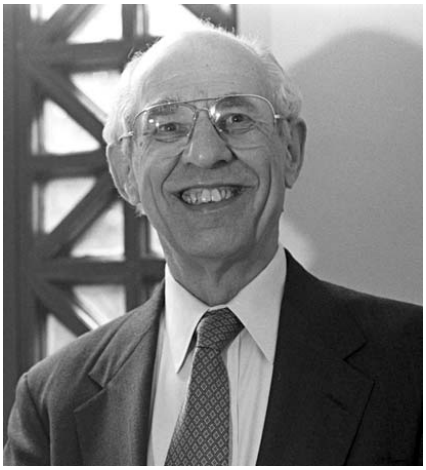
PHI 030: April 27, 2015

Table of Contents

"What Theories Are Not," Hilary Putnam (1926 -)



Key Ideas

1. Carnap is wrong to divide scientific terms into observable and unobservable.
2. There is no problem about how to interpret theoretical terms.
3. Carnap is wrong that justification proceeds from observable terms to unobservable ones.
4. If an "observation term" is one that cannot apply to an unobservable, then there are no observation terms. Observation terms can be applied to unobservables.
5. Terms referring to unobservables are invariably explained, in the actual history of science, with the aid

of already present locutions referring to unobservables.
6. The difference between observation reports and theoretical statements can't be made in terms of **vocabulary**.

Select Quotations from Putnam

1. The topic [of the paper] is the role of theories in empirical science; and what I do in this paper is attack what may be called the "received view" [which is Carnap's] on the role of theories--that theories are to be thought of as "partially interpreted calculi" in which only the "observation terms" are "directly interpreted" (the theoretical terms being only "partially interpreted," or, some people even say, "partially understood").

2. The view divides the nonlogical vocabulary of science into two parts: Observation Terms, e.g., red, touches, stick, and Theoretical Terms, e.g., electron, dream, gene.

3. This division of terms into two classes is then allowed to generate a division of statements into two classes as

follows: *Observational Statement*, i.e., statements containing only observation terms and logical vocabulary, and *Theoretical Statements*, i.e., statements containing theoretical terms.

4. Lastly, a scientific theory is conceived of as an axiomatic system which may be thought of as initially uninterpreted, and which gains "empirical meaning" as a result of a specification of meaning for the observation terms alone. A kind of partial meaning is then thought of as drawn up to the theoretical retical terms, by osmosis, as it were.

5. My contention here is simply:

   (1) The problem for which this dichotomy was invented ("how is it possible to interpret theoretical terms?") does not exist.

   (2) A basic reason some people have given for introducing the dichotomy is false: namely, justification in science does not proceed "down" in the direction of observation terms. In fact, justification in science proceeds in any direction that may be handy-more observational assertions sometimes being justified with the aid of more theoretical ones,

and vice versa.

(3) In any case, whether the reasons for introducing the dichotomy were good ones or bad ones, the double distinction (observation terms-theoretical terms, observation statements-theoretical statements) presented above is, in fact, completely broken-backed.

6. What I mean when I say that the dichotomy is "completely broken-backed" is this:

   (A) If an "observation term" is one that cannot apply to an unobservable, then there are no observation terms.

   (B) Many terms that refer primarily to what Carnap would class as "unobservables" are not theoretical terms; and at least some theoretical terms refer primarily to observables.

   (C) Observational reports can and frequently do contain theoretical terms.

   (D) A scientific theory, properly so-called, may refer only to observables. (Darwin's theory of evolution, as originally put forward, is one example.)

7. [Putnam's analysis of Carnap's writing] reveal[s] that Carnap, at least, thinks of observation terms as corresponding to qualities that can be detected without the aid of instruments.

8. While I have not been able to find any explicit statement on this point, it seems to me that writers like Camap must be neglecting the fact that all terms---including the `observation terms'---have at least the possibility of applying to unobservables.

9. The following points must be emphasized:

   (1) Terms referring to unobservables are invariably explained, in the actual history of science, with the aid of already present locutions referring to unobservables.

   (2) There is not even a single term of which it is true to say that it could not (without changing or extending its meaning) be used to refer to unobservables.

10. In short: if an "observation term" is a term which can, in principle, only be used to refer to observable things, then there are no observation terms.

11. A theoretical term, properly so-called, is one which comes from a scientific theory (and the almost untouched problem, in thirty years of writing about "theoretical terms" is what is really distinctive about such terms).

12. That observation statements may contain theoretical terms is easy to establish. For example, it is easy to imagine a situation in which the following sentence might occur: "We also observed the creation of two electron-positron pairs."

13. I do not deny the need for some such notion as "observation report." What I deny is that the distinction between observation reports and, among other things, theoretical statements, can or should be drawn on the basis of vocabulary.

