Scientific Method
Understanding How Science Works

Amir H. Ebrahimnezhad

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Abstract

While epistemology is a vast philosophy, we consider a more specific part of it. In this draft we are looking at the philosophy of science, scientific method, mathematical modeling and empiricism. By the end of this draft one would know the grounding mechanism that science has been working upon.

1 Introduction

1.1 Considering Science

Apart from the more general concept of knowledge, as scientists we must have a sense of the term in our boundaries; to know what kind of *knowledge* is considered scientific knowledge. The term knowledge was supposed to have a close relation with Justified True Belief though we mentioned that JTB can also be something that is not knowledge. For scientific knowledge let us begin with the same term.

A Scientific Justified True Belief therefore can be considered a close resemblence of the Scientific Knowledge. Thus we would try to define that first, by which we would have a better understanding of the Scientific Knowledge itself. To define such a term it is clear that we have to define Justification in scientific manner.

But before that what kind of beliefs are scientific? Do people who do a dance to make the sky rain have beliefs that can be considered scientific? A

2 Plato and Forms

to be written.

3 Aristotle's Philosophy of Science

▶ **Three Stages for Science:** Aristotle states sceintific inquiry in three stages. The first starts with having an absolute knowledge of the reality, having a knowledge for a certain event in the real world. For instance the knowledge that things fall to the earth (down) if they are not picked or thrown. By possessing such knowledge a scientific explanation begins, where one would try to explain the observed fact (the knowledge) in the principles and the logic he agrees with. Aristotle thought of scientific inquiry as a path from observations to explanatory prionciples and back to observations.[1]

> Callout — Scientific explanation is a trnasition from knowledge of a fact to a knowledge of the reasons for the fact.

▶ **Induction:** Aristotle believed that for each thing there is a matter that makes the particular a unique individual, and the form which makes it to be a member of a generalization. He then persuits to state that generalizations about forms are drawn from sense experience, using *induction.*

▶ **Enumeration:** Aristotle considered two types of induction, enumeration and direct intuition. The first one is a simple generalization method. Where a property which seems to be aquiered by several matters, is therefore generalized to be a property of the group those matter belong to. For instance if several humen have five fingers in each hand then we can argue that the group of things, which are called humen has the property of five fingers in each hand. We can go further and look at other animals and since most of mammals would also have five fingers we can extend the group and have the following argument:

1. Several mammals have five fingers in each arms.

2. ∴ Mammals have five fingers in each arm.

In a more general manner we can write Simple Enumeration as:

> " *Premisses:* What is obsereved to be true of several individuals ⟶ *conclusion:* What is presumed to be true of the species to which the individuals belong"

▶ **Intuition:** In the second type one would argue not by the mass number of individuals properties, but by having an insight. In this sense we won't argue because there are many examples that supports our reasoning. But we argue since the logical or *essential* thing is the conclusion that we have. For instance we might have the insight that the bright side of the moons seems to always face the sun. Thus concluding that the light of the moon is just the reflection of the light of the sun. ▶ **Deduction:** After the induction, the generalization would be used as premisese for the deduction of statements about the initial observations. There he allowed for types of statements to be used as premises of deduction.

1. **A**: All S are P.

2. **E**: No S is P.

3. **I**: Some S are P.

4. **O**: Some S are not P.

We therefore have the relations that (1) S wholly included in P. (2) S wholly excluded from P. (3) S partially included in P. (4) S partially excluded from P. The first type was considered the most important one among them by Aristotle. Because he believed that certain properties are only for individuals of certain classes he maintained that a proper scientific explanation should be given in terms of statements of this type (type A). He then would use the A type statements to form an argument:

$$\text{All } M \text{ are } P \text{All } S \text{ are } M \therefore \text{All } S \text{ are } P \tag{1}$$

The important thing showed by Aristotle was that any arguments validity is depended on the relationship between the premisses and conclusion.[1]

References

[1] John Losee. *A historical introduction to the philosophy of science*. Oxford University Press, London, England, 4 edition, March 2001.