

Phil 60/HPS 60: Introduction to Philosophy of Science Section 2 Handout

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Outline:

1. Tips to do better in the assignments:
 - a. Focus on making several points well rather than many points badly
 - b. Try to structure your thinking clearly:

Example of an actual paragraph (from when I studied philosophy of science in undergraduate):

- “A hypothesis is falsifiable, and thus scientific, when it is...”
- “First, falsifiability is an insufficient condition for a theory to be scientific. There are a number of theories which are falsifiable yet which should not be considered scientific. Consider the theory that purple human-sized faeries are having a happy tea party and cuddling each other in my backyard. Indeed, such a theory is falsifiable. If it were false, then you could go into my backyard and observe that there are no such cuddling creatures. Yet it seems intuitively implausible to say it is a scientific theory. If a scientist announced that “a new scientific theory of cuddling faeries has been devised,” it would surely seem absurd. So in this sense, even though a theory is falsifiable, it may not be scientific. Hence, falsifiability is not a sufficient condition for a theory’s scientific status.”

Structure of that paragraph:

- **Topic sentence of the paragraph:** “First, falsifiability is an insufficient condition for a theory to be scientific.”
 1. **Supporting claim:** “There are a number of theories which are falsifiable yet which should not be considered scientific.”
 - a. **Example supporting claim 1:** “Consider the theory that purple human-sized faeries are having a happy tea party and cuddling each other in my backyard.”
 - i. **Claim about falsifiability in the example:** “Indeed, such a theory is falsifiable.”
 - **Support for claim i:** “If it were false, then you could go into my backyard and observe that there are no such cuddling creatures.”
 - ii. **Claim about non-scientific status in the example:** “Yet it seems intuitively implausible to say it is a scientific theory.”
 - **Support for claim ii:** “If a scientist announced that “a new scientific theory of cuddling faeries has been devised,” it would surely seem absurd.”
 2. **Conclusion:** “So in this sense, even though a theory is falsifiable, it may not be scientific. Hence, falsifiability is not a sufficient condition for a theory’s scientific status.”

2. Content about falsifiability:
 - a. Deductive reasoning:
 - i. Meaning:
 1. Reasoning which purports to be deductively valid
 2. Some reasoning (or an argument) is deductively valid when it is impossible for the premises to be true and the conclusion false:
 - a. Modus ponens:
 - i. P1: If (you will go the party), then (I will come with you)
 - ii. P2: (You will go to the party) _____.
 - iii. C: Therefore, (I will come with you)
 - b. Disjunctive syllogism:
 - i. P1: Either (there are clouds in the sky) or (it is sunny)
 - ii. P2: It is not the case that (there are clouds in the sky)
 - iii. C: Therefore, (it is sunny)
 - b. Induction:
 - i. This is ambiguous
 - ii. It can mean at least 3 things:
 1. Starting with observations before inferring theory:
 - a. Example:
 - i. **Observation:** Noticing that babies who die of sudden infant death syndrome (SIDS) are often placed face down when sleeping
 - ii. **Inference to theory:** Therefore, SIDS is caused by position-induced oxygen deprivation
 2. Enumerative induction:
 - a. Example:
 - i. Crow #1 is black
 - ii. Crow #2 is black
 - iii. ...
 - iv. Crow #n is black (for some n)
 - v. Therefore, all crows are black
 - b. (Note: I could do this reasoning even if I started with the theory or hypothesis that all crows are black first)
 3. Non-inductive reasoning:
 - a. Any reasoning which is not deductive
 - iii. Problem of induction:
 - i. Different articulations
 - ii. Most popular version due to David Hume
 - iii. One versions:
 1. Consider example of predictive inference:
 1. Emerald #1 is green
 2. Emerald #2 is green
 3. ...
 4. Emerald #n is green (for some n)
 5. Therefore, the next emerald
 2. Question:

- a. What justifies the move from 1-4 to 5?
 - i. One answer:
 - 1. P1: In the past, the future has been like the past
 - 2. C: So in the future, the future will be like the past
 - ii. Objection:
 - 1. The move from 1 to 2 above is reasonable only if we already assume that the future will be like the past!
 - a. P1: In the past, the future has been like the past
 - b. (P2: The future will be like the past!)
 - c. C: So in the future, the future will be like the past
 - iii. The problem: there is no non-circular justification of induction
- d. Popper:
 - i. A theory or hypothesis is scientific if and only if it is falsifiable
 - ii. A hypothesis is falsifiable when it is logically possible that there are one or more observation statements which, if true, entail the falsity of the hypothesis¹
 - 1. Such potential observation statements are called *potential falsifiers*²
 - iii. A theory may have a potential falsifier, but it may also be true and have no *actual falsifiers* (i.e. actual observations which falsify the theory).³
 - iv. Attempts to falsify a theory must be rigorously pursued for science advances through conjectures and their refutations
 - v. Severity of a test:
 - 1. Minimally severe test: $P(e|b) = P(e|h)$ where:
 - a. e is some evidence, b is some background theory or knowledge and h is some hypothesis under test
 - b. $P(a|b)$ for some propositions a and b is the probability of a given b
 - c. Example: $P(a|b)$ is the probability of Alison being happy given that Billy is sad
 - 2. Maximally severe test: $P(e|b) = 0$ while $P(e|h) = 1$
 - 3. Example of a severe test: Stellar parallax and special relativity
 - vi. Corroboration is a measure of the degree to which a hypothesis/theory has withstood severe tests up until now
 - 1. It is non-inductive: There is no guarantee about corroboration in the future

¹ Alan Chalmers, *What is this thing called Science?*, 3rd ed. (St Lucia: Queensland University Press, 1999), 62 and 66.

² Ibid. and Karl Popper, *The Logic of Scientific Discovery* (London and New York: Taylor & Francis E-Library, 2005), 18 and 66. Accessible at <http://strangebeautiful.com/other-texts/popper-logic-scientific-discovery.pdf>.

³ It should be noted that, for Popper, science cannot involve inferences that a theory is true. Rather, he talks in terms of verisimilitude or truth-likeness. In this sense, Popper could say that some theories have a higher or lower degree of verisimilitude.