

# 24.09 Minds and Machines

## spring 2007

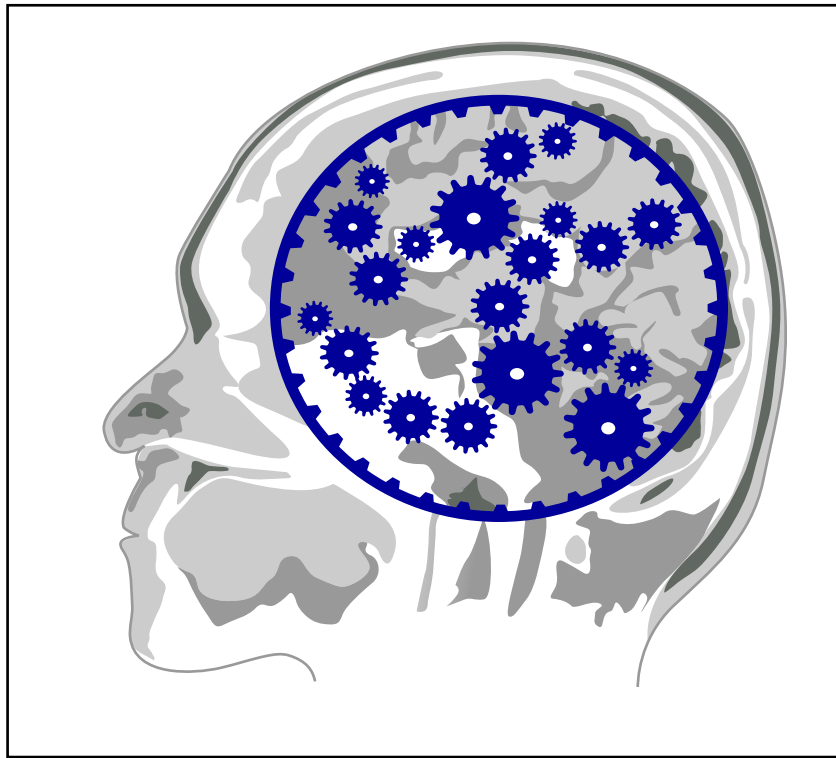


Figure by MIT OCW.

- functionalism, contd.

# lesson from Aunt Bubbles (?)

- minded creatures must have a certain sort of internal structure—being a giant lookup table isn't enough

# lessons (?) from our discussion of behaviorism

- mental states are the inner causes of behavior
- the correspondence between mental states and behavior is many-many
  - (a) mental state M may produce different sorts of behavior, depending on the creature's other mental states
  - (b) the same behavior may be produced by different mental states

