PHI030: Questions About Carnap with (Some Possible) Answers

Metaphysical

1. Can you expand more on what "anti-metaphysical" means in terms of Popper and Carnap?
    a. Metaphysical claims, for Carnap, have "no possibility of confirmation" and are "not grounded in empirical procedures."
2. What exactly is the nothing nothings that you referred to in class?
    a. The quote, "the nothing itself nothings," is from Martin Heidegger's *What Is Metaphysics*. See http://plato.stanford.edu/entries/nothingness/#AniCogAbs for Carnap's critique.

Correspondence Rules

1. Clarification on the "correspondence rules." I know it translates observable to unobservable but how does it do that.

    a. By providing scientists with a way to think about nonobservables in familiar terms, e.g., conceiving of molecules as tiny spheres
2. What are some examples of correspondence rules helping prove a theory?
    a. In the Kinetic Theory of Gases:
        i. Correspondence rule: Temperature of gas corresponds to mean kinetic energy of the molecules
        ii. Correspondence rule: Pressure of the gas is connected to impact of molecules on confining wall of vessel.
        iii. These helped figure out the mass of molecules and how many molecules a cubic centimeter of gas at a certain temperature and pressure would contain.
    b. Theory of Electromagnetism
3. How exactly are the correspondence rules used?
    a. The Kinetic Theory of Gases and the Theory of Electromagnetism are two examples that Carnap gives.

4. Are the Correspondence Rules widely accepted by modern philosophers of science or is it a controversial topic?
    a. Carnap's distinction between observational and non-observational terms has been widely criticized. He needs correspondence rules to bridge the gap, but if there is no gap, then they aren't needed. So that may be a critique of the rules.
5. Will there ever be a limit to correspondence rules? Or do they continue as long as science and ideas are being developed?
    a. For Carnap, as long as there are terms for nonobservables, there must be correspondence rules to use for translation. He writes: "The procedure is never-ending. There is always the possibility of adding new rules."
6. We can never strictly define theoretical terms because they're everchanging? I don't really understand why we can't strictly define theoretical terms.

a. If we define a theoretical term entirely with observational terms, then it stops being a theoretical term and becomes observational. Carnap also writes: "Because the history of physics has shown such a steady, unceasing modification of theoretical concepts, most physicists would advise against correspondence rules so strong that a theoretical term becomes explicitly defined. Moreover, it is a wholly unnecessary procedure. Nothing is gained by it. It may even have the adverse effect of blocking progress."

Anticipatory Theories

1. What makes a theory version "anticipatory" or not? Aren't all versions anticipatory? How do you know which ones to hold on to "for a while" and which ones should be rejected?
    a. Anticipatory theories have "no possibility of confirmation" and so can't be tested. If the anticipatory never generates predictions, or the

predictions it generates are contradicted by evidence, then we abandon it.

2. How did Carnap know that the anticipatory versions of theories would be useful one day and shouldn't be thrown out?
    a. He doesn't know exactly, which is why he says we shouldn't "reject too rashly any anticipatory vision of a theory." He looks to the history of science, e.g., Ionian philosophers for evidence that anticipatory theories sometimes yield genuine science.
3. How do you distinguish when something is an anticipatory version of a theory and when it isn't going to work out and is simply not firmly founded?
    a. If the anticipatory never generates predictions, or the predictions it generates are contradicted by evidence, then we abandon it.
4. Carnap & Popper agree to not discard of theories immediately but I thought Popper said once a theory is falsified it is to be rid of.

    a. Metaphysical or anticipatory theories aren't, according to Popper, "unimportant, or insignificant," they just aren't scientific.

