciplinary Ph.D. Program in Cognitive Science. (IDP for short).

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The Interdisciplinary PhD Program

Eight participating departments:

Anthropology, Communication, Computer Science and Engineering, Linguistics, *Neurosciences*, Philosophy, Psychology, and Sociology

Faculty from even more departments:

Anthropology, Biology, Cognitive Science, Communication, Computer Science and Engineering, Linguistics, Music, Neuroscience, Philosophy, Psychiatry, Psychology, and Sociology.

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The Interdisciplinary PhD Program

This program lets you explore beyond the boundaries of your discipline:

You are expected to gain significant expertise in an area of study *outside* your home department.

Added value: *secondary specialty*

Your PhD would then read:

“Neuroscience and Cognitive Science”

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Structure of the Program

- o. You apply for admittance (usually in your 2nd or 3rd year) proposing a program of study in a participating department or in the Cognitive Science Department. Your PhD topic should be interdisciplinary in nature.
1. You fulfill all of the requirements for a PhD in Neuroscience up through the University Qualifying Exam.

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Structure of the Program

2. You also propose a "secondary specialty."

This could be:

- in a recognized discipline (e.g., Psychology) or,
- covering a substantive issue in Cognitive Science that spans departmental boundaries (e.g., "How and where are emotional facial expressions processed in cortex?")
- This requirement is fulfilled by
 - taking on the order of six courses that don't start with "Neuro"
 - **or** (*and this is more fun!*) you spend about a year in someone's lab outside the department.

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Structure of the Program

3. For breadth, you participate in six quarters of "Cognitive Science 200"
4. You produce a stellar thesis solving a fundamental problem in Cognitive Science.

Note: There are a *lot* of postdocs advertised in Cognitive Neuroscience!

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An example: Brian Keeley



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An example: Brian Keeley

Home department: Philosophy

Advisors in Philosophy: Sandra Mitchell and Pat Churchland

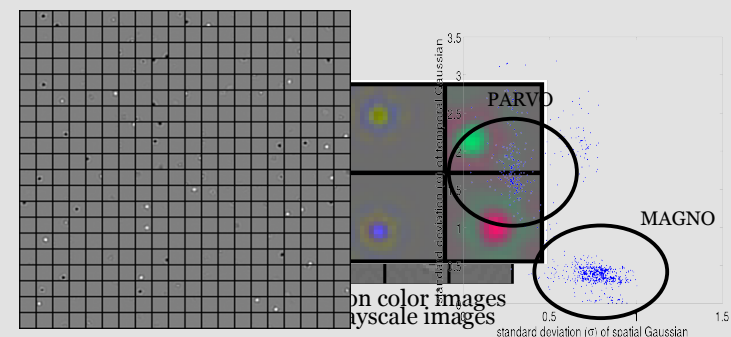
Secondary Specialty: Behavior of weakly electric fish
(work performed in Walter Heiligenberg's lab at the Scripps Institution of Oceanography)

Ph.D. in Philosophy and Cognitive Science (1997)

Current project: The role of neurobiology in differentiating the senses

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Another example: Honghao Shan... Efficient Encoding of the world leads to magno and parvo-cellular response properties...



Trained on video

This suggests that these cell types exist *because* they are useful for efficiently encoding the temporal dynamics of the world.

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Relevant local happening:

- We have a \$33.5M grant from NSF for a “Science of Learning Center” titled:
- The Temporal Dynamics of Learning Center
- We are composed of four *research networks* studying:
 - Interacting Memory Systems (Andrea Chiba, UCSD Cog Sci & Neurosciences)
 - Social Interaction (Javier Movellan, UCSD, Inst. for Neural Comp.)
 - Sensorimotor learning (Howard Poizner, UCSD, INC)
 - Perceptual Expertise (Isabel Gauthier & Tom Palmeri, Vanderbilt)
- We are studying the role of time and timing in learning, from spike-time dependent plasticity to the timing of social interactions.

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Links

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- Home page:
- <http://cseweb.ucsd.edu/~gary/>
- (or just google Gary Cottrell)
- Also see:
- Cog Sci home page: idp.ucsd.edu (follow "for graduates" menu to "Interdisciplinary PhD program")
- TDLC home page: tdlc.ucsd.edu

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