

## PREFACE

NATURAL Selection is not Evolution. Yet, ever since the two words have been in common use, the theory of Natural Selection has been employed as a convenient abbreviation for the theory of Evolution by means of Natural Selection, put forward by Darwin and Wallace. This has had the unfortunate consequence that the theory of Natural Selection itself has scarcely ever, if ever, received separate consideration. To draw a physical analogy, the laws of conduction of heat in solids might be deduced from the principles of statistical mechanics, yet it would have been an unfortunate limitation, involving probably a great deal of confusion, if statistical mechanics had only received consideration in connexion with the conduction of heat. In this case it is clear that the particular physical phenomena examined are of little theoretical interest compared to the principle by which they can be elucidated. The overwhelming importance of evolution to the biological sciences partly explains why the theory of Natural Selection should have been so fully identified with its role as an evolutionary agency, as to have suffered neglect as an independent principle worthy of scientific study.

The other biological theories which have been put forward, either as auxiliaries, or as the sole means of organic evolution, are not quite in the same position. For advocates of Natural Selection have not failed to point out, what was evidently the chief attraction of the theory to Darwin and Wallace, that it proposes to give an account of the means of modification in the organic world by reference only to 'known', or independently demonstrable, causes. The alternative theories of modification rely, avowedly, on hypothetical properties of living matter which are inferred from the facts of evolution themselves. Yet, although this distinction has often been made clear, its logical cogency could never be fully developed in the absence of a separate investigation of the independently demonstrable modes of causation which are claimed as its basis. The present book, with all the limitations of a first attempt, is at least an attempt to consider the theory of Natural Selection on its own merits.

When the theory was first put forward, by far the vaguest element in its composition was the principle of inheritance. No man of learning or experience could deny this principle, yet, at the time, no approach could be given to an exact account of its working. That an

independent study of Natural Selection is now possible is principally due to the great advance which our generation has seen in the science of genetics. It deserves notice that the first decisive experiments, which opened out in biology this field of exact study, were due to a young mathematician, Gregor Mendel, whose statistical interests extended to the physical and biological sciences. It is well known that his experiments were ignored, to his intense disappointment, and it is to be presumed that they were never brought under the notice of any man whose training qualified him to appreciate their importance. It is no less remarkable that when, in 1900, the genetic facts had been rediscovered by De Vries, Tschermak, and Correns, and the importance of Mendel's work was at last recognized, the principal opposition should have been encountered from the small group of mathematical statisticians then engaged in the study of heredity.

The types of mind which result from training in mathematics and in biology certainly differ profoundly; but the difference does not seem to lie in the intellectual faculty. It would certainly be a mistake to say that the manipulation of mathematical symbols requires more intellect than original thought in biology; on the contrary, it seems much more comparable to the manipulation of the microscope and its appurtenances of stains and fixatives; whilst original thought in both spheres represents very similar activities of an identical faculty. This accords with the view that the intelligence, properly speaking, is little influenced by the effects of training. What is profoundly susceptible of training is the imagination, and mathematicians and biologists seem to differ enormously in the manner in which their imaginations are employed. Most biologists will probably feel that this advantage is all on their side. They are introduced early to the immense variety of living things; their first dissections, even if only of the frog or dog fish, open up vistas of amazing complexity and interest, at the time when the mathematician seems to be dealing only with the barest abstractions, with lines and points, infinitely thin laminae, and masses concentrated at ideal centres of gravity. Perhaps I can best make clear that the mathematician's imagination also has been trained to some advantage, by quoting a remark dropped casually by Eddington in a recent book—

‘We need scarcely add that the contemplation in natural science of a wider domain than the actual leads to a far better understanding of the actual.’ (p. 267, *The Nature of the Physical World*.)