

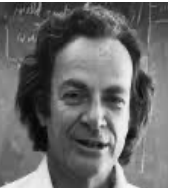
13. Naturalism

- 1. Naturalism
- 2. Theory-Ladenness of Observation
- 3. Social Structure and the Division of Scientific Labor

1. Naturalism

Should philosophy of science be useful to science?

Sceptical physicists:



Richard Feynman
(1918-1988)

"Philosophy of science is as useful to scientists as ornithology is to birds."



"...we should not expect it [philosophy of science] to provide today's scientists with any useful guidance about how to go about their work or about what they are likely to find."



Steven Weinberg
(1933-2021)



Neil de Grasse Tyson

"...we learn about the expanding universe...we learn about quantum physics, each of which falls so far out of what you can deduce from your armchair that the whole community of philosophers... was rendered obsolete."

"Philosophy is dead."



Stephen Hawking
(1942-2018)

Really?!?

Response 1:

Foundationalism: To describe science, one needs to stand *outside* of science.

- In other words: Providing an account of science is different from doing science.
 - *Foundationalist philosophy of science isn't concerned with being a useful guide for scientists, just like ornithology isn't concerned with being a useful guide for birds.*
 - *Historians and sociologists of science study science, as opposed to doing science. Why criticize philosophers of science for not doing something they aren't trying to do?*

Example: Why are many prominent contemporary physicists so opposed to philosophy?

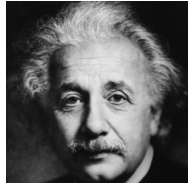
- Answer: Pedagogy! After World War II, there was an exponential increase in enrollment in physics PhD programs.

"The massive training mission that ensued—bolstered in the US by tens of thousands of new federal fellowships in physics and allied fields—radically changed how physics was taught..."*

- Old pedagogy: Focused on conceptual foundations.
- New pedagogy: "Shut up and calculate!"

• On the other hand:

- Foundationalism based on logical analysis (logical positivism, logical empiricism) has been shown to be inadequate.
- And: Many physicists think philosophy *is* useful for practicing scientists.



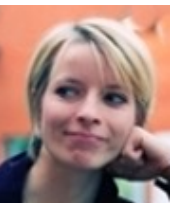
Albert Einstein
(1879-1955)

"A knowledge of the historic and philosophical background gives that kind of independence from prejudices of his generation from which most scientists are suffering. This independence created by philosophical insight is—in my opinion—the mark of distinction between a mere artisan or specialist and a real seeker after truth"

"Philosophy has always played an essential role in the development of science, physics in particular, and is likely to continue to do so."



Carlo Rovelli



Francesca Vidotto

"There is no physicist who does physics without being guided by some kind of philosophy. What I mean is that you should have a picture of what you're doing, what your methods are, what your goal is, and what you want to understand. Without a clear philosophy, you risk doing bad physics. All the great physicists, of the past and of the present, had very good training in philosophy."

"Physicists should stop saying silly things about philosophy."*



Sean Carroll

*<https://www.preposterousuniverse.com/blog/2014/06/23/physicists-should-stop-saying-silly-things-about-philosophy/>

Response 2:

Naturalism: "Philosophy is continuous with science."

- Claim: Philosophy can use results from science to help answer *philosophical* questions about science itself.

Metaphysics and Physics

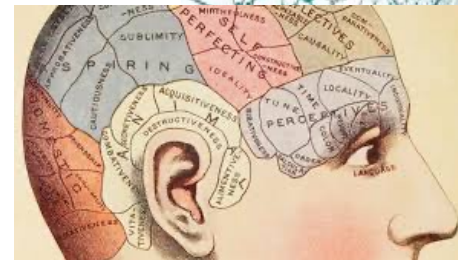
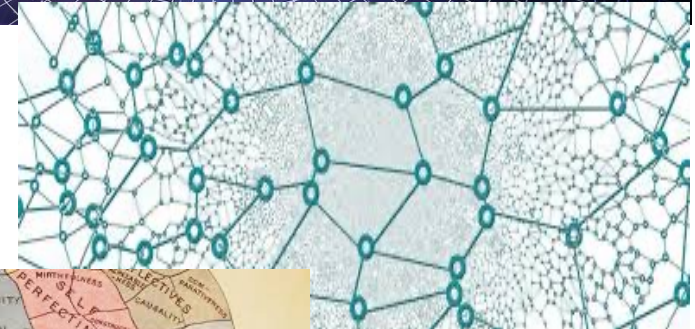
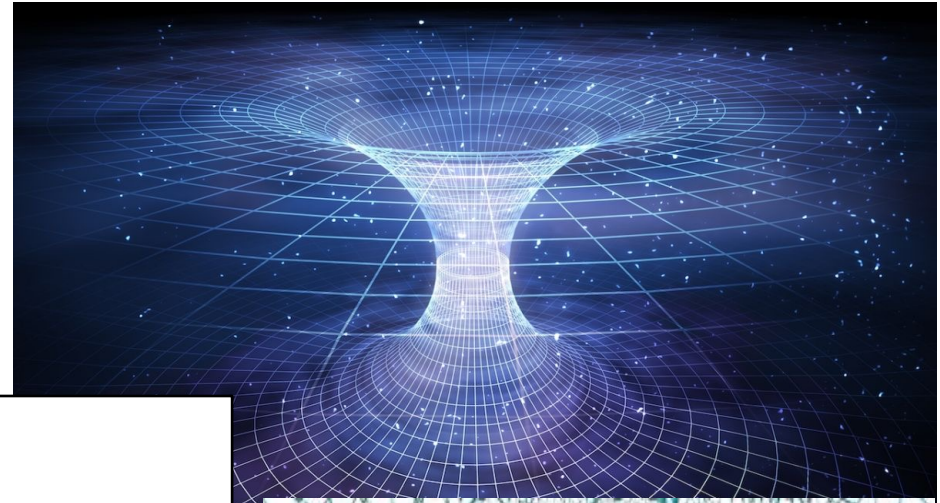
- What is the nature of space and time?
- What is fundamentally real?
- Is the universe predetermined?

