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## **Psychology 354**

### ***Final Review***

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#### **Exam format**

#### **Exam tips**

#### **Course Themes in Review**

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#### **Exam Format**

- Same format as midterm
- 10 definitions (choose from 12)
  - 3 marks each
    - 2 marks define the term
    - 1 mark say why term is interesting
  - Don't use point form!
- 1 essay (choose from 3)
  - 35 marks
  - 3-4 pages
  - Don't use point form
- Sample exam is on the website

#### **Exam Tips**

- Be more advanced than in midterm!
- Don't name drop
  - Don't name a term, and assume that by naming it I will think that you know what it means
- Don't fish
  - Don't regurgitate the whole course
  - Keep your answer focused
- Try to surprise me
  - Go beyond what I've told you to get full marks on the essay

#### **Theme 1: Three Schools**

- Key theme of course was that there are three different schools of thought in modern cognitive science
  - Know their properties
  - Know their relations to one another
  - Know their relative advantages and disadvantages

## Classical Cognitive Science

| Classical Cognitive Science |   |
|-----------------------------|---|
| Core Ideas                  | <ul style="list-style-type: none"> <li>Mind as a physical symbol system</li> <li>Mind as digital computer</li> <li>Mind as planner</li> <li>Mind as creator and manipulator of models of the world</li> <li>Mind as sense-think-act processing</li> </ul>             |
| Preferred Formalism         | Symbolic logic  |
| Tacit Assumption            | Nativism, naive realism   |
| Type of Processing          | Symbol manipulation   |
| Prototypical Architecture   | Production system (Newell, 1973)  |
| Prototypical Domain         | <ul style="list-style-type: none"> <li>Language</li> <li>Problem solving</li> </ul>   |
| Philosophical Roots         | <ul style="list-style-type: none"> <li>Hobbes</li> <li>Descartes</li> <li>Leibniz</li> <li>Craik</li> </ul>   |
| Some Key Modern Theorists   | <ul style="list-style-type: none"> <li>Chomsky</li> <li>Dennett</li> <li>Fodor</li> <li>Polyshyn</li> </ul>   |
| Some Pioneering Works       | <ul style="list-style-type: none"> <li><i>Plans And The Structure Of Behavior</i> (Miller, Galanter, &amp; Pribram, 1960)</li> <li><i>Aspects Of The Theory Of Syntax</i> (Chomsky, 1965)</li> <li><i>Human Problem Solving</i> (Newell &amp; Simon, 1972)</li> </ul> |

## Connectionist Cognitive Science

| Connectionist Cognitive Science |   |
|---------------------------------|---|
| Core Ideas                      | <ul style="list-style-type: none"> <li>Mind as information processor, but not as a digital computer</li> <li>Mind as a parallel computer</li> <li>Mind as pattern recognizer</li> <li>Mind as a statistical engine</li> <li>Mind as biologically plausible mechanism</li> </ul>                                   |
| Preferred Formalism             | Nonlinear optimization  |
| Tacit Assumption                | Empiricism  |
| Type of Processing              | Pattern recognition   |
| Prototypical Architecture       | Multi-layer perceptron (Rumelhart, Hinton, & Williams, 1986)  |
| Prototypical Domain             | <ul style="list-style-type: none"> <li>Discrimination learning</li> <li>Perceptual categorization</li> </ul>  |
| Philosophical Roots             | <ul style="list-style-type: none"> <li>Aristotle</li> <li>Locke</li> <li>Hume</li> <li>James</li> </ul>   |
| Some Key Modern Theorists       | <ul style="list-style-type: none"> <li>J.A. Anderson</li> <li>Hinton</li> <li>Kohonen</li> <li>McClelland</li> </ul>  |
| Some Pioneering Works           | <ul style="list-style-type: none"> <li><i>Principles Of Neurodynamics</i> (Rosenblatt, 1962)</li> <li><i>Parallel Models Of Associative Memory</i> (Hinton &amp; Anderson, 1981)</li> <li><i>Parallel Distributed Processing</i> (McClelland &amp; Rumelhart, 1986; Rumelhart &amp; McClelland, 1986b)</li> </ul> |

