

Part IV

## **Testing Scientific Ideas**

**12. Observation**

**13. Measurement**

**14. Experiment**

**15. Concluding**

*So far we have dealt with scientific ideas and some of their applications. Henceforth we shall tackle the problem of finding out the extent to which those ideas fit facts. Since this fitness is estimated through experience, we shall study the empirical procedures whereby ideas concerning facts are checked.*

*Empirical operations are made in science with cognitive aims or with practical ones. Cognitively directed empirical operations are those performed in order to produce data, generate modest conjectures, or test hypotheses and theories. Practically directed empirical operations are those aiming at testing rules of procedure or concrete systems — materials, instruments, persons, organizations. In brief, empirical operations can be classed into cognitively directed or knowledge-increasing (data-gathering, hypotheses-generating, or hypotheses-testing), and practically directed or power-increasing (rules-testing or systems-testing). In the following, emphasis will be laid on cognitively directed empirical procedures.*

*Now the results of empirical operations aiming at advancing our knowledge are insignificant by themselves: they have to be interpreted and evaluated — i.e. some “conclusions” must be drawn from them. In other words, if such empirical results are to become relevant to scientific ideas then certain inferences must be performed. This is why the present and last part of the book closes with a chapter devoted to the evaluation of hypotheses and theories in the light of scientific experience. In this way we close the loop that starts with facts prompting the questioning that elicit ideas requiring empirical tests.*