Metaphysics and Biology and Chemistry

- What is a species?
- How do complex systems supervene on simple systems?
- What is the source of life?

Epistemology and Psychology

- What are belief states?
- What is knowledge and how is it obtained?
- *What constitutes an observation?*



2. Theory-Ladenness of Observation

How neutral (objective) are observations?

Theory-Ladenness of Observation

Weak Version: The observations that affect theory choice are filtered through a process influenced by theoretical beliefs.

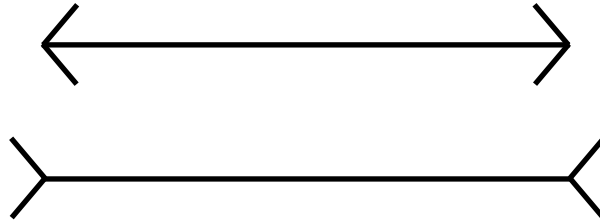
← *Holism about testing*

Strong Version: The experiences that a person has are influenced by their beliefs, including their theories.

← *Recall inverted goggles experiments.*



- How can we assess the Strong version?
 - *Naturalism: Look to psychology...*



- Both lines are the same length.
 - *Lower one seems longer because of unconscious use of background assumptions in processing visual inputs.*

Evidence for theory-ladenness of observations?

- Not for Strong Version:
 - *The illusion is not affected by the knowledge that it is an illusion!*
 - *Suggests: Background assumptions are not "high-level" theories, but rather "low-level" assumptions (nature of 3-dim space, effect of distance on apparent size, etc).*

Naturalist's Moral:

Observation is a natural phenomenon that psychology is equipped to better understand than, say, philosophy of mind.

2. Social Structure and the Division of Scientific Labor

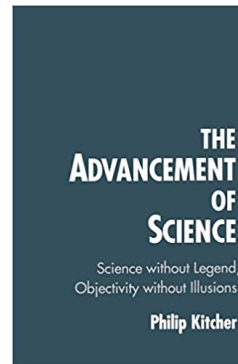
Another example of a naturalistic approach to philosophy of science...

- Science as a combination of cooperation and competition.

What is the best distribution, for science as a whole, of scientists across a range of research traditions/programs?



Philip Kitcher



The Advancement of Science (1993)

When is it rational for an individual scientist to join a research tradition/ program within a given field?



Lakatos



Laudan

- Specific question: How can resources be distributed over several research programs all addressed to the same problem in order to maximize the chance that the problem will be solved?
 - Hedge your bets? Distribute resources over all programs?

Relevant questions

- Suppose (ideally) there is "Top-Down" control over science:

How can the degree to which one program is more promising than another be quantified?

How can a program with *decreasing marginal returns* (becomes less effective the more workers you assign to it) be identified?

- Suppose (realistically) that there is no "Top-Down" control over science:

- Assume: *Science works on a reward system (prestige).*

- Assume: *Individual scientists are motivated by self-interest (obtaining rewards).*

What kind of reward system in science will produce distributions of workers that benefit science as a whole?

What kind of reward system will produce the same distribution of workers that the Top-Down Control system produces?

Option 1: Give fixed reward to everyone who works on the program that eventually succeeds, regardless of how many workers there are.

No bet-hedging:

- Incentivizes working on most promising program.
- What if it fails?

Option 2: Reward individuals for making choices that produce the maximum benefit in terms of the overall chance that the community will solve the problem.

Unrealistic:

- How could it be implemented?

Option 3: Reward *equally* only those who work on the program that eventually succeeds.

Optimal! Hedges bets:

- Incentivizes working on small programs: Reward is diluted in crowded programs.
- Incentivizes working on less-promising programs: Maximizes expected payoff.



Kitcher's account of the social structure of science

But: Does Option 3 encourage "free riding"?*

Free riding:

Option 3: Reward *equally* only those who work on the program that eventually succeeds.

$E = mc^2$

$E = mc^{1.97823}$



Joining a promising crowded program and contributing a minimal effort for a better chance of a smaller reward.

versus

Joining a smaller, less crowded program and contributing a larger effort with a lesser chance of a larger reward.

Option 4: Reward an individual in proportion to the contribution she makes to the program she joins, and if that program eventually succeeds.

- *Incentivizes working on smaller, less-promising programs (like Option 3).*
- *Discourages free rides: Early joiners with greater contribution get more reward than late joiners with less contribution.*

*Strevens, M. (2003) "The Role of the Priority Rule in Science", *Journal of Philosophy* 100, pp. 55-79.

Open Questions

- How might we get a community of individuals to behave in a "scientific" way?
 - *Scientists need to make a living.*
 - *Society as a whole must allow questioning and open-ended inquiry.*
 - *There has to be a balance between competition and cooperation of an appropriate sort.*
- Is there only one way to do this?
 - *Intense, egoistic competition of Western market-based societies?*
 - *Less competition and more cooperation of communitarian or socialist societies?*
 - *Male-centric, female-centric, etc., societies?*