# PROBLEM OF INDUCTION IN BIOLOGY

B.RAJEEV*

The problem of induction was originally posed by David Hume in his book 'A treatise of human nature'(1739). It goes to the heart of the question of wether and how we may 'know' something about the future occurrence of an event, based purely on its (repeated) occurrence in the past. A central example being of course, the events predicted by a scientic law. Hume himself concluded that there was no rational grounds to infer that an event would occur merely on the basis of its occurrence in the past. The solution that he proposed was based on a form of skepticism or agnosticism. Hume's argument against the existence of god - that there is no constant conjunction between god and his deeds - opposes the argument from design or teleological arguments and is closely related to the problem of inference, using the principle of induction. Since the time of its formulation by Hume, the problem of induction has been studied by both philosophers and scientists; and within the discipline of mathematics, the 'principle of induction', is an indispensable tool for most working mathematicians.

We shall try to show below, that the roots of the problem really lie in human evolution and ultimately perhaps in biology. However, from a strictly scientic point of view, the problem has a resolution , within the framework of determinism. The reason that we may indeed expect the future occurrence of an event, given its past occurences, is because of the action of deterministic laws and we may expect the recurrence of such events as long as the conditions required by the law are satised. There are two aspects of this solution that are worth noting. Firstly, the 'framework of determinism' can only yield a half way solution, since scientific laws are, thanks to quantum mechanics, ultimately random. Even if we were to adopt the 'practical' view that, it is only at the microscopic level that determinism breaks down, it is by no means clear that the macroscopic domain belongs exclusively to deterministic laws. Much of our environment must be considered random and subject to the vagaries of uncontrolled energy flows at different scales. Yet, it is within this framework of randomness that deterministic laws, like that of gravity, prevail and to that extent provide a solution to the problem of human cognition posed by inductive logic.

The second aspect of the 'deterministic solution' to the induction problem that was mentioned above, is that the natural setting for the problem and one that we believe is often obscured, is that of time. Problems of philosophy, as distinct from history and evolution, are more often than not, posed in a transcendental logical form that, as in the present case, obscures its temporal setting. The problem of induction may then be considered as one that is related to our notion of time viz. an undefined future, juxtaposed against a denite past. The problem is of constructing knowledge as we move from the past into the future. It is worth restating, if only to not lose the thread of time (sic), that the problem of induction is related to uncertainty of the future and indeed to the relation between knowledge of the past and knowledge of the future. But this uncertainty is common to all species. In other words the problem of induction in a biological context may be posed as follows : how do species create knowledge to move from the past into the future? And to the extent that they are successful, a species maybe considered to have solved the problem of induction in some sense or the other. This is rightfully a problem in the theory of evolution on which, in this note, we shall venture to make a few comments.

A fundamental feature of the Darwinian theory of evolution is that species adapt to their environment. This

* Indian Statistical Institute, Bangalore Centre, Email : brajeev@isibang.ac.in