Philosophy $2^2 3^3$: Intuitions and Philosophy
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Tuesdays and Thursdays, 1pm - 2:15pm
Library 209

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Class 6 - Scientific Method

I. Holism, reflective equilibrium, and science

Our course is centrally concerned with methodology in philosophy.
We started by looking at foundationalist epistemologies, and a bit at coherentist ones, in order to examine the ultimate methods of justification for our beliefs.
We have found two sorts of problems with foundationalist theories.

The first kind of problem involved particular choices of foundational beliefs.
Perhaps Descartes just took the wrong axioms.
Perhaps sense-data are not the ultimate atomic facts.
These problems seemed worrisome, but not fatal to the foundationalist attitude.
Better choices of foundations could ameliorate such worries.

The second kind of problem was more profound, and arose in two directions.
The color incompatibility problem led us to Sellars's insights about the myth of the given.
According to the foundationalist, our atomic beliefs are supposed to have their justifications on their surfaces.
If there are no self-justifying givens, then there are no immediately-perceivable, atomic facts.
We discussed two kinds of resultant holism.
Semantic holism is the thesis that meaning is a property of entire languages (or at least large swaths of language).
Confirmation holism is the thesis that a statement is neither confirmed nor refuted by itself, but presupposes a larger theory.

From another direction, Goodman argued that justifications for induction and deduction follow the same patterns.
He noticed that we accept certain general principles because they yield the specific claims we believe.
We justify those beliefs because they are derived from acceptable general principles.
Goodman argued that the apparent circularity of these defenses is virtuous, and that a consequence of accepting the method implicit in his observation leads to a dissolution of the problem of induction.
If he is correct about induction and deduction, then foundationalism must be replaced by what has come to be known as reflective equilibrium.
We have particular observations, none of which is privileged.
We have general theories, none of which is taken as dogma.
We look to balance the theories and the observations, and to achieve a stable relationship between them.
The name 'reflective equilibrium' was coined by John Rawls, in the context of theorizing about ethics.
But the procedure originates in epistemology.

Goodman arrived at the method of reflective equilibrium in the context of analyzing the problem of induction, of trying to characterize the differences between acceptable and unacceptable inferences.
He argued that the problem of induction is small potatoes compared to the new riddle of induction, which arises when we try to determine how evidence confirms a theory.
The problem of induction, as Goodman presents it, looks so intractable that it must be relying on a

mistaken description of the problem.
Quine wrote, "The Humean predicament is the human predicament" ("Epistemology Naturalized," p 72).
He means that there is no straight solution to the problem of induction, and thus no possibility of self-justifying, immediately-given experiences or observations.
Once we accept the impossibility of solving the traditional problem of induction, we have to adopt something like Goodman's virtuously circular method.
The only possible response is to dissolve the problem, as Goodman (and Hume) did.

The lessons we have learned so far are these:

1. Justification seems to be holistic, rather than atomistic.
2. There is an interaction between general theories and particular statements that supports all of our beliefs.

Given holism, the method of seeking reflective equilibrium between our theories and our particular beliefs finds a proper home in the philosophy of science.

> People adopt or entertain a hypothesis because it would explain, if it were true, some things that they already believe. The evidence is seen in its consequences (66).

II. Resolving contradictions in a theory

The reading for today concerns scientific methodology.
But, the lessons of this reading are not meant to be limited to a narrow field.
Quine is presenting guiding principles for the management of all of our beliefs, including philosophical ones.
The lessons from philosophy of science translate to philosophy, according to the holist, because all of our beliefs are linked together in a massive, interconnected web.
We do not isolate science from our ordinary reasoning, we do not separate distinct fields of study.
As a consequence, philosophy is not to be distinguished from science.
There is no metaphysics, apart from science; there is no epistemology apart from scientific method.
Scientific theories will tell us what exists.
The scientific method is the only method that matters.
We are all scientists, even in our everyday life, and our methods, if they are to be the best methods, must not differ from the scientific method.

One of the most important methodological lessons we take from science concerns how to manage a belief that contradicts ones we already hold.

> Once we recognize a conflict among our beliefs, it is up to us to gather and assess our evidence with a view to weeding out one or another of the conflicting beliefs (14).

Quine's murder mystery (pp 17-19) is an example of how to proceed.
In that example, we have a system of hypotheses, each of which is independently justified, but all of which are incompatible.
We have to choose which hypothesis to cede, so we look at the various evidence.

As I mentioned last week, a contradiction within a large theory merely tells us that there is a problem in the theory.
It need not tell us where the problem lies.
If we were to believe that there were going to be no parties this weekend, and then we received a flyer for a gathering on Friday, we could resolve the contradiction which results from adding the belief we gain from the flyer to our belief set in various ways.

