Reductionism

Jerry Fodor (1935-2017)

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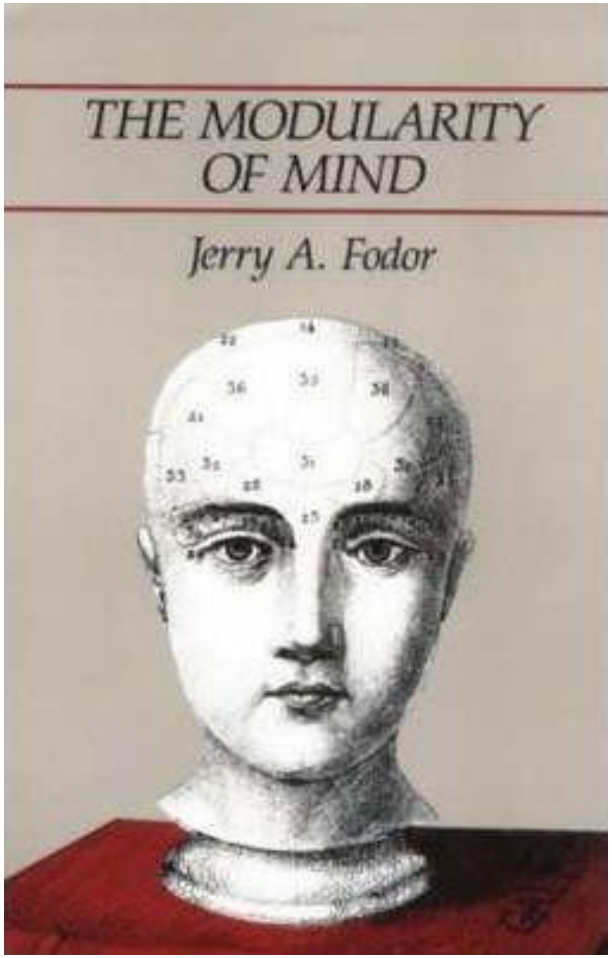
- Wrote an important book on cognitive architecture; argued that the mind is “modular” (this will re-emerge in the week where we discuss evolutionary psychology)


THE MODULARITY
OF MIND
Jerry A. Fodor

Fodor, J. (1974) “Special Sciences (Or: The Disunity of Science as a Working Hypothesis)”

a bit of background on the issues...

- One of the early criticisms of cognitive science was that some models seemed very unconcerned about how the brain actually worked
- Consider Chomsky's work in linguistics, which we talked about on Day 1
- There, one is concerned with uncovering the rules that generate all and only the grammatical sentences of some natural language
- There isn't (or, in the early days, wasn't) much interest in how the brain actually encodes those rules

- There has also been a long-standing issue in philosophy of science about how some sciences relate to others
- For instance, if everything is just physical stuff, then why do we have other sciences at all?
- How do these “special sciences” (anything other than physics) relate to the physical sciences?

- Logical positivists were very interested in reduction
- The account of reduction that Fodor provides comes to a large extent from Ernet Nagel (1901-1985)

Fodor distinguishes two claims

(1) whether physics is universal, that is, whether everything is ultimately physical

(2) whether reducibility to physics should be a guide to how to construct theories and laws in the special sciences

...and three theses

token physicalism: “all the events that the sciences talk about are physical events” (p. 100)

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Can someone explain what the difference is between token physical and materialism?

...and three theses

token physicalism: "all the events that the sciences talk about are physical events" (p. 100)

materialism: all events can be described by some science and that token physicalism is true

reductivism: "the conjunction of token physicalism with the assumption that there are natural kind predicates in an ideally completed physics which correspond to each natural kind predicate in an ideally completed social science" (p. 100)

Fodor endorses token physicalism (and probably materialism)

But he rejects reductivism.

Moreover, Fodor claims that, if reductivism is false, then a reduction (in the standard sense) cannot occur between a higher-level science and physics.

First, let’s be more clear about what a “reduction” is, at least for Fodor

conditionals

“P □ Q” is read “If P, then Q”

(The term to the left of the arrow is called the “antecedent” and the term to the right is called the “consequent”)

biconditionals

“P □□ Q” is read “P if and only if Q”

A biconditional represents necessary and sufficient conditions. E.g., “The shape is a triangle if and only if it has exactly three interior angles”.

(Fodor’s notation is slightly different.)

Fodor says a reduction occurs when

$S_1x \rightarrow S_2x$

and...