Empirical and Theoretical Laws & Terms

1. Are there other types of terms beside Observational and Theoretical ones?
    a. Mathematical and logical terms.
2. Can a scientific theory justify empirical laws?
    a. The theories generate empirical laws and so provide justification. E.g., the kinetic theory of gases, which refers to molecules, explains why our empirical laws are true.
3. What is the relationship between empirical laws and theoretical laws?
    a. Quoting Carnap: "Theoretical laws are, of course, more general than empirical laws." "A theoretical law is not to be distinguished from an empirical law by the fact that it is not well established, but by the fact that it contains terms of a different kind." "Theoretical laws are related to empirical

laws in a way somewhat analogous to the way empirical laws are related to single facts." "The supreme value of a new theory is its power to predict new empirical laws."

4. What makes both theoretical and empirical laws significant?
    a. Finding them is one of the main goals of science.
5. How can theoretical laws eventually become empirical laws?
    a. Theoretical laws don't become empirical laws; they predict new empirical laws.
6. How exactly is a hypothetical question used to create a empirical law? I also noticed that the book said that an empirical law can create a hypothetical law. How do both of these work?
    a. The molecule was hypothesized to explain how gases behave under certain temperatures and pressures. It led to empirical laws describing what happens to pressure when volume is constant and heat increases, what will happen when only part of gas is heated, etc.

    b. Empirical testing helps scientists develop theoretical laws, e.g., classical physics gave really wrong predictions to certain experiments, such as blackbody radiation, which led to the creation of the theory of quantum mechanics.
7. Did Carnap believe that between empirical laws and theoretical laws one was more prominent in scientific theory than the other?
    a. Depends on what you mean by prominent. Theoretical laws are "more general than empirical laws" and they often generate empirical laws, so in a sense they are more powerful.
8. Can the solution that Carnap proposed translate terms the other way around? For example, can it translate terms for unobservables to terms for observables?
    a. If an unobservable could be defined entirely in terms of observables, then it would be, for Carnap, observable.
9. What does it mean to justify a theoretical law? Does justifying mean you try to prove a theoretical law?

a. Yes, more or less. Carnap puts the question like this: "How can the kind of knowledge that will justify the assertion of a theoretical law be obtained? An empirical law may be justified by making observations of single facts. But to justify a theoretical law, comparable observations cannot be made because the entities referred to in theoretical laws are nonobservables...."

10. Do all philosophers and scientists agree on empirical and theoretical laws?
    a. No.
11. Where does Carnup stand on using theoretical terms to define empirical law? He states it doesn't make sense, but gives examples where it appears to be fine.
    a. For Carnap, we have no trouble defining empirical laws because they contain observational terms, which can be fully defined.
12. Could you explain in 2 sentences the way to explain an empirical law and a theoretical law?

    a. Quoting Carnap: "Theoretical laws are, of course, more general than empirical laws." "A theoretical law is not to be distinguished from an empirical law by the fact that it is not well established, but by the fact that it contains terms of a different kind." "Theoretical laws are related to empirical laws in a way somewhat analogous to the way empirical laws are related to single facts." "The supreme value of a new theory is its power to predict new empirical laws."

Observable and Nonobservable

1. Has anyone else who read this excerpt from Carnap had an issue with his idea of "observable" because observation itself is somewhat indirect as it is influenced by perception & is thus subjective ("blue" is not so obvious to a blind or color blind person)?
    a. Yes. Carnap has been critique extensively on this issue, e.g., the Putnam article we read.
2. When we describe an nonobservable scientific event, we use similar observable examples to help us with

explaining the event. So can we say theoretical laws are based on empirical theory?

   a. Empirical testing helps scientists develop theoretical laws, e.g., classical physics gave really wrong predictions to certain experiments, such as blackbody radiation, which led to the creation of the theory of quantum mechanics.

3. How can you verify the truth of theories when it is not conclusive because nonobservables can never be directly measured or observed?

   a. Carnap thinks confirmation of theories that use terms for nonobservables is always indirect. He argues that "the supreme value of a new theory is its power to predict new empirical laws," so if they theory can do that, then it is a good theory. Some philosophers, however, think that we can never know if statements containing nonobservables are true.