## Embodied Cognitive Science

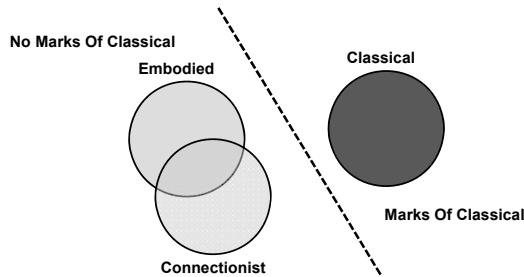
| Embodied Cognitive Science |   |
|----------------------------|---|
| Core Ideas                 | <ul style="list-style-type: none"> <li>Mind as controller of action</li> <li>Mind emerging from situation and embodiment, or being-in-the-world</li> <li>Mind as extending beyond skull into world</li> <li>Mind as sense-act processing</li> </ul>           |
| Preferred Formalism        | Dynamical systems theory  |
| Tacit Assumption           | Embodied interaction  |
| Type of Processing         | Acting on the world   |
| Prototypical Architecture  | Behavior-based robot (Brooks, 1989)   |
| Prototypical Domain        | <ul style="list-style-type: none"> <li>Locomotion</li> <li>Social interaction</li> </ul>  |
| Philosophical Roots        | <ul style="list-style-type: none"> <li>Vico</li> <li>Dewey</li> <li>Heidegger</li> <li>Merleau-Ponty</li> </ul>   |
| Some Key Modern Theorists  | <ul style="list-style-type: none"> <li>Brooks</li> <li>Clark</li> <li>Noë</li> <li>Wilson</li> </ul>  |
| Some Pioneering Works      | <ul style="list-style-type: none"> <li><i>Cognition And Reality</i> (Neisser, 1975)</li> <li><i>The Ecological Approach To Visual Perception</i> (Gibson, 1977)</li> <li><i>Understanding Computers And Cognition</i> (Winston &amp; Flores, 1987)</li> </ul> |

## Theme 2: Unification?

- A second main theme running through the course is the potential for a unified cognitive science
  - Given what we know about the three schools, to what extent are they complementary or similar?
  - Is there a need for the three schools to be united?
  - Is there a possibility for such unification?

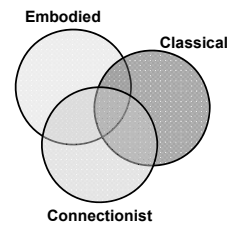
### If Classical Marks Exist...

- ... then classical theories are qualitatively different than alternatives, which may or may not share features that distinguish them from one another



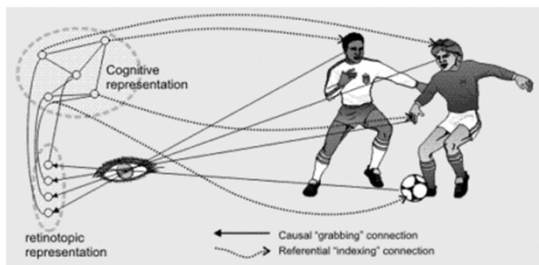
### If Classical Marks Do Not Exist...

- ... then classical theories share characteristics with other cognitive theories, raising the possibility of theories with hybrid characteristics



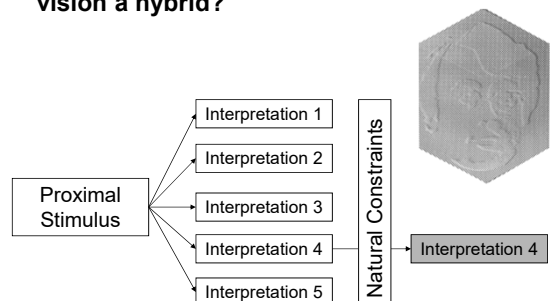
### A Hybrid Theory?

- Pylyshyn's FINST theory: hybrid or not?



### Another Hybrid?

- Is Marr's natural computation theory of vision a hybrid?



- **You have been exposed to many technical terms used in cognitive science**
  - Know what they mean
  - Know why they are important
  - Use them wisely

[illegible][illegible]

4

## A Unified Vocabulary?



**Word cloud created from Chapters 3, 4 and 5 combined**

## The Cognitive Sciences

[illegible]