$S_1x \leftrightarrow P_1x$
$S_2x \leftrightarrow P_2x$
$P_1x \rightarrow P_2x$

where the *S* terms come from a special science and the *P* terms come from a physical science

Reductivism is the view that one can reduce a (true) law from a special science in the manner described in the previous slide

Let’s look at how a reduction is supposed to work in more detail

Thomas Gresham (1519-1579)

Gresham's Law

- The English shilling used to be made of silver, but Henry VIII started putting in less valuable metals into the coin.
- But the old, silver coins had the same face value as a new, less-silvery coin.
- People knew about the change, so they started hoarding the old coins (with more silver) and using only the new coins (with less inherent value).
- If you melted down the old coin for the silver it would be worth more than the its face value, so why spend it if you didn't have to

Gresham's Law

Here's a (rough) formulation of Gresham's Law, rendered as a conditional:

"If currencies *X* and *Y* have the same face value but *X* has more inherent value than *Y*, then *X* will decrease in proportion in the market relative to *Y*"

Note that this is a conditional

"*If* currencies *X* and *Y* have the same face value but *X* has more inherent value than *Y*, *then X* will decrease in proportion in the market relative to *Y*"

So we can let S_1x stand for the antecedent and S_2x for the consequent and get: $S_1x \rightarrow S_2x$

two important points

first...

the conditional uses vocabulary from the "universe of discourse" of economics—e.g., "currency", "market", "inherent value", "face value"

These are "natural kinds" or "natural kind terms" or "natural kind predicates" in economics

first...

- different sciences have different universes of discourse and different natural kinds
- e.g., in cognitive science we have “representations”, in biology we have “species” and “organisms”, in physics we have “mass” and “force” and “spin”, etc.

second...

Fodor thinks any law in a science must have natural kind terms in both the antecedent and consequent of the law

This was satisfied in our formulation of Gresham's Law

second...

"*If* currencies *X* and *Y* have the same face value but *X* has more inherent value than *Y*, *then X* will decrease in proportion in the market relative to *Y*"

That is, $S_1x \square S_2x$ has the right natural kind terms in the conditional

second...

So a law from economics will cite natural kind terms *from economics*...

...while a law from cognitive science, biology, and physics will draw from the natural kind terms in cognitive science, biology, and physics, respectively

Recall what a reduction is

$S_1x \rightarrow S_2x$

and...

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$S_2x \leftrightarrow P_2x$
$P_1x \rightarrow P_2x$

where the *S* terms come from a special science and the *P* terms come from a physical science

$S_1x \rightarrow S_2x$ Now we have an example

and...

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$S_1x \Box S_2x$ Now we have an example

and...

$S_1x \Box\Box P_1x$ But what does this mean?
$S_2x \Box\Box P_2x$
$P_1x \Box P_2x$

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For says a reduction occurs when

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$P_1x \Box P_2x$

where the *S* terms come from a special science and the *P* terms come from a physical science

$S_1x \Box\Box P_1x$

What this means is that P_1x is the physical state that is the basis for S_1x

P_1x just means “the world is in physical state P_1” (whatever that state may be)

Fodor talks about this in terms of “event identities”

$S_1x \square\square P_1x$ means...

“every event which consists of *x*’s satisfying S_1 is identical to some event which consists of *x*’s satisfying P_1 and vice versa” (p. 100).

"*If* currencies *X* and *Y* have the same face value but *X* has more inherent value than *Y*, *then X* will decrease in proportion in the market relative to *Y*"

S_1x: currencies *X* and *Y* have the same face value

$S_1x \Box\Box P_1x$

currencies *X* and *Y* have the same face value but *X* has more inherent value than *Y* if and only if the world is in physical state P_1

"*If* currencies *X* and *Y* have the same face value but *X* has more inherent value than *Y*, *then* *X* will decrease in proportion in the market relative to *Y*"

S_2x: *X* will decrease in proportion in the market relative to *Y*

$S_2x \Box\Box P_2x$

X will decrease in proportion in the market relative to *Y* if and only if the world is in physical state P_2

- If you like, you can think of the *S* term as a "supervenient property" and the *P* term as the "supervenience base"
- E.g., my belief "It is cold outside" supervenes on the physical state of my brain when I have that thought
- This is a so-called *non-causal dependency relationship*
- Note, Fodor does not say "supervenience" anyhwere. But I'm pretty sure his argument would still work if that's how we configure the relationship between *S* and *P*.

$S_1x \Box S_2x$

and...

$S_1x \Box\Box P_1x$
$S_2x \Box\Box P_2x$
$P_1x \Box P_2x$ now what does this mean?

where the *S* terms come from a special science and the *P* terms come from a physical science

$P_1x \rightarrow P_2x$

This is a law from physics that says, roughly, “If the world is in physical state P_1, then it will be in physical state P_2”

Fodor think a reduction like this will probably never happy. Why?

