

## Overview of Distributed Cognition

## The logic of empirical science

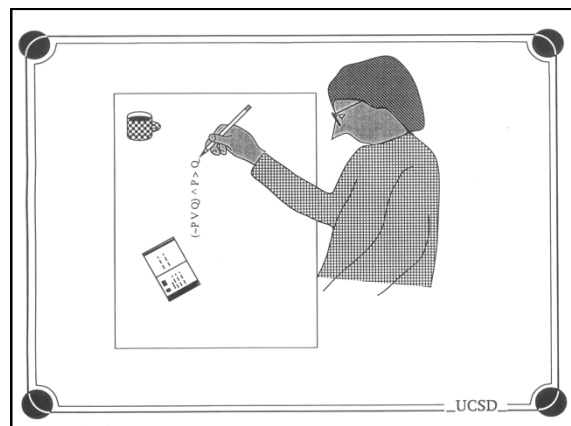
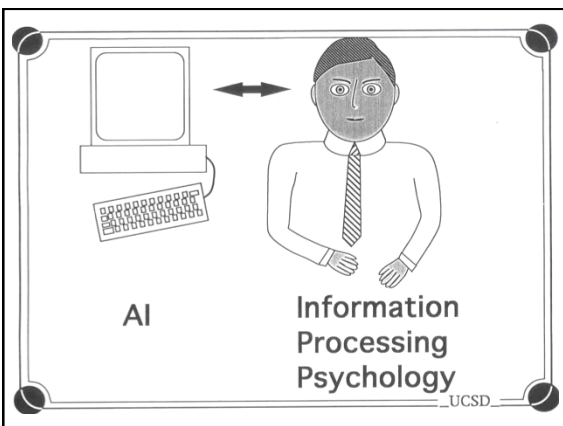
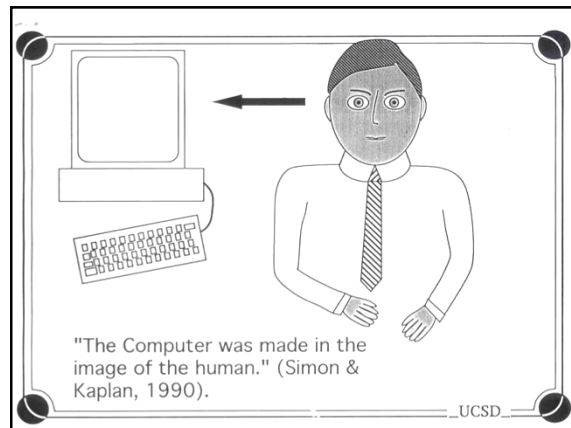
- A hypothesis **IMPLIES** observations
    - $H \rightarrow O$
    - Underlying mechanism  $\rightarrow$  behavior
- A weak inference                      The only strong inference

