Tutorial 6 Model Answers

1. A hypothesis is a *conjecture* proposed as part of an explanation. Hypotheses are less grand than theories but are always advanced in the context of existing theories and beliefs. Hypotheses are the bread and butter of science, because to explain some phenomenon is simply 'to offer a hypothesis that helps us understand it' (p 180).

   Example: In 1845, Joseph Leverrier posited a new planet to explain why Uranus doesn't follow the path predicted by Newton's theories of gravity and motion (p 177).

2. Testability, (explanatory) scope, and conservatism feature in both lists. *Mechanism* is not highlighted by Schick and Vaughn. Fruitfulness corresponds to *predictive power*. Simplicity corresponds to *Ockham's Razor*. Summary versions of Schick and Vaughn's criteria can be found on pp 182, 185, 187, 189, and 190.

3. Schick and Vaughn discuss the *testability of hypotheses*. A hypothesis is testable if it predicts something new. Leverrier's hypothesis that an unknown planet is the cause of deviations in Uranus' orbit *was* testable. He could use Newton's theories together with data on the orbit of Uranus to predict the location of the new planet. The sighting of Neptune confirmed his hypothesis and further confirmed Newton's theories.

   A hypothesis is falsifiable if there is some way to show it false. Leverrier's prediction of the location of a new planet was a test that, if unsuccessful, would have falsified this hypothesis. Popper argued that falsifiability is the principal difference between science and pseudo-science. But it can be rational to resist falsification by altering your views about background conditions, at least for a time.

4. Prediction and explanation both involve deduction. Background theories together with hypotheses and data are used to deduce observable consequences. They differ in that we explain *what has already happened*, we predict *what has not*. Fruitfulness is the power to predict novel phenomena. Explanatory scope is the range of (kinds of) phenomena that a hypothesis or theory can explain.

5. Criteria of Adequacy

   A mechanism is provided: encephalitis is spread by insect bites. Testability is satisfied: reducing contact with mosquitos in other counties should lead to lower rates of infection. Explanatory scope: the insect-bite hypothesis can be drawn on to explain the way changes in lifestyle, leisure activities, and standard of living can impact this and other diseases. Ockham's razor: rates very highly on this criterion as no new entities, forces or procedures are postulated. A simple hypothesis.

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