# the mousetrap

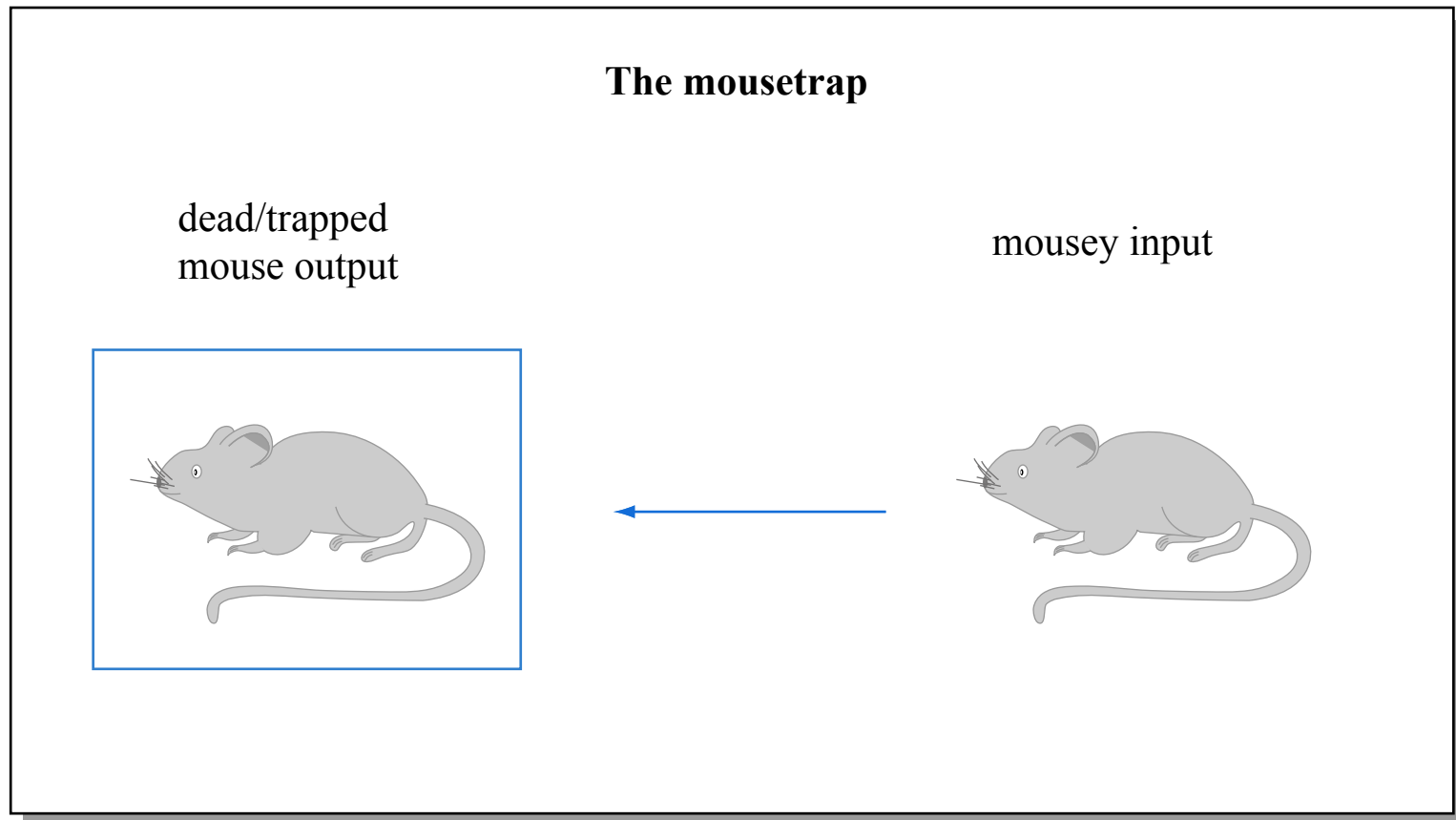


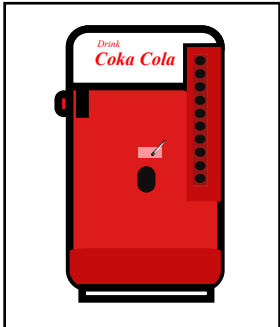
Figure by MIT OCW.

# mousetraps can be “multiply realized”

Images removed due to copyright restrictions.  
Mousetrap.

# the mousetrap

- the simplest sort of functional kind
- since no constraints are placed on its inner organization, it is also a behavioral kind






# the 3-Coke vending machine

initial  
state  
s

output  
for  
25¢ input

next  
states

$M_3 I_0$	$M_2 I_0$	$M_1 I_0$	$M_3 I_1$	$M_2 I_1$	$M_1 I_1$
“25¢”	“25¢”	“25¢”			
$M_3 I_1$	$M_2 I_1$	$M_1 I_1$	$M_2 I_0$	$M_1 I_0$	shut down

Figures by MIT OCW.