...because he thinks it would be a miracle if a law about monetary exchanges (for example) is realized by a law that relates physical states

That is, it would be a miracle if $S_1x \rightarrow S_2x$ is a law in a special science *and* the physical realization of that law, $P_1x \rightarrow P_2x$, is a law from physics.

Why would this be a miracle?

This gets back to Fodor's claim that a law (whether in a special science or in physics) must relate natural kind terms

With Gresham's law, for example, we are arguably dealing with natural kinds (for economics): the *value* of coins within a *market*, etc.

But the physical realization of this state will not be a natural kind, Fodor claims. The physical story is just a story about the composition of little objects spread amongst the British Isles, or wherever else the law applies, even when it's not about shilling but is instead about rubles, dollars, wampum, etc.

Put another way, while S_1x and S_2x will be natural kinds, P_1x and P_2x will probably not be

But this is problematic. Because a law, according to Fodor, must relate natural kind terms. And if P_1x and P_2x are *not* natural kinds, then $P_1x \Box P_2x$ cannot be a law, and hence the reduction is not possible.

But Fodor is not just (or mainly) interested in economics.

“I take it that the preceding discussion strongly suggests that economics is not reducible to physics in the proprietary sense of reduction involved in claims for the unity of science. There is, I suspect, nothing special about economics in this respect; the reasons why economics is unlikely to reduce to physics are paralleled by those which suggest that psychology is unlikely to reduce to neurology.”

Possible objections?

One possible objection

- Fodor says that a law needs to reference "natural kind" terms
- Does this just mean the objects that the law references must be natural kinds?
- Or does it also mean that the set of objects the law references must *itself* be a natural kind?

natural kind objects:

proton (physics), market (economics), representation (cognitive science), organism (biology), etc.

a natural kind as set of objects:

the protons in a particular atom, the markets in South America, the representation in a particular brain, the organisms in some habitat

a set of natural kind objects that is not itself a natural kind (?):

a random proton in this classroom, a neutron in Petersburg, and an electron in Paris.

Each of these objects is a natural kind (in physics), but the set of objects does not seem itself to be a natural kind.

- Assume that P_1 is the physical realization of S_1, and that P_2 is the physical realization of S_2
- It seems the P's *will* pick out natural kind objects from physics (e.g., electrons)
- It's just that the set of objects might not be itself a natural kind (e.g., a set of objects in the British Isles)
- But if a law references a set of objects, does the set itself need to be a natural kind, or just the objects in the set?
- Fodor's argument seems to assume both, but this is not obviously correct.

We should be clear about what Fodor is and is not arguing for

- In short, Fodor is a token physicalist; he thinks the world is ultimately made up of physical stuff
- However, he thinks that higher-level phenomena do not correspond to physical natural kinds
- Hence, a reduction of a higher-level science (like psychology) to physics will not be possible, at least given the standard way that (he takes) philosophers to construe reduction

“Even if (token) psychological events are (token) neurological events, it does not follow that the natural kind predicates of psychology are co-extensive with the natural kind predicates of any other discipline (including physics). That is, the assumption that every psychological event is a physical event does not guaranty that physics (or, *a fortiori*, any other discipline more general than psychology) can provide an appropriate vocabulary for psychological theories. I emphasize this point because I am convinced that the make-or-break commitment of many physiological psychologists to the reductivist program stems precisely from having confused the program with (token) physicalism” (p. 105).

a different (and more popular?) take

- Higher-level sciences *do* reduce to physics
- But, we still need higher-level sciences so that we can understand complex phenomena

Franz Ferdinand (1863-1914)

Gavrilo Princip

- E.g., we *could* explain the start of WWI in the language of physics (with protons, electrons, spin, etc.), but that description would be so complicated that it would be basically meaningless for us (given our cognitive limitations)
- So we choose to stay at the higher level

Putnam's Triangle

You have a circle whose area is 12.5 cm^2 and an isosceles triangle whose sides are each 6 cm.

When you try to push the triangle through the, circle, it won't fit.

Why?

- You *could* explain this in terms of the physical interaction between the edge of the circle and the triangle's sides

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- You *could* explain this in terms of the physical interaction between the edge of the circle and the triangle's sides
- Or, you could point out that the area is equal to Pi * r^2.
- So, if the area is 12.5 cm^2, then a little algebra shows that the circumference of the circle is 4 cm.
- And you can't fit an object that is 6 cm long through an object that is 4 cm long.

In this case, it seems much easier, and just as accurate, if we explain why the triangle doesn't fit in the language of geometry, not physics.

In both examples, we're adopting an *instrumentalist* justification for higher-level sciences

We need higher-level sciences because they are useful to use; they are an instrument, like glasses

This contrasts with Fodor, who argues that we have higher-level sciences because we could not even in principle reduce them to physics.