1. We could check the date on the flyer; maybe there is a confusion about the data.
2. We could give up our belief about there being no parties this weekend.
3. We could redefine the term 'party' such that the gathering is not a party.
et al.

Of course, we need methods for weighing the evidence, for choosing among various options.
Those methods are governed by various abstract principles.

> In probing the evidence, where do we stop? In probing the evidence for [1] through [4] we dredged up various underlying beliefs, but we could have probed further, seeking evidence in turn for them. In practice the probing stops when we are satisfied how best to restore consistency: which one to discard among the beliefs we have canvassed (18-9).

The question of how to restore consistency to theories is not to be distinguished from the question of how to reason generally.
The answer is complicated by the fact that there are various ways to proceed each of which fit the logical requirements.
We can easily restore consistency to a theory which contains a contradiction in different, incompatible ways.

III. The under-determination of theories by evidence

Theories are generally under-determined by evidence.
Simple examples include the fact that evidence often provides correlation without indicating causation.
For example, a recent study shows that Facebook users get lower grades in college.
We do not know whether to conclude that Facebook use causes lower grades or that people who use Facebook are those who are already likely to be less successful.
Similarly simple examples are ubiquitous.

More profoundly, we have choices among theories for the holistic reasons we have discussed.
When presented with a theory and an observation, there are various options of how to integrate the observation into the theory.
Even when an observation does not conflict with other, previously-accepted hypotheses, there are always lots of theories that can accord with our claims.
Some of those theories have extraneous elements.
We discount theories that refer to ghosts, for example, and seek an explanation of the noise in the attic that appeals only to natural phenomena, like wind and expansion or contraction of materials due to humidity.
We invoke principles of parsimony, or Ockham's razor: do not multiply entities beyond necessity.

IV. Principles of reasoning; the scientific method

Quine presents five "virtues" which guide our analyses of hypotheses, which help us to determine how best to restore consistency to our theory, or belief set, and which govern scientific reasoning generally.

1. Conservatism
2. Modesty
3. Simplicity
4. Generality
5. Refutability

These principles guide our choices of theories.
Conservatism tells us to only revise as little as we need to, in order to maintain as much as possible of our previous theory.
We accept only the weakest, or most modest, principles, as the most plausible.
"The lazy world is the likely world" (68).

Quine points out that simplicity for our large theory trumps simplicity for any portion of that theory, when the two conflict.
The claim 'objects fall to the Earth' is simple, but conflicts with gravitational theory, which is simpler overall, and more general.

> There is a premium on simplicity in any hypothesis, but the highest premium is on simplicity in the giant joint hypothesis that is science, or the particular science, as a whole. We cheerfully sacrifice simplicity of a part for greater simplicity of the whole when we see a way of doing so (69).

This desire for generality applies to all the virtues.
We are looking for the most conservative total theory, and the most modest total theory.

Quine's fifth virtue, refutability, was emphasized by Karl Popper, who hung around with the positivists, but worked independently of them.
Popper, like the positivists, was concerned to distinguish between science and pseudo-science.
Popper claimed that the mark of legitimate science was refutability.
Pseudo-sciences always have ways to account for the failures of their predictions.
For example, macro-economists will tell us lots of reasons why they did not predict our recent economic difficulties.
And, they will present a theory that will explain those difficulties.
But, they will (generally speaking) not conclude that any principles of macro-economics were refuted.
(Popper himself argued most vehemently against Freudian theories of the unconscious and Marxist theories of history.)
Quine includes refutability, as a nod to Popper's basic point, that theories must be honestly tested, and not held as dogma.
But, as Quine notes, holism entails that any principle can be held irrefutable, as a logical matter.

> Just about any hypothesis...can be held unrefuted no matter what, by making enough adjustments in other beliefs - though sometimes doing so requires madness. We think loosely of a hypothesis as implying predications when, strictly speaking, the implying is done by the hypothesis together

> with a supporting chorus of ill-distinguished background beliefs. It is done by the whole theory taken together (79).

V. From science to rationality

Quine's virtues are not limited to philosophy of science.
In fact, they are principles of rationality, generally.

> Insofar as we are rational in our beliefs..., the intensity of belief will tend to correspond to the firmness of the available evidence. Insofar as we are rational, we will drop a belief when we have tried in vain to find evidence for it (16).

Science is the epitome of a rational enterprise, especially when we consider science, as the holist does, in its most broad form.
That is, in the holist's sense of 'science', every rational pursuit is science.
That includes philosophy.
These principles are not merely methodological virtues for the scientists.
They are guiding principles for philosophical theorizing.
That is why Quine moves from discussions of simple beliefs to more sophisticated examples from science.
There is no difference, methodologically, between our philosophy and our science.
All reasoning is governed by the same kinds of principles, the same scientific method, the same reflective equilibrium that Goodman discussed.