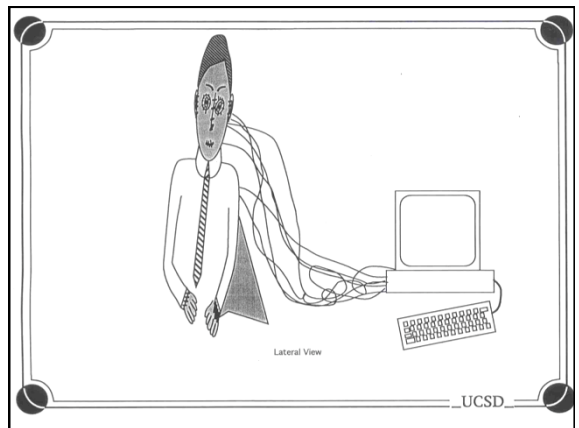
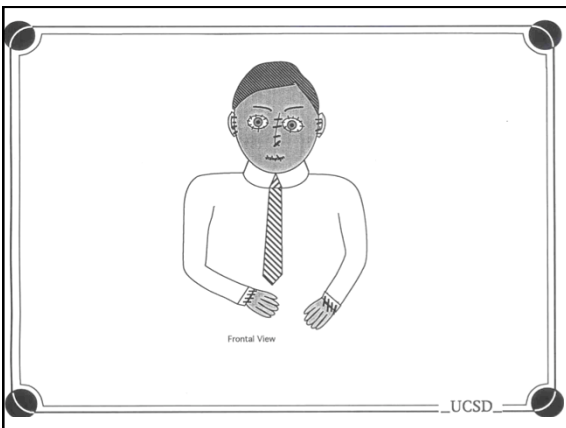
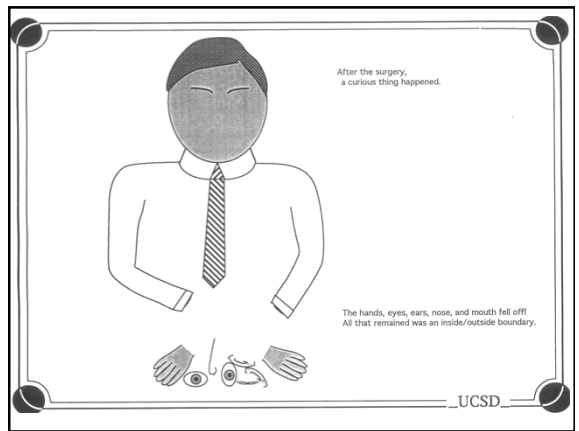
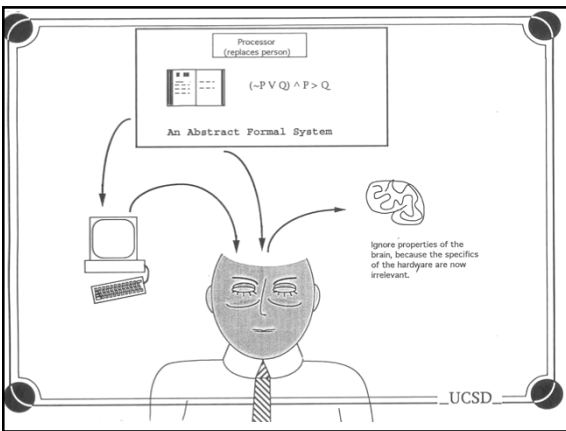
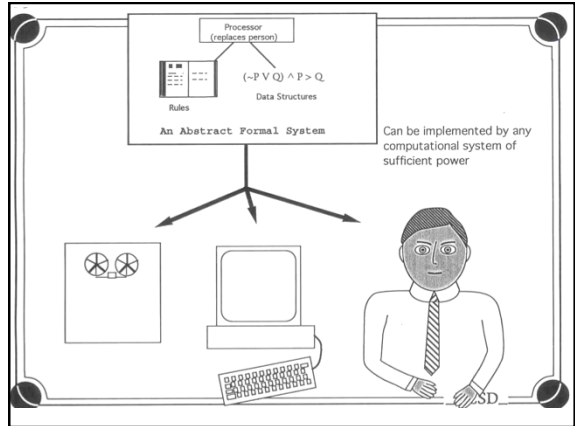
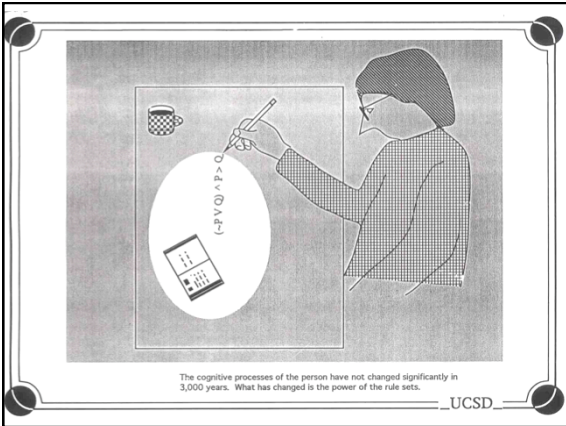
$H \rightarrow O$   
 $O$   
 -----  
 ❖  $H?$

$H \rightarrow O$   
 Not  $O$   
 -----  
 ❖ Not  $H$

## What are the mechanisms underlying human cognition?

- PSSH  $\rightarrow$  Human cognition?
- Brain  $\rightarrow$  Human cognition?
- Supersized mind  $\rightarrow$  Human cognition?





But whose inside/outside boundary was it?

The boundary that remained was not the boundary of the person. Nor was it the boundary between those things that are "in the head" and those things that are "outside the head." It was simply the boundary of the formal system, the boundary between the realm of abstract formal symbols and everything else. Included in the everything else are the concrete symbols that the logician wrote on the paper.

