Prof. C. Byrne Philosophy 251

Problem of Induction

Two formulations:

1. **Problem of Generalization**: How can we generalize (infer a universal proposition) about the properties of a whole class of objects based on the observation of only a proper subset of the members of that class? Such claims presuppose that the members of the class that we have not observed resemble the ones that we have observed (Hume, *Treatise on Human Nature*).
2. **Problem of Prediction**: We can predict the future only by presupposing that a particular sequence of events in the future will occur as it always has in the past (for example, that the laws of physics will continue to hold as they have always been observed to hold). Hume called this the Principle of Uniformity of Nature (Hume, *Enquiry into Human Understanding*).

Both accounts lead to the question of what justifies inductive inferences, or more precisely, what justifies the Principle of Uniformity (the claim that things that are the same in kind will continue to behave in the same way). Hume argues that such a justification can be neither deductive—because it is a logically contingent proposition that cannot be derived from necessary truths—nor inductive because such a justification would be circular (beg the question). Thus, Hume argued that no justification of causal reasoning is possible because the latter presupposes the Principle of Uniformity; we simply have a psychological propensity to believe that certain causes are necessarily connected to certain effects.

Today: inductive inferences are held to be deductively invalid, that is, it is not necessarily the case that if the premises are true, the conclusion is also true. Given the truth of the premises, it is only probable that the conclusion is true.

Some Types of Inductive Inference:

1) **Direct inductive inference**:

Infers the relative frequency of a trait in a sample sub-population from its relative frequency in the population from which the sample sub-population is drawn:

Most students drink coffee in the morning, and you are a student. Therefore, you probably drink coffee in the morning.

2) **Inverse inductive inference**:

Infers the relative frequency of a trait in a *target population* from its relative frequency in a *sample* of that population:

Premise 1:	S is a sample of X's.
Premise 2:	Proportion 1 of X's in S that are Y.
Conclusion:	Proportion 2 of X's that are Y (where Proportion 2 is less than or equal to Proportion 1).

Most Golden Retrievers that I have met are friendly. Therefore, most Golden Retrievers are friendly.

Polling (example of inverse inductive inference)

Generalizations over people's opinions; to make sure the sample is representative, the following must be considered:

1) Size and composition of the sample;
2) Characteristics of the larger, target group about which the inference is to be drawn;
3) The property in question, usually an opinion held by the larger, target population.

Sampling errors: Does sample include all of the relevant sub-groups? That is, how lumpy is the population being sampled; does that population have relevant sub-groups?

Measurement errors: How reliable is the information collected? How good were the questions?

3) **Universal inductive inference**: inference from a sample to a universal conclusion.

All swans that we have seen are white. Therefore, all swans are white.

All observed beheaded human beings have died. Therefore, all living human beings have an attached head.

4) **Inference by analogy**:

Inference from the traits of one individual or set of individuals (the *analogue*, found in the premises) to those of another individual or set of individuals (the *primary subject*, found in the conclusion) on the basis of traits that they share.

Here the question is how relevant the similarities and differences are between the individuals being compared; there will always be some similarities and differences, but how relevant are they. If the similarities between the things being compared are relevant and the differences irrelevant, the inference is strong; if the similarities are less relevant and the differences relevant, the inference is weak or faulty. In the latter case, it is often said that you are comparing apples to oranges.

Good Inductive Inference

In all of the above, a good inductive inference presupposes that the sample is representative of the larger class (the target population) from which it is taken. If it is not, the *fallacy of hasty generalization* occurs. One way to overcome sampling errors is to take a larger sample; the best way, however, is to take a *random sample*, in which every member of the target population has an equal chance of being included.

With respect to the class of objects being considered, it is important to consider how uniform, homogeneous, or invariable it is. Physical objects are typically classified on the basis of their causal properties. Some such groups are causally very uniform, e. g., bodies of a certain mass or chemical composition; others are quite diverse, e. g., human beings.