14. One can hardly maintain that theoretical terms are only partially interpreted, whereas observational terms are completely interpreted, if no sharp line exists between the two classes.

"Observation," N. R. Hanson (1924-1967)

Key Ideas

1. The problem: How are data molded by theories, interpretations, or intellectual constructions?
2. Seeing is an experience.
3. Seeing the 'same thing' is not the same as having one's eyes similarly affected.
4. Saying we 'interpret' what we see doesn't help. Why?
5. Because we see ambiguous images differently and the difference cannot be a matter of interpretation. Why?
6. Because to interpret is to think, and we don't deliberately think about the Necker Cube in one way

rather than another. We just see it one way rather than another.

7. The way in which we see---how elements of perception are organized---depends on our knowledge, experience, and theories.
8. People have different knowledge, experience, and theories, and therefore can see the 'same' things differently.
9. Physics is mostly about organizing concepts.
10. Different conceptual organizations---different theories---will lead to different observations.

Select Quotations from Hanson

1. [Viewing *Amoeba* as either a one-celled animal or a noncelled animal] is not an experimental issue, yet it can affect experiment. What either man regards as significant questions or relevant data can be determined by whether he stresses the first or the last term in "unicellular animal."

2. Some philosophers have a formula ready for such situations: "Of course they see the same thing. They make the same observation since they begin from the same visual data. But they interpret what they see

differently. They construe the evidence in different ways." **The task is then to show how these data are molded by different theories or interpretations or intellectual constructions**.

3. Considerable philosophers have wrestled with this task. But in fact the formula they start from is too simple to allow a grasp of the nature of observation within physics.

4. We must proceed carefully, for wherever it makes sense to say that two scientists looking at *x* do not see the same thing, there must always be a prior sense in which they do see the same thing. The issue is, then, "Which of these senses is most illuminating minating for the understanding of observational physics?"

5. [S]eeing the sun is not seeing retinal pictures of the sun.

6. If they are hypnotized, drugged, drunk, or distracted they may not see the sun, even though their retinas register its image in exactly the same way as usual.

7. Seeing is an experience.

8. People, not their eyes, see.

9. Naturally, Tycho and Kepler see the same physical object. They are both visually aware of the sun.

10. Suppose that the only object to be seen is a certain lead cylinder. Both men see the same thing: namely this object---whatever it is. It is just here, however, that the difficulty arises, for while Tycho sees a mere pipe, Kepler will see a telescope, the instrument about which Galileo has written to him.

11. If, however, we ask, not "Do they see the same thing?" but rather "What is it that they both see?," an unambiguous answer may be forthcoming. Tycho and Kepler are both aware of brilliant yellow-white disc in a blue expanse over a green one.

12. Differences between them [Kepler and Tycho] must arise in the interpretations they put on these data.

13. **Thus, to summarize, saying that Kepler and Tycho see the same thing at dawn just because their eyes are similarly affected is an elementary mistake.** There is a difference between a physical state and a visual experience. Suppose,

however, that it is argued as above---that they see the same thing because they have the same sense-datum experience. Disparities in their accounts arise in ex post facto interpretations of what is seen, not in the fundamental visual data. **If this is argued, further difficulties soon obtrude.**

14. [See Ambiguous Images at end of slides]

15. Do we, then, all see the same thing [looking at the Necker Cube]? If we do, how can these differences be accounted for?

16. [O]ne does not first soak up an optical pattern tern and then clamp an interpretation on it.

17. Instantaneous interpretation [...] is an [idea] which philosophers force on the world to preserve some pet epistemological or metaphysical theory.

18. [Unlike the issue of historical interpretation, which is an empirical question], whether we are employing an interpretation when we see [the Necker Cube] in a certain way is not empirical. What could count as evidence? In no ordinary sense of "interpret" do I interpret [the Necker Cube] differently when its

perspective reverses for me. If there is some extraordinary sense of that word it is not clear, either in ordinary language, or in extraordinary (philosophical) language. To insist that different reactions to [the Necker Cube] must lie in the interpretations put on a common visual experience is just to reiterate (without reasons) that the seeing of *x* must be the same for all observers looking at *x*.

19. **To interpret is to think, to do something; seeing is an experiential state.** The different ways in which these figures are seen are not due to different thoughts lying behind the visual reactions.

20. [Hanson anticipates an objection.] The sun, however, is not an entity with such variable perspective.

21. But these reversible perspective figures are examples of different things being seen in the same configuration, where this difference is due neither to differing visual pictures, nor to any "interpretation" superimposed on the sensation....

22. Seeing is not only the having of a visual experience; it is also the way in which the visual experience is had.

23. The layman must learn physics before he can see what the physicist sees.

24. If one must find a paradigm case of seeing it would be better to regard as such not the visual apprehension of color patches but things like seeing what time it is, seeing what key a piece of music is written in, and seeing whether a wound is septic.

