

# **Philosophy 240**

## ***Symbolic Logic***

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Class 7: Syntax and Semantics  
The Chinese Room

# Three Theories of Mind

## 1. Dualism

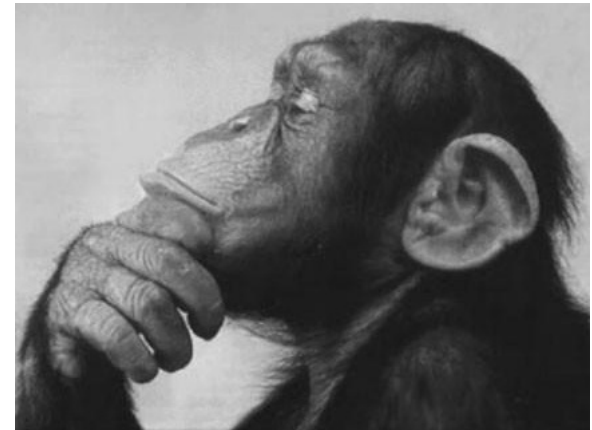
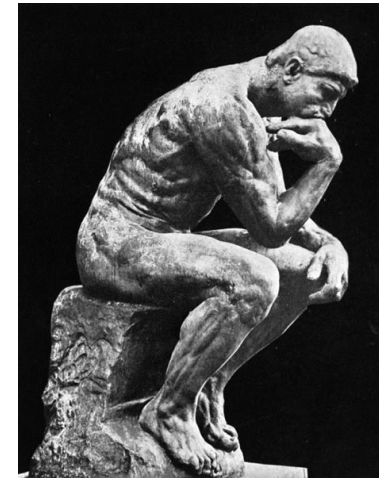
- ▶ Minds are non-physical substances (souls).
- ▶ Main problem: interaction

## 2. Behaviorism

- ▶ Mental states are behaviors, or dispositions to behave.
- ▶ Main problem: mental states with no attached behaviors

## 3. Mind-Brain Identity Theory

- ▶ Minds are brains.
- ▶ Main problem: chauvinism



# Functionalism

## The Dominant Theory of Mind

- The mind is the software of the brain.
- Anything that behaves like something with a mind, and that has internal processes that map onto our internal processes, has a mind.
- Functionalists are usually materialists, but need not be.
- Functionalism accommodates behaviorist's missing internal states.

# Computer Scientists are Functionalists

Saying Deep Blue doesn't really think about chess is like saying an airplane doesn't really fly because it doesn't flap its wings -Drew McDermott, Computer Science, Yale University.



# Zombies

## A Problem for Functionalism



# McCarthy's Thermostat

has three beliefs

1. that it is too cold
2. that it is too hot
3. that it is just right



# Strong AI

- Weak AI thesis: machines built to perform tasks that humans perform can give us some insight into the nature of our thought.
  - mostly uncontroversial
- Strong AI claim: computers (can) actually have minds.
  - Cheap calculators can now perform very complicated tasks, and quickly.
  - Machines are already able to do many tasks that once were inconceivable:
    - Proving mathematical theorems that require more computation than humans can perform.
    - Chess
- Better machines may approach or overtake human skill in other areas.
- All we need in order to have a mind is to simulate the behavior, along with some plausible internal causes of that behavior.
- A Plausible Functionalism

# Syntax and Semantics

- Computers and their software work according to purely formal, syntactic manipulation.
- The syntax of a program or system of formal logic concerns its form, or shape.
- The semantics of a system or program concerns the meanings, or interpretations, of its terms.



# Object Languages and Meta-Languages

- The object language is the language that we are studying.
- The meta-language is the language we use to study the object language.
- Rules for wffs
  - written in the meta-language
  - about how to construct an object language
- Rules for constructing truth tables
  - written in a meta-language
  - That's why we use  $\top$  and  $\perp$ , which are not symbols of our object language.
  - Truth tables themselves are written in the meta-language.
- The syntax tells how the formulas are constructed.
- The semantics tells how to interpret the formulas.
- Inference rules will be specified syntactically, too.

# Separating Syntax from Semantics

- We can treat our formal languages as completely uninterpreted, or topic-neutral.
- We can play with the symbols, according to the rules we specify, as if they were meaningless toys.
- We can interpret our languages variously, comparing interpretations in order to see the properties of the language itself clearly.
- Frege wanted a syntactic criterion for logical consequence.
  - To ensure that all deductions are secure
  - To ensure that we do not implicitly smuggle into our results unjustifiable interpretations
  - Non-Euclidean geometries
  - Infinitesimals

# Frege on Syntax and Semantics

from Begriffsschrift (Concept-Writing)

So that nothing intuitive could intrude [into our concept of logical consequence] unnoticed, everything had to depend on the chain of inference being free of gaps. In striving to fulfil this requirement in the strictest way, I found an obstacle in the inadequacy of language: however cumbersome the expressions that arose, the more complicated the relations became, the less the precision was attained that my purpose demanded...The present *Begriffsschrift*...is intended to serve primarily to test in the most reliable way the validity of a chain of inference and to reveal every presupposition that tends to slip in unnoticed, so that its origin can be investigated.

# How Computers Work



- Computers, in their most basic form, contain:
  - ▶ a complete list of possible states of the system (state table)
  - ▶ lists of possible inputs
  - ▶ lists of outputs computable from inputs and state table
  - ▶ all lists are specifiable syntactically
- Computer programs are algorithms, like cooking recipes.
  - ▶ An algorithm is just a list of instructions, a procedure.
  - ▶ Recipes generally just give simple, linear instructions.
  - ▶ An algorithm can also do different things depending on the state of the system executing the algorithm.
- Some algorithms contain conditional clauses
  - ▶ if the machine is in such-and-such a state, and receives such-and-so input, then it does this-and-that and moves into this other state.
- Computers merely follow algorithms.
- Every step of the algorithm can be specified syntactically, by its inscription.

# Appearance and Reality

- When we play a video game, we see cars and people, and hear music.
- We interact with the machine on a semantic level.
- But, the computer is just processing syntax, crunching 0s and 1s.
- If strong AI and functionalism are right, then human behavior must be describable algorithmically as well, and representable in purely syntactic form, using a formal language like the one we use in logic.
- Despite appearances, we are just information processors (according to strong AI).

# The Chinese Room

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# Searle's Claim

Any syntactic processor, completely describable in terms of formal processing, is *necessarily* not a mind.

# Searle's Argument

1. Brains cause minds.
  2. Syntax is not sufficient for semantics.
  3. Computer programs are entirely defined by their formal, syntactic structure.
  4. Minds have semantic contents.
- C1: Computer programs are not sufficient for minds (i.e. computers can not think).
- C2: The way that brains cause minds can not be by running a computer program.
- C3-4: Anything that causes minds, including any artefact that we might make, must have causal powers at least equivalent to those of the brain.