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**CC06: Scientific Method and Philosophy of Science**

**Philosophy of Science : Stephen Toulmin**

(Aims, Methods and Achievements of Physical Sciences)

The students are required to study the “Introductory” chapter of Stephen Toulmin's book *The Philosophy of Science*, particularly the section: 1.1 Logic and the physical sciences.

Stephen Toulmin begins the introductory chapter by pointing out that though everyone cannot be an expert in physics, “but everybody likes to have a grasp of physical ideas”.

For the layman there are two sources for understanding physical sciences:

1. Books of popular science in which the theoretical advances in physics are explained, while avoiding technicalities.
2. In addition to this, for the students of philosophy, there are books on logic, which discuss the nature and problems of physical sciences under the heading “Induction and Scientific Method”.

However, according to Toulmin, certain important questions are not discussed by *both* the classes of work, and, as a result, the defenceless reader gets a distorted picture of aims, methods and achievements of physical sciences.

## 1.1 Logic and the physical sciences

According to Toulmin, the topics, which are discussed generally in books of logic are as follows: Induction, causality, whether the results of science are true or highly probable, the Uniformity of Nature, the accumulation of confirming instances, Mill's method and probability calculus.

It is not, says Toulmin, that the things said are untrue or fallacious, but rather they are *irrelevant*: the questions discussed have no bearing on physics. Meanwhile, the *actual methods* or *arguments*, which physical scientists *use*, are rarely discussed.

For example, points out Toulmin, one can continue to write indefinitely about "Causation and its Place in Modern Science", if one fails to notice how rarely the word "cause" appears in the writings of professional scientists.

The students of philosophy, according to Toulmin, need an introductory guide to the types of methods and arguments scientists use in actual practice. In particular, the students of philosophy need to understand how far these methods and arguments are similar to those which logicians have traditionally discussed. How far the problems that logic books discuss have a bearing on what working scientists actually do.

According to Toulmin, the focus ought to be on questions like:

How do physicists actually decide that an explanation is acceptable?

What sort of job an expression must perform in order to qualify as a "law of nature"?

How are laws of nature different from hypotheses?

Again, how does mathematics come to play such a large part in physical sciences?

Are genes, electrons, etc., really existing or they are mere explanatory devices?

According to Toulmin, these are the questions that cannot be answered satisfactorily without paying attention to what scientists actually do.

### **Summary:**

1. According to Toulmin, philosophy of science is the study of *aims*, *methods* and *achievements* of physical sciences.
2. In Toulmin's view, what traditional books of logic discuss under the heading "Induction and Scientific method" are not untrue or fallacious, but rather *irrelevant*, because they do not pay attention to actual methods and arguments, which scientists employ.
3. Therefore, according to Toulmin, students of philosophy need an introductory guide to the types of arguments and methods the scientists employ in *actual practice*.

### **Critical comments:**

1. Toulmin has confined himself to physical sciences, whereas Karl Popper, a leading philosopher of science of twentieth century, has discussed philosophy of social sciences as well, in his *Philosophy of Historicism*. (The students are required to study this topic, too, along with the main ideas in Popper's *Logic of Scientific Discovery*.)
2. The traditional books of Inductive Logic or Scientific Method are not as irrelevant as Toulmin makes them out to be, except that they give a central place to the *necessary connection* theory of causality in scientific method. This theory has largely been given up since it was criticized by David Hume. Even the much dated B. N. Roy's A

*Textbook of Inductive Logic* contains many examples from actual science. Cohen and Nagel's *Logic and Scientific Method*, which students are required to study for the "Scientific Method" part of this course, is much updated.

### **Questions:**

1. *The Philosophy of Science* is written by:

(i) Bertrand Russell (ii) G. E. Moore (iii) Stephen Toulmin (iv) Karl Popper.

2. According to Toulmin, traditional books of logic give a correct picture of scientific method. Yes or No?

3. Discuss, according to Toulmin, whether the traditional books of logic give a correct picture of scientific method or not?

4. What questions, according to Toulmin, an introductory book on philosophy of science ought to answer?

### **References**

Stephen Toulmin, *The Philosophy of Science* (London: Hutchinson University Library, 1967).

Bryan Magee, *Popper* (London: Fontana Paperbacks, 1982).