25. The visitor must learn some physics before he can see what the physicist sees. Only then will the context throw into relief those features of the objects before him which the physicist sees [...].

26. Blooming, buzzing, undifferentiated confusion visual life would be [without the ability to structure visual elements]. [Note: This may be how LSD works.]

27. **The elements of the visitor's visual field, though identical with those of the physicist, are not organized for him as for the physicist**; the same lines, colors, shapes are apprehended by both, but not in the same way. There are indefinitely many ways in which a constellation of lines, shapes, patches, may be seen. Why a visual pattern is seen

differently is a question for psychology, **but that it may be seen differently is important in any examination of the concepts of seeing and observation**.

28. Hence Tycho and Kepler see different things, and yet they see the same thing. **That these things can be said depends on their knowledge, experience, and theories.**

29. The **elements of their experiences are identical; but their conceptual organization is vastly different.**

30. It is the sense in which Tycho and Kepler do not observe the same thing which must be grasped if one is to understand disagreements within microphysics. physics. Fundamental physics is primarily a search for intelligibility---it is philosophy of matter. Only secondarily is it a search for objects and facts (though the two endeavors are as hand and glove). **Microphysicists seek new modes of conceptual organization.** If that can be done the finding of new entities ties will follow. Gold is rarely discovered by one who has not got the lay of the land.

31. To say that Tycho and Kepler, Simplicius and Galileo, Hooke and Newton, Priestley and Lavoisier, Soddy and Einstein, De Broglie and Born, Heisenberg and Bohm all make the same observations but use them differently ently is too easy. It does not explain controversy in research science.

See Ambiguous Images Below.

Ambiguous Images

These illustrate Hanson's argument that the same images can be seen in different ways and that the difference in how they are seen is not because they are interpreted differently.

Necker Cube

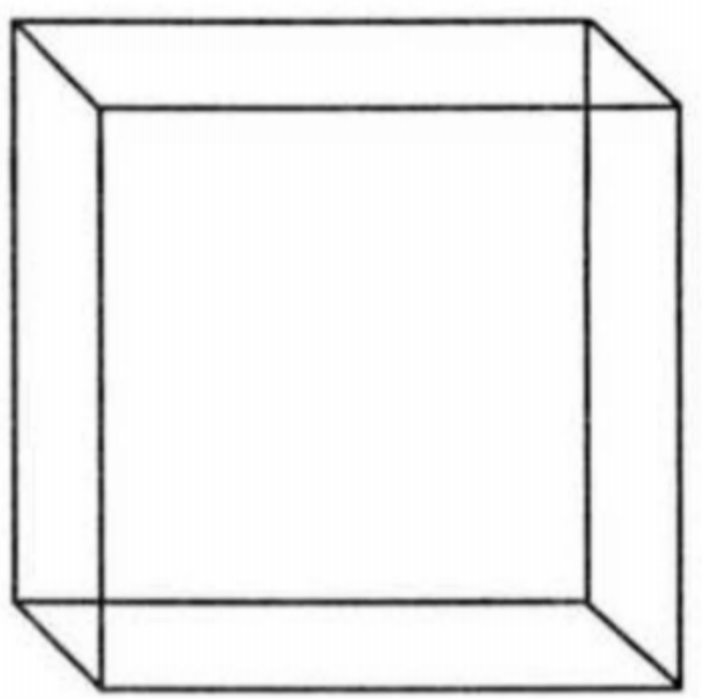
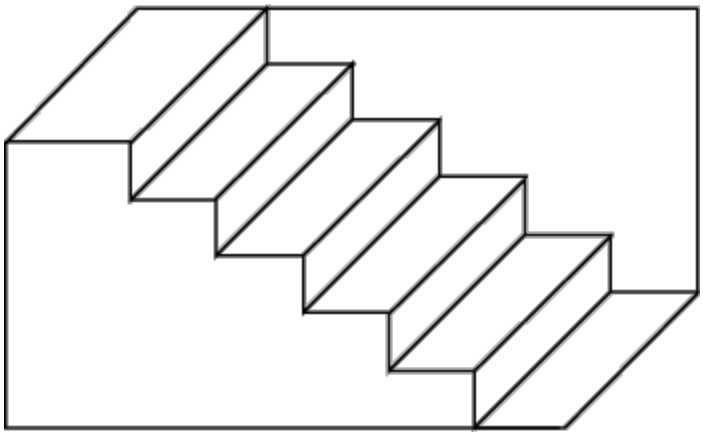