# the 3-Coke vending machine

- it can be multiply realized
- a functional but not behavioral kind
- what are the states  $M_3$ ,  $I_2$ , etc?  
—the table tells the whole story



# a toy functionalist theory of pain

input \ state	toe-stubbing	icepack on toe
P	P, "Ow!"	R, "Phew!"
R	P, "Ow!"	R, no output

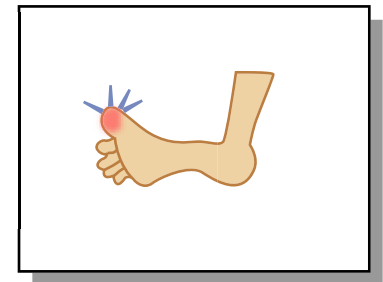


Figure by MIT OCW.

# the toy functionalist theory

- the state of being in pain (or being in a state of relief) just is being in P (R)
- S is in P iff S is in the first of two states X, Y, that are related to one another and to the possible inputs and outputs of S as follows:

being in X and stubbing its toe causes S to remain in X and emit “Ow!”; being in Y and stubbing its toe causes S to be in X and emit “Ow!”; being in X and having an icepack on the toe causes S to be in Y and emit “Phew!”; being in Y and having an icepack on the toe causes S to remain in Y and produce no output

# functionalism

- the view that mental states are functional states—states specified in terms of their causal relations to inputs, outputs, and other states

# functionalism and the lessons (?)

- mental states can be multiply realized
- input-output isn't enough: it's what's in between that matters (recall the Aunt Bubbles machine)
- mental states are the inner causes of behavior
- the correspondence between mental states and behavior is many-many
- functionalism accommodates all the above

# reminder: Turing machines

- simple computing machines
- if a function can be computed at all, it can be computed by some Turing machine
- it's important not to confuse the machine as abstract object (about which things are proved) with a physical realization of the machine

Image removed due to copyright restrictions.  
Photograph of Alan Turing (1912-1954).

# Turing machines

states:  $S_1, S_2, \dots, S_n$

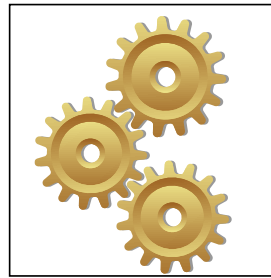
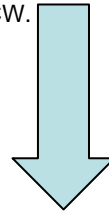


Figure by MIT OCW.

head  
{R, L, 1, 0, halt}



...100011110000111101110000000  
00...

tape

a simple Turing machine (nb: different  
machines can compute the same  
function)

state scanned cell	$S_1$	$S_2$
1	R, $S_1$	H
0	1, $S_2$	H

# functionalism and Turing machines

- the Turing machine played an important role in the development of functionalism
- “machine functionalism” (Block, Putnam) is an early version of functionalism
- however, the architecture of Turing machines is unnecessarily restrictive (e.g., a machine is only in one state at a particular time; we are in many mental states simultaneously)



# functionalism and physicalism

“By ‘physicalism’, I mean the doctrine that pain, for example, is identical to a physical (or physiological) state...if functionalism is true, physicalism is false” (Block, 95)

- if functionalism is true, then there could be a creature entirely made from “non-physical” stuff that had mental states
- that’s the sense in which functionalism is not a physicalist theory
- but there’s also a sense in which functionalism is a physicalist theory (the more usual sense, these days)
- if functionalism is true, only physical materials are needed in order to make a mind

# representationalism (the representational theory of the mind)

- mental states require inner representations: a subject is in such-and-such mental state with representational content that  $p$  only if a proper part of the subject has the representational content that  $p$
- for example, if the subject believes that snow is white, then according to representationalism some proper part of the subject (part of her brain, presumably) has the representational content that snow is white

# computationalism (the computational theory of the mind)

- a combination of (a) functionalism, (b) representationalism, and (c) the idea that mental processes are computational: they involve the algorithmic manipulation of symbols (i.e. the inner representations)