UCSD

The cognitive processes of the person have not changed significantly in 3,000 years. What has changed is the power of the rule sets.

UCSD

### Brain and Body

1. The brain provides soft-assembled control of the body.

StM  
CitW

### Brain, Body, and World

2. The brain provides soft-assembly of mind from resources in brain, body, and world.
7. What brains represent: interaction with surrogate situations.

StM  
CitW

### Symbolic tools for thinking

Pylyshyn: PSSH

2. Nav as comp
3. Nav practice
3. Material symbols

StM  
CitW

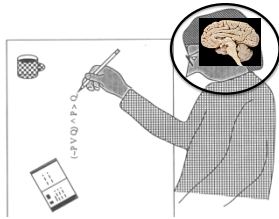
### Other material tools for thinking

3. Nav practice
4. World incorporated
6. Cog Impartiality

StM  
CitW

## Retreat to the Brain

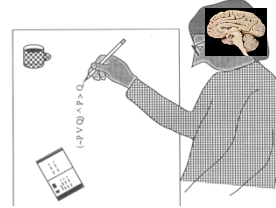
5. The "mark of the cognitive" and Where the powerful regularities are.



StM  
CitW

## An Alternative computational framework

Ch 8  
Connectionism



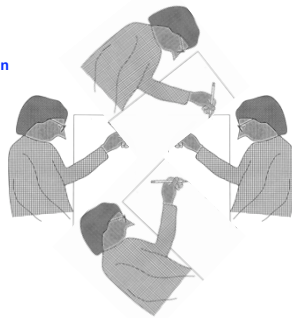
StM  
CitW

## Emergent Cognitive Properties

Ch 4: SODC

Ch 5: Communication

1. social learning



StM  
CitW

## Teaching

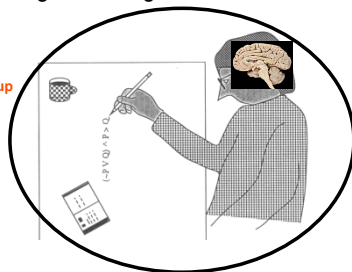
Ch 6: Context of learning



StM  
CitW

Cultural practices orchestrate the interactions of brain, body, and culturally organized world to produce high-level cognition

10: Mind as Mashup  
All

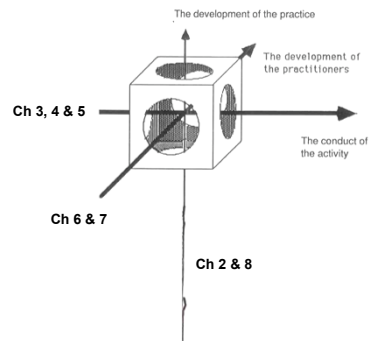


StM  
CitW

## Enculturating the Supersized Mind

A cultural flip on Andy Clark's Extended Mind flip

- Clark delivers the Extended Mind
- What organizes the extended mind?
  - Clark's trapdoor into the future
- The “mark of the cultural” is everywhere
- The enculturation of the supersized mind



### What does a brain represent?

- Nervous systems do not form representations of the world, they can only form representations of interactions with the world.

### Where do human brains do what they do?

- For humans the world in which brain and body are situated is cultural.

### How do human brains get organized?

- The brain (with the help of cultural practices) can form functional units that represent interactions with cultural patterns,
- functional units that can maintain coordination with cultural patterns.
- and functional units that can, via emulation, imagine those interactions and that coordination.

### How do human brains achieve high-level cognitive processes?

- Under the guidance of yet other cultural practices, the human brain can form higher-level functional units that establish coordination among other forming and already formed functional units.

## What is the human brain?

- The human brain is a special super flexible medium in which the historical residues of culture can interact.

High-level Cognitive Processes

Nervous System

GOFAI ↔ High-level Cognitive Processes

Nervous System

GOFAI ↔ High-level Cognitive Processes

PDP

Nervous System

GOFAI ↔ High-level Cognitive Processes

PDP

Low-level processes  
perceptual/motor

Connectionism  
Neural Nets

Nervous System

GOFAI ↔ High-level Cognitive Processes

PDP

Low-level processes  
perceptual/motor

Embodiment

Connectionism  
Neural Nets

A-Life

Nervous System

