

ICS 464

Introduction to Cognitive Science

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Next

Today's Activities

- Next week's homework
- Introductions
- Representation
 - Non-mental vs Mental
- History
- Challenges to Cognitive Science
- Approaches to Cognitive Science

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Next

8/23/06 - Wednesday

- Read Chapter 1 - What's in Your Mind? By Zenon W. Pylyshyn
- Homework
 - Outline and summarize your section
 - Submit to message board – My UH
 - Topic "Homework 01"
 - due Sunday 12 noon 08/27/06
 - Send test message before due date
- Extra Credit 01 – Due 9/12, 4pm.

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Next

Summarizing and outline your section

- Generate a glossary of terms and people
- Summary of concepts
- Generate at least two question
- How does this section connect to the previous section and next section?
(See Example)

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Next

Chapter 1 - What's in Your Mind? Zenon W. Pylyshyn

- Introduction – 1-2
 - What is special about intelligent behavior? 3-4
 - Meaning and causality, 4-6
 - Symbols, codes, and computing, 6-7
- The Tri-level Hypothesis, 7- 10
 - Representation-governed behavior, 10-12
 - What kind of computer is the mind?, 12-13
- Cognitive Capacity, 13-18
- Unconscious Processes, 18-19
 - How can we know how it works inside?, 19-23
 - What, then, is really in your mind?, 23-24

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Introductions

- Pass out cards

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Next

	<ul style="list-style-type: none">■ On the card you have■ Line#1 – Real Name■ Line#2 – Preferred Name■ Line#3 – Interests■ Line#4 – Background■ Line#5 – Career Plans <p style="text-align: right;">7 Next</p>

	<ul style="list-style-type: none">■ Partner with a person with a different color card and talk for 10 minutes.■ You will be introducing your partner to the class for a minute or two.■ Why?<ul style="list-style-type: none">– In multidisciplinary fields such as cognitive science, you will be working people from a broad spectrum of fields.– Respect between different field of study is <u>not</u> a given, but is earned through productive communications. <p style="text-align: right;">8 Next</p>

Cognitive Science

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Next

Cognitive Science

- “Many, but not all cognitive scientists, view thinking as a kind of computation and use computational metaphors to describe and explain how people solve problems and learn.” Thagard (2004)
- Most cognitive scientists agree that knowledge in the mind consists of mental representations.

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Non-mental Representation

- Everyone is familiar with non-mental representations, such as the words on this screen.
- I have just used the words “this screen” to represent the screen that you are now seeing.
- People often also use pictorial representations such as maps of their campuses and buildings.

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Mental Representations

- Solving problems requires doing things with mental representations, such as reasoning that you still need five more courses to graduate or deciding to take another course from Professor Ikehara.
- Different kinds of mental representations such as rules and concepts foster different kinds of mental procedures.
- Consider different ways of representing numbers. ΓΩΠ ● ▲ Θζη VIII 8

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Next

	<ul style="list-style-type: none">■ What are some other examples of non-mental representations?■ What are some example of mental representations?
	<p>13 Next</p>

	<h2>History of Cognitive Science</h2>
	<p>14 Next</p>

History - Philosophy

- Plato and Aristotle (400 - 300s BC)
 - Plato thought that the most important knowledge comes from concepts such as virtue that people know innately independently of sense experience.
 - Aristotle discussed knowledge in terms of rules also known as empiricism.
- Descartes and Leibniz (1600s-1700s)
 - Knowledge can be gained just by thinking and reasoning, a position known as rationalism.
- Kant (1800s)
 - Attempted to combine rationalism and empiricism by arguing that human knowledge depends on both sense experience and the innate capacities of the mind.

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History - Psychology

- Wundt and his students initiated laboratory methods for studying mental operations more systematically. (late 1800s- early 1900s)
 - Introspection
- Pavlov, Watson & Skinner (early 1900 – 1960s)
 - Behaviorism, a view that virtually denied the existence of mind. (classical conditioning, no introspection & operant conditioning).

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History – Psychology & Linguistics

- Miller (1950s)
 - Human memory limitations can be overcome by recoding information into chunks, mental representations that require mental procedures for encoding and decoding the information.
- Chomsky (1960s)
 - Rejected behaviorist assumptions about language as a learned habit and proposed instead to explain people's ability to understand language in terms of mental grammars consisting of rules.

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History - Artificial Intelligence

- McCarthy, Minsky, Newell, and Simon were founding the field of artificial intelligence (1950-1960s)
- McCarthy
 - Artificial intelligence based on formal logic.
- Newell and Simon
 - Rules for accounting for aspects of human intelligence.
- Minsky
 - Proposed that concept like frames are the central form of knowledge representations. Similar to schemas and scripts.
 - Invented the perceptron, a type of neural network.

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History - Psychology

- Broadbent (late 1950s to 1960s) - Drew important relationships between attention, perception, short-term memory and long-term memory.
 - Attention is the cognitive process of selectively concentrating on one thing while ignoring other things.
 - Perception is the process of acquiring, interpreting, selecting, and organizing sensory information
 - Short-term memory, sometimes referred to as "primary" or "active" memory, is that part of memory which stores a limited amount of information for a limited amount of time (roughly 15-45 seconds).
 - Long-term memory (LTM) is memory, stored as meaning, that can last as little as 30 seconds or as long as decades.

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History - Psychology

- Lachman and Butterfield (late 1970s)
 - The mind is regarded as a general purpose, symbolic-processing system.
 - The goal is to identify symbolic processes and representations which are involved in performance on all cognitive tasks.

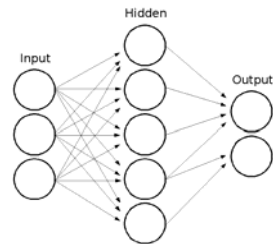
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Next

History - Psychology

- McClelland & Rumelhart (1980s)

- Connectionism models mental or behavioral phenomena as the emergent processes of interconnected networks of simple units. A version being the neural network.



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History - Neuroscience

- Neuroscience (1990s)

- Brain scanning technologies to study how specific areas of the brain contribute to thinking.
- Neurologically realistic computational models of mind.

- Damasio (1990s)

- Argues that rationality stems from our emotions.
- Emotions stem from our bodily senses.
- Mind and body are inter-related.

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Discussion

- Given the history of cognitive science, what do you think the next steps should be?

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Challenges to Cognitive Science

- Cognitive science neglects the important role of emotions in human thinking.
- Cognitive science ignores the importance of consciousness in human thinking.
- Cognitive science disregards the significant role of physical environments in human thinking.

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Challenges to Cognitive Science

- Cognitive science neglects the contribution of the body to human thought and action.
- Human thought is inherently social in ways that cognitive science ignores.
- The mind is a dynamical system, not a computational system. (Dynamical systems can be unpredictable).
- Mathematical results show that human thinking cannot be computational in the standard sense, so the brain must operate differently, perhaps as a quantum computer.

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Discussion

- Which of the challenges to cognitive science do you think is most critical?
- Which of the challenges to cognitive science do you think is least critical?

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