Popper and Carnap

1. Would Popper agree with Carnap's theories? Are they philosophers? Or do they consider themselves scientists first?
    a. Popper and Carnap are (were) philosophers, not scientists, though Carnap initially wrote a Ph.D. dissertation in physics that was deemed too philosophical, so he switched. Popper and Carnap agreed on some issues, e.g., the importance of empirically testable claims in science, but disagreed on others, e.g., the role of induction in science.

Scientific Theories

1. If theoretical terms can be verified, can that thus verify any theory related to those theoretical terms?
    a. The items that theoretical terms pick out, e.g., atom, can only be observed or measured or verified indirectly. Detecting a theoretical object does not verify (or confirm) any theory related to those items because conflicting theories often use the same terms.

2. Can a theory really stay alive due to its productivity in science when there is multiple instances of evidence that is wrong, but only one instance of evidence that it is right?
    a. No. But that's not usually the way the history of science goes. Successful theories get lots of stuff right, so when it turns out they are wrong in some respect, there is resistance to giving it up. Many factors affect whether a partially wrong theory is retained or not.
3. What is the relationship between empirical laws and scientific theory?
    a. Scientific theories contain empirical laws, among other things.
4. How do theories essentially become laws?
    a. The *Oxford Dictionary of Science* defines a theory as "a description of nature that encompasses more than one law but has not achieved the uncontrovertible status of a law." So a theory must become uncontrovertible, i.e., indisputable. But since theories contain more

than one law, they never become laws, they generate them.

5. Which is the most correct definition for a scientific theory? What makes a definition be more correct and cohesive?
    a. There isn't one. Good definitions are ones that separate scientific theories from non-scientific theories and capture those features of scientific theories that we find to be salient.

Miscellaneous

1. Did Carnap necessarily argue with Bridgman in his article?
    a. Yes, to an extent. Carnap thinks Bridgman is wrong that correspondence rules can yield "operational definitions," which would have counted against Carnap's claim that nonobservational terms can never be fully defined.
2. Why didn't Newton's law work?

    a. Newton's theory of gravity, e.g., makes incorrect predictions about how much gravity bends light. See http://www.wired.com/2009/05/dayintech_0529/.
3. Why is it important to distinguish between the way a philosopher and a scientist think about a theoretical or empirical law?
    a. Philosophers of science seek to explain and analyze science, so if the two groups are using terms differently, then that must be addressed, otherwise the groups are talking past each other. Carnap addresses this issue regarding observables because he thinks his argument works whether the definition of the philosopher or the definition of the scientist is used.
4. Have Marxist replied to the criticism of them adjusting the predictions?
    a. Yes, e.g., Maurice Cornforth's *The Open Philosophy and the Open Society: A Reply to Karl Popper's Refutations of Marxism*.

5. If someday we discover that the speed of light is not the limit for information to travel, what will happen to Einstein's theory about the speed limit?
    a. That would be big trouble for physics generally, so it's hard to say. However, Einstein's theories might then function like Newton's, i.e., powerful but within a more limited domain.
6. Should all sciences (even ones that are seemingly unrelated such as astronomy and physiology) be held to the same set of rules in order to be considered as such? If so, how do we decide which rules to include or exclude?
    a. Popper thinks that all science must pass his falsification test and Carnap thinks scientific theories are collections of sentences that must make coherent, testable claims. So, for them, the answer is Yes.

More Examples

1. Could you give us an example of an ideal scientific theory that can qualify all Carnap's criteria?

    a. Carnap holds up the theory of electromagnetism as an example of "the power of a theory to predict new empirical laws." He also argues that Newton "exhibits the first comprehensive, systematic theory, containing unobservables as theoretical concepts."
2. What can be another example of Carnap's demonstration of his argument?
    a. Conceiving of genetic material as DNA, which is nonobservable, has allowed us to predict various empirical laws having do with genetic abnormality, the results of which often are observable.