# relations between the three theses

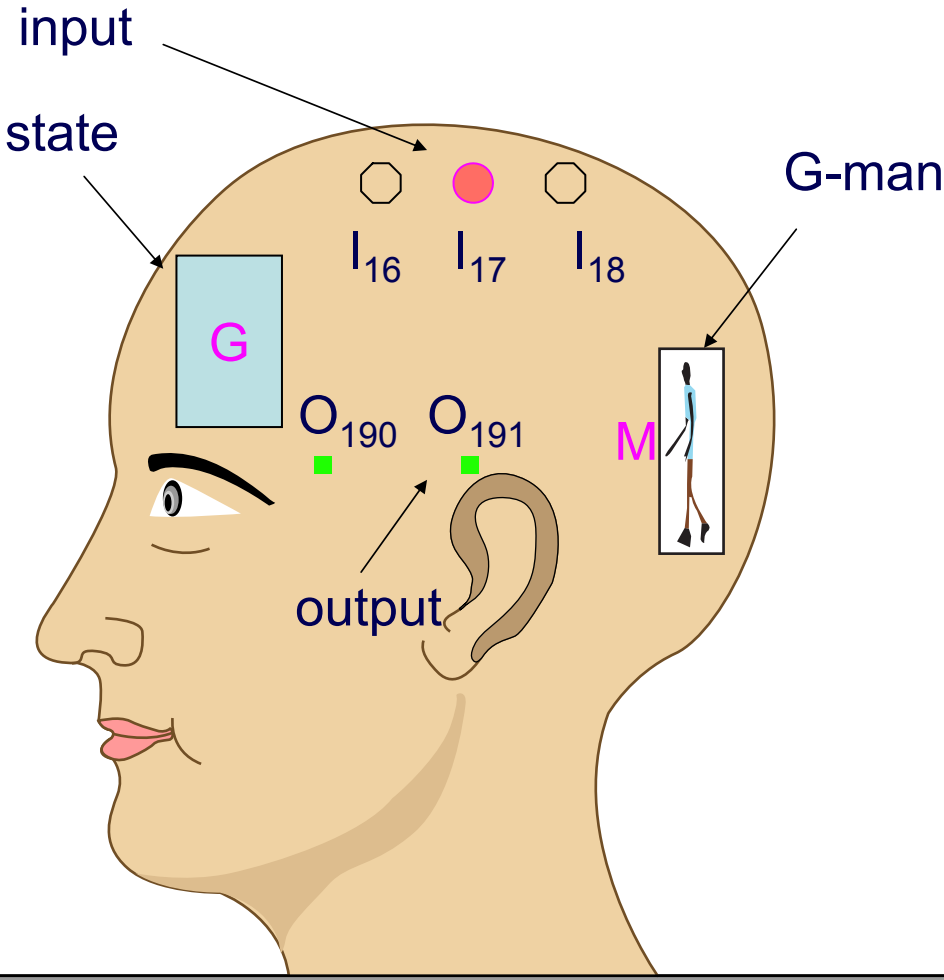
- computationalism implies functionalism and representationalism
- neither of the converse implications holds
- neither functionalism nor representationalism implies the other

# “troubles with functionalism”

Imagine a body externally like a human body, say yours, but internally quite different. The neurons from sensory organs are connected to a bank of lights in a hollow cavity in the head. A set of buttons connects to the motor-output neurons. Inside the cavity resides a group of little men. Each has a very simple task: to implement a “square” of an adequate machine table that describes you. (96)

On one wall is a bulletin board on which is posted a state card, i.e., a card that bears a symbol designating one of the states specified in the machine table. Here is what the little men do: Suppose the posted card has a 'G' on it... Suppose the light representing input I 17 goes on. One of the G-men has the following as his sole task: when the card reads 'G' and the I 17 light goes on, he presses output button O 191 and changes the state card to 'M'... In spite of the low level of intelligence required of each little man, the system as a whole manages to simulate you because the functional organization they have been trained to realize is yours... (96)

# Block's homunculus head



input	$I_{16}$	$I_{17}$	$I_{18}$
state	$O_{25}K$	$O_{191}M$	$O_{45}P$
G	$O_8H$	$O_{77}Z$	$O_5C$

Figure by MIT OCW.

