Editorial

Most scientists pursue their scientific activity without any explicit awareness of the epistemological foundations on which it rests. Few pause to question its basic tenets. Is there for example, an epistemic gap which will forever preclude a knowledge of the real world? Are there statements which can be objectivated? What is the process whereby scientific knowledge is acquired and advanced? Can theories be induced from observations and are there any criteria for evaluating them? Can observations be made without some theory in mind? Is the law of causality universally valid?

Scientific enterprise however continues to flourish, as the work of individual scientists is related to its larger corpus through modes of criticism and approval which are implicitly guided by prevailing ideas on these issues. This in itself, of course, cannot guarantee progress unless such ideas are constantly criticised and superseded by more incisive ones. A clearer insight into philosophical issues of science can thus prove accessory to scientific advancement itself. Indeed, as pointed out by Heisenberg, the great development of natural science since the 17th century was preceded and accompanied by a development of philosophical ideas closely connected with the fundamental concepts of science.

Not all epistemological issues are satisfactorily settled. The oldest of these is the theory of scientific procedure and demarcation criteria for empirical sciences first addressed by Aristotle in the 4th century B.C. His inductive-deductive method of scientific enquiry whilst surviving in the main, was progressively refined between the 13th and 17th centuries in a relentless quest for ensuring that scientific knowledge so acquired represented 'true knowledge' as far as possible free from logical traps. Grosseteste, Roger Bacon and Newton greatly sharpened this classical scheme by adding to it a third stage involving rigorous experimental tests logically derived from a hypothesis. However, the next distinct advance was made by Karl Popper who demanded a rather stringent falsifiability criterion to be applied to theories for selecting the most eligible one.

The asymmetric relationship that verification or falsifiability of a theory bear to its validity, was realized by Grosseteste in the 13th century, who advocated the method of falsification (modus tollens arguments) in discriminating between competing theories. To Popper however, evidence is valuable only in so far as it would tend to falsify general statements, and, instance confirmation, just another 'failure of an attempt to falsify the theory under test'. Popper is of course aware that there are vast areas of enquiry which can profit from working hypotheses not amenable to his stringest test. But, a positive aspect of demarcating such endeavours would be to constantly strain at their potential scientificity which may stimulate useful discourse and eventual possible testability.

Demarcation however, has a negative aspect too, of instilling unintended value that may arise from exclusion. Most endeavours in Earth System sciences fall in this category. Since its gigantic proportions and highly interactive energetics limit the possibility of control experiment, one must be content with carefully observing what uninterrogated nature may offer. This has encouraged some earth scientists and possibly others in similar disciplines to seek a distinct identity subject to different methodological principles to which Popper's criteria may not apply. This is neither necessary nor desirable as argued by Pramod Moharir in this volume. Recourse to methodological prerogatives without a sound philosophical basis can only breed logical inconsistencies.

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