

	<p><b>ICS 464</b></p> <p>Introduction to Cognitive Science</p>
	<p style="text-align: right;">1 Next</p>

	<p><b>Today's Activities</b></p>
	<ul style="list-style-type: none"> <li>■ Quiz 01</li> <li>■ Approaches to Cognitive Science</li> <li>■ Discuss questions from Chapter 1</li> <li>■ Background for Chapter 2</li> </ul>
	<p style="text-align: right;">2 Next</p>

	<p><b>9/06/06 - Wednesday</b></p>
	<ul style="list-style-type: none"> <li>■ Read Chapter 2 - Explaining the Infant's Object Concept: Beyond the perception cognition dichotomy by Brian J. Scholl and Alan M. Leslie</li> <li>■ Homework02 due <ul style="list-style-type: none"> <li>- Outline and summarize your section</li> <li>- Submit to message board - My UH</li> <li>- Topic "Homework 02"</li> <li>- due Tuesday 12 noon 09/05/06</li> </ul> </li> </ul>
	<p style="text-align: right;">3 Next</p>

	<p><b>Summarizing and outline your section</b></p>
	<ul style="list-style-type: none"> <li>■ Generate a glossary of terms and people</li> <li>■ Summary of concepts</li> <li>■ Generate at least two question</li> <li>■ How does this section connect to the previous section and next section?</li> <li>■ The person assigned the first section of the chapter needs to give a sentence or two about the author's background.</li> </ul>
	<p style="text-align: right;">4 Next</p>

## Quiz01

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## Quiz01 #1

- Name at least three fields of research that contribute to the field of cognitive science mentioned in the lectures.
- This is a multidisciplinary field and this class identifies contributions from disciplines such as cognitive psychology, linguistics, artificial intelligence, philosophy and neuroscience.

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## Quiz01 #2

- Lecture 02 discussed non-mental and mental representations. Give two examples of each.

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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.

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## Quiz01 #3

- Seven challenges to cognitive science were given in Lecture 02. Give a short description of two of them.

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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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## Quiz01 #4

- According to Pylyshyn, “the mind is a type of computer” and “the reason we need to understand what kind of computer the mind is, is that merely simulating intelligent functions - however interesting and difficult it may be - is not enough for the purpose of explaining human intelligence.” From a computer science point of view, is explaining human intelligence important? Please explain your answer. Book page 12

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## Quiz01 #5

- A major source of evidence in cognitive science is the measurements of relative complexity using reaction time. Briefly describe a cognitive science experiment where relative complexity changes reaction time. You can make up an experiment or use one from the book.

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## Theory or Model

- Explains the past
- Predicts the future
- Parsimonious (Ockham's razor)
  - Occam's razor states that the explanation of any phenomenon should make as few assumptions as possible, eliminating, or "shaving off", those that make no difference in the observable predictions of the explanatory hypothesis or theory.
  - Or simple is preferred.

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## Approaches to Cognitive Science

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**“Theory without experiment is empty,  
experiment without theory is blind”**

■ **Psychologist Approach**

- Controlled human and animal experiments are designed evaluate the conceptual constructs of cognitive science. Examples of constructs include types of learning, representation and memory.

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Information Scientist

- One of the ways of developing theoretical frameworks is by forming and testing computational models intended to be analogous to human mental operations.
- Models that simulate human performance of deductive reasoning, concept formation, mental imagery, and analogical problem solving can be developed.
- Results of psychological experiments on people can be compared to the computational model.

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Linguist Approach

- The main theoretical task is to identify grammatical principles that provide the basic structure of human languages.
- Identification takes place by noticing subtle differences between grammatical and ungrammatical utterances.

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Neuroscientist Approach

- Psychologist devise tasks that require the specialize mental activity. For example, mental imagery or word interpretation.
- Neuroscientist, with brain scanning technology (fMRI, PET, EEG) identify theorized active areas.

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	<p>Cognitive Anthropologist Approach</p> <ul style="list-style-type: none"> <li>■ Studies <u>cross-cultural</u> issues of cognitive ability by direct, first hand observation of daily behavior.</li> <li>■ <u>Living and interacting</u> with members of a culture to a sufficient extent that their social and cognitive systems become apparent.</li> <li>■ Theories of cross-cultural cognitive issues are built using this method is called <u>ethnography</u>.</li> </ul>
	<small>21</small> Next

	<ul style="list-style-type: none"> <li>■ Philosophy Approach</li> <li>■ Deals with <u>fundamental issues</u> that underlie the experimental and computational approaches to mind.             <ul style="list-style-type: none"> <li>– Abstract issues such as the nature of representation and computation.</li> <li>– How people think and how should they think.</li> </ul> </li> </ul>
	<small>22</small> Next

	<h2>Discussion</h2>
	<ul style="list-style-type: none"> <li>■ What are the advantages and disadvantages of the different approaches to cognitive science?</li> <li>■ Which approach do you prefer?</li> </ul>
	<small>23</small> End

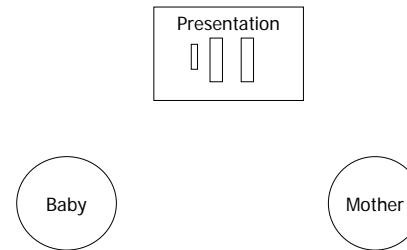
	<h2>Questions from Chapter1</h2>
	<ul style="list-style-type: none"> <li>■ Which approach might you use to try to answer each question?             <ul style="list-style-type: none"> <li>– Psychologist Approach</li> <li>– Information Scientist</li> <li>– Linguist Approach</li> <li>– Neuroscientist Approach</li> <li>– Cognitive Anthropologist Approach</li> <li>– Philosophy Approach</li> </ul> </li> </ul>
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## Cognitive Experimental Methodologies

- The most naïve subjects are infants given their limited amount of life experience.
- Testing infants on various tasks can reveal if cognitive abilities are present and when cognitive abilities are developed.
- But how do we ask infants without language?