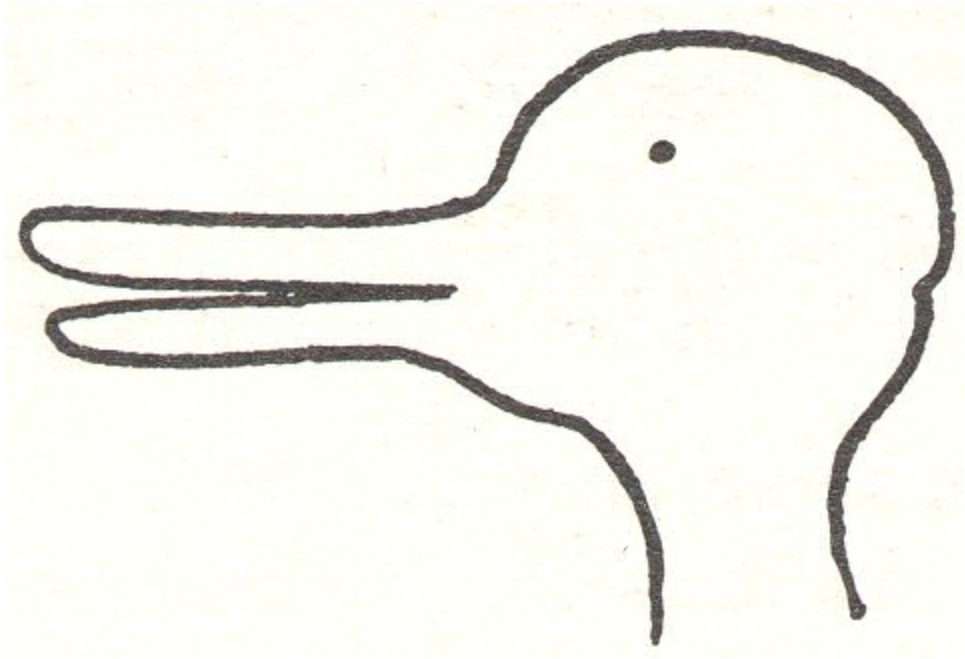
Fig.1

Schroeder's staircase

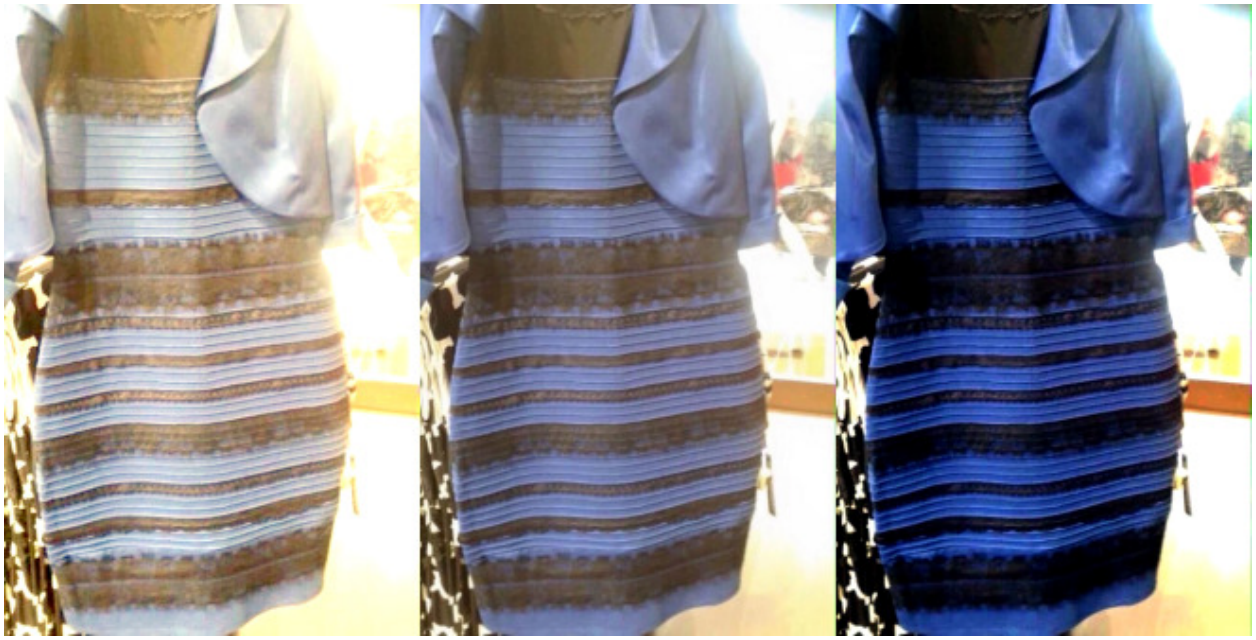


Rubin's Vase

Duck-rabbit



The (Infamous) Dress



[Wired: The Science of Why No One Agrees on the Color of This Dress]