ID1

Introduction

1.3 MODELS AS APPROXIMATIONS OF REALITY

It has already been observed that mathematical models limit their description to the quantitative links established by real systems between their measurable attributes so that they constitute, in any case, only partial descriptions. The asymptotic evolution of science has however also canceled the illuministic illusions on the possibility of achieving exact descriptions of reality. Even the relations accepted as laws of nature can be considered, at most, as models *not yet* falsified. Newton's law of motion is a good example of the extended acceptance of a mathematical relation as an absolute description of a phenomenon before its falsification, but it's also a good example of the excellent accuracy of a simple model in describing a very large range of situations.

Many phenomena are simply too complex to be described in detail by manageable models and/or are not ruled by any definite law of nature (e.g. national economies). The construction of mathematical models should thus be ruled by *usefulness* criteria more than by (always relative) *truth* criteria. The inherent approximations associated to models outline that different models of the same system can be used for different purposes (interpretation, prediction, filtering, diagnosis, simulation) optimizing their performance for these tasks. The criteria to compare and select models have, consequently, both a philosophical and a practical importance. A well known criterion is the "razor of Occam", due to William of Occam (1290–1350) establishing that the simpler among the models accounting for the same phenomenon must be preferred. This principle certainly helped the acceptance of the model proposed, for the solar system, by Copernicus who, prudently, emphasized that his heliocentric model should have been considered only as an exercise to obtain in a simpler way the results of the officially accepted Ptolemaic model.

A different description of the parsimony principle can be found in the work of Popper (1963). According to this author, among the models that explain the available observations, the model explaining as little else as possible (the most powerful unfalsified model) is to be preferred. The parsimony principle is supported not only by philosophical arguments (and by common sense) but also by mathematical arguments that show how increasing model complexity leads, when the models are deduced from uncertain data, to corresponding increases in the uncertainty of their parameters.

SECTIONS	MODULES	QUESTIONS	HOME PAGE
PREV. MODULE	FAQ	TUTOR	NEXT MODULE