there is prima facie doubt whether [the homunculus head] has any mental states at all—especially whether it has what philosophers have variously called “qualitative states”, “raw feels”, or “immediate phenomenological qualities” ...there is prima facie doubt whether there is anything it is like to be the homunculi-headed system.(97)

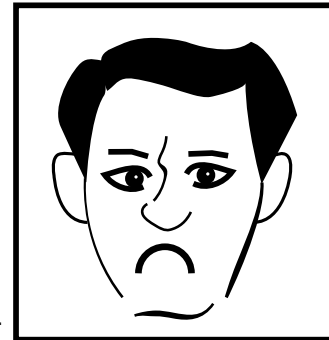


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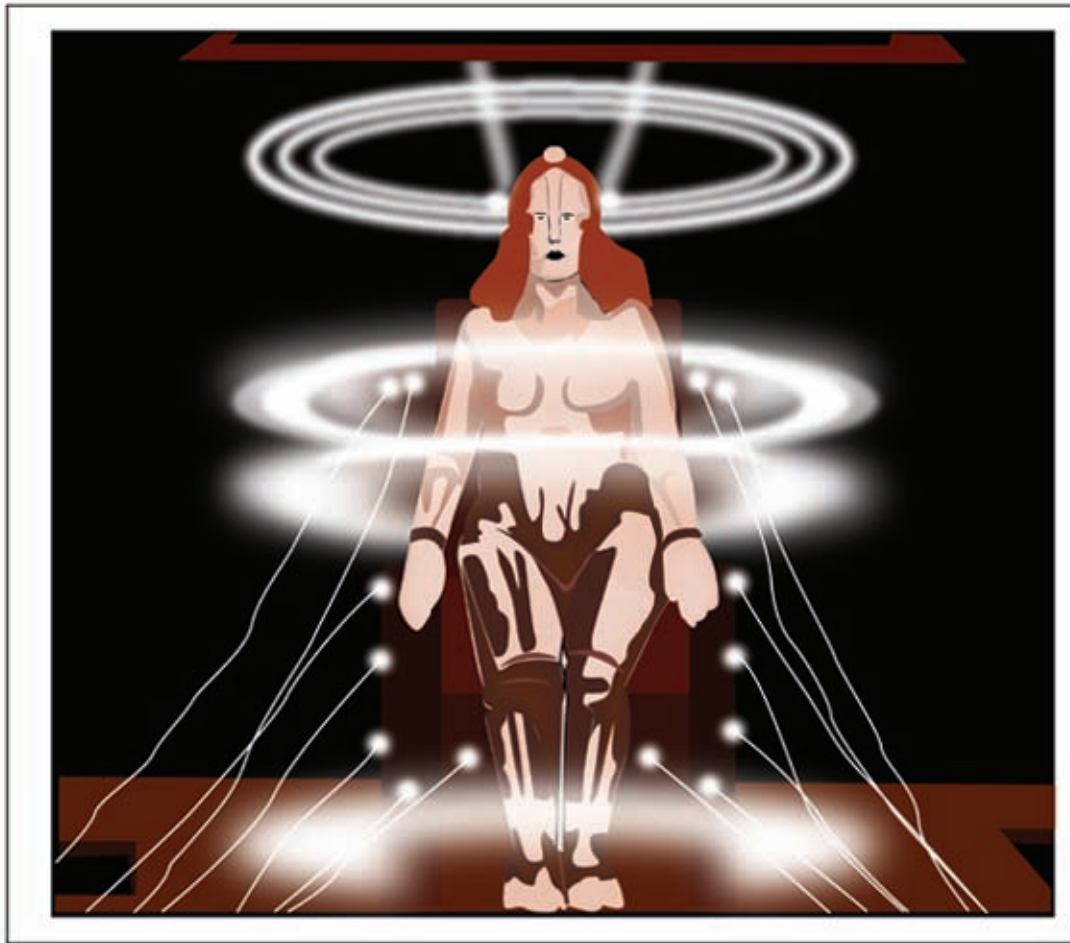


Figure by MIT OCW.

- Lewis next time