

What Is Thought?

PSY 322/ORF 322: Human Machine Interactions

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Rejections of Dualism

- ▶ Idealism
 - ▶ Physical universe as “constructed out of” or “reducible to” mental phenomena.
 - ▶ Problem: the physical universe existed long before minds or mental phenomena!
- ▶ Physicalism
 - ▶ The physical realm is self-sufficient.
 - ▶ Mental phenomena have physical effects.
 - ▶ So mental phenomena must be reducible to physical phenomena.
 - ▶ Question: How do we know that the physical realm is self-sufficient?

Descartes' Physics

- ▶ Descartes assumed that all bodily interactions could be explained mechanically.
 - ▶ While bodies can transmit motion, they cannot originate it.
 - ▶ Since humans can originate motion, they are not just bodies.
 - ▶ So the physical realm is not self sufficient.

Expanding Physics

- ▶ Gravity, electricity, magnetism, etc. cannot be explained in mechanical terms
- ▶ Is that an argument against physicalism?
- ▶ When people realized this, they expanded their notion of the physical to include the principles governing such phenomena
- ▶ Question: does this trivialize the claim that physics is self-sufficient?

Extending Physicalism

- ▶ Suppose we extend the notion of “body” (or “physics”) to include chemical and electromagnetic principles in addition to principles of mechanics.
- ▶ Can physics in this wider sense account for mental phenomena?
- ▶ Possible views:
 - ▶ Yes: mental phenomena are reducible to physical phenomena in this extended sense
 - ▶ No: mental phenomena are a further exception, beyond electromagnetic phenomena.

Examples of Reduction

- ▶ Water is H_2O .
- ▶ Heat is molecular motion.
- ▶ Lightning is an electrical discharge.
- ▶ Apparent biological design explained via evolution through natural selection.
- ▶ Genetic explanations in terms of DNA
- ▶ Physical explanation of life
- ▶ Beliefs are states of the brain?
- ▶ Pain is the stimulation of C-fibers?

Two Challenges

1. Are there particular mental phenomena that show physics needs to change?
 - ▶ Compare 19th C physics and chemistry.
 - ▶ Problems in chemistry helped motivate changes in physics
2. Even if physics does not have to change, are there still aspects of mind that are not reducible?

Models of Mind

- ▶ Mechanical toys of the 16th Century suggested a person might be a machine.
- ▶ Flow charts in programming: Psychological theories as flow charts.
- ▶ Information theory. Mind as an information processing system.
- ▶ Telephone switchboard analogy.
- ▶ Developments in AI suggest further models of human intelligence.

Computer Theory and Programming

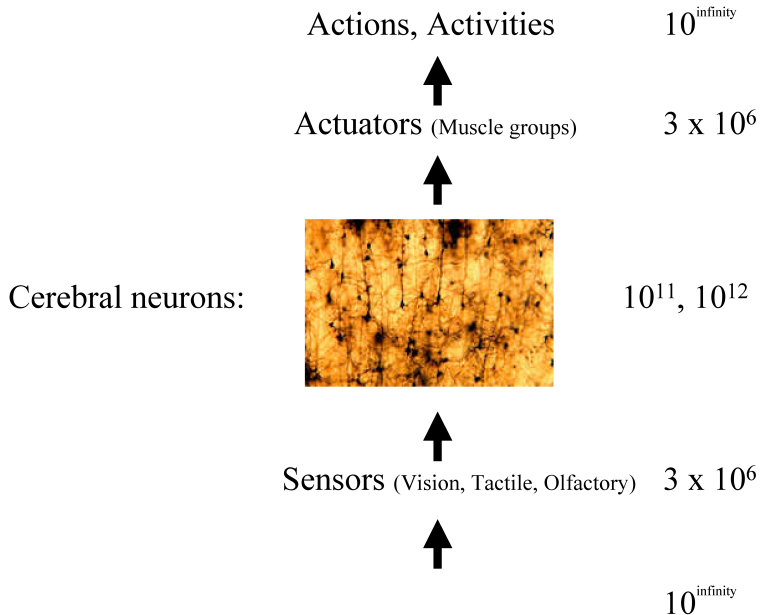
- ▶ Logic programming: thinking as theorem proving.
- ▶ Post production systems: grammars as production systems, minds as production systems.
- ▶ Computer: mind as a computer; person as a computer in a robot.
- ▶ Subroutines and modularity, psychological modularity: perceptual systems, language systems, motor systems, face-recognition system.
- ▶ Expert systems: intelligence as expertise.
- ▶ Pattern recognition and statistical learning theory: psychological learning as pattern recognition.

What Is Thought?



“Semantics is equivalent to capturing and exploiting the compact structure of the world, and thought is all about semantics.” Eric Baum, *What Is Thought?*, page 3.

Scale Relationships in the Human Processor



Occam's Razor

- ▶ “thought, and for that matter life, arises from the execution of a computer program.”
 - ▶ DNA: computer program for a biological organism
 - ▶ In the brain: computer program for thought, programmed by DNA plus experience.
- ▶ “a sufficiently compact program explaining and exploiting a complex world essentially captures reality.”
- ▶ Strong AI: “the mind is equivalent to a computer program”.

Compactness, Modules, and Evolutionary Programming

- ▶ Computer programmers make use of subroutines or modules, building on earlier developments
- ▶ Evolution does the same in programming DNA
- ▶ Thought uses old concepts and metaphors to understand new ideas.

Executable Code and Source Code

- ▶ Compare the intelligibility of
 - ▶ machine code, the lowest level instructions to the computer, the code that is directly “executed” by the computer.
 - ▶ higher level source code, the code that has to be compiled or interpreted to provide an executable set of instructions.
- ▶ The source code is both much shorter than the machine code and much more intelligible.
- ▶ “The neural circuitry is . . . akin to an executable. The DNA is more like the source code” (13).

Chinese Room Argument

- ▶ A system might behave as a speaker of Chinese and contain events with the right functional properties without understanding Chinese.
- ▶ A computer simulating a Chinese speaker does not understand Chinese.