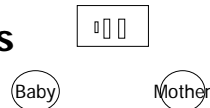
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## Infant Looking Times



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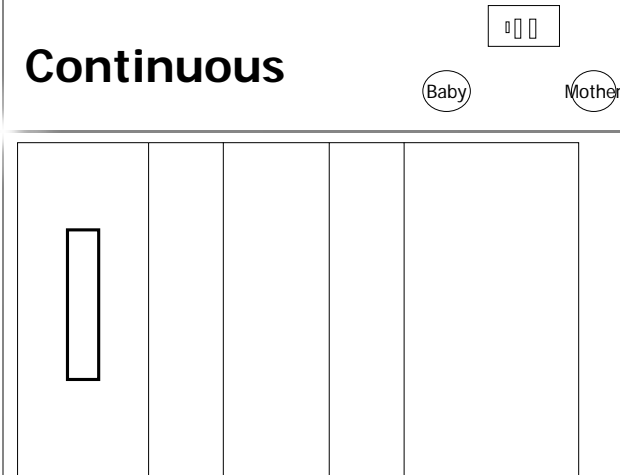
## Infant Looking Times



- When a baby is presented with a novel stimulus the baby looks.
- When the baby is presented with the same stimulus, the baby gets bored and stops looking, or habituates to the stimulus.

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## Continuous



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**Discontinuous**

Baby Mother

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**Continuous**

Baby Mother

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**Discontinuous**

Baby Mother

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**Infant Looking Times**

Baby Mother

Initial knowledge of the principle of spatiotemporal continuity	Habituated Continuous	Habituated Discontinuous
Novel Continuous		Looked more
Novel Discontinuous	Looked more	

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## Pulfrich Pendulum

- The **Pulfrich effect** is a consequence of the fact that at low light levels the brain's response to visual information from the eye is slower; by selectively limiting the light level to one eye, the relative delay in image perception can create an illusion of depth.

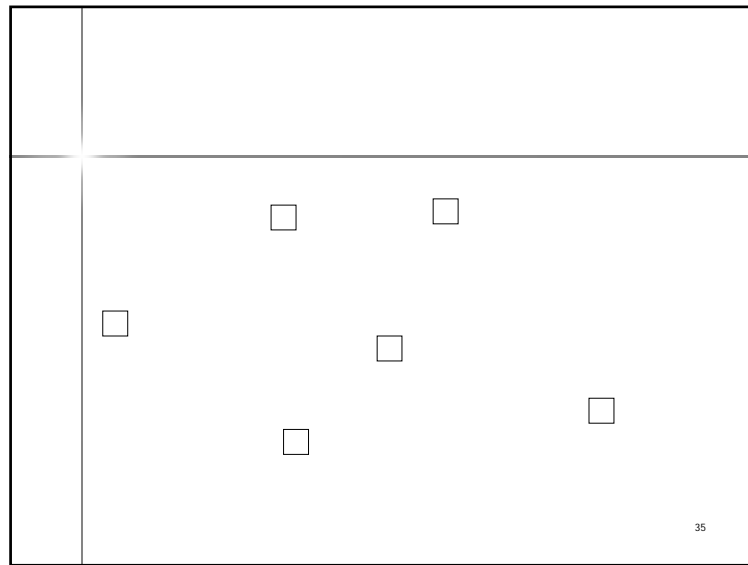


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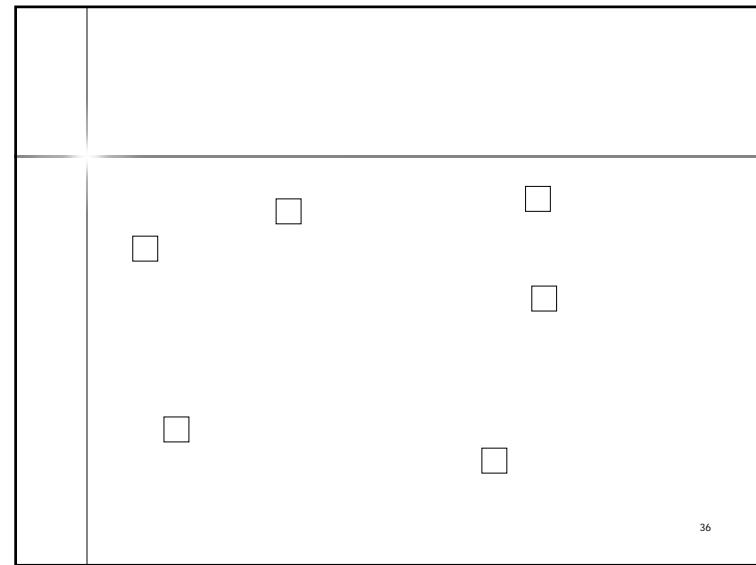
## Visual Indexing

- “. . . a mechanism whereby preattentive object-based individuation, tracking, and access are realized.” Pylyshyn 1989,1994

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