NATURAL SELECTION

AND

TROPICAL NATURE

ESSAYS ON

DESCRIPTIVE AND THEORETICAL BIOLOGY

BY

ALFRED RUSSEL WALLACE

AUTHOR OF 'THE MALAY ARCHIPELAGO,' 'ISLAND LIFE,' 'DARWINISM,' ETC.

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PREFACE

THE present volume consists mainly of a reprint of two volumes of essays — *Contributions to the Theory of Natural Selection*, which appeared in 1870, with a second edition in 1871, and has now been many years out of print; and, *Tropical Nature and Other Essays*, which appeared in 1878.

In preparing a new edition of these works to appear as a single volume I have thought it advisable to omit two essays—that on "The Malayan Papilionidæ" as being too technical for general readers, and that on "The Distribution of Animals as indicating Geographical Changes," which contains nothing that is not more fully treated in my other works. Another essay — "By-Paths in the Domain of Biology"—has also been partly omitted, one portion of it forming a short chapter on "The Antiquity and Origin of Man," while another portion has been incorporated in the chapter on "The Colours of Animals and Sexual Selection." More than compensating for these omissions are two new chapters—"The Antiquity of Man in North America" and "The Debt of Science to Darwin."

Many corrections and some important additions have been made to the text, the chief of which are indicated in the table given below; and to facilitate reference the two original works have separate headings, and form Parts I. and II. of the present volume.

ALTERATIONS IN THE SECOND EDITION OF CONTRIBUTIONS, ETC.

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ADDITIONAL MATTER IN THE PRESENT VOLUME.

Natural Selection.

Tropical Nature.

The Antiquity of Man in North America.

The Debt of Science to Darwin.

Parkstone, Dorset,
March 1891.

Natural Selection. *First Edition* 1870
Reprinted 1875

Tropical Nature. *First Edition* 1878
First published together 1891. *Reprinted* 1895

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ESSAYS ON NATURAL SELECTION

I

ON THE LAW WHICH HAS REGULATED THE INTRODUCTION OF NEW SPECIES [1]

Geographical Distribution dependent on Geologic Changes

EVERY naturalist who has directed his attention to the subject of the geographical distribution of animals and plants must have been interested in the singular facts which it presents. Many of these facts are quite different from what would have been anticipated, and have hitherto been considered as highly curious, but quite inexplicable. None of the explanations attempted from the time of Linnæus are now considered at all satisfactory; none of them have given a cause sufficient to account for the facts known at the time, or comprehensive enough to include all the new facts which have since been, and are daily being, added. Of late years, however, a great light has been thrown upon the subject by geological investigations, which have shown that the present state of the earth and of the organisms now inhabiting it is but the last stage of a long and uninterrupted series of changes which it has undergone, and consequently, that to endeavour to explain and account for its present condition without any reference to those changes (as has frequently been done) must lead to very imperfect and erroneous conclusions.

The facts proved by geology are briefly these: That

[1] This article, written at Sarawak in February 1855 and published in the *Annals and Magazine of Natural History*, September 1855, was intended to show that some form of evolution of one species from another was needed in order to explain the various classes of facts here indicated; but at that time no means had been suggested by which the actual change of species could have been brought about.

during an immense but unknown period the surface of the earth has undergone successive changes; land has sunk beneath the ocean, while fresh land has risen up from it; mountain chains have been elevated; islands have been formed into continents, and continents submerged till they have become islands; and these changes have taken place, not once merely, but perhaps hundreds, perhaps thousands of times.—That all these operations have been more or less continuous but unequal in their progress, and during the whole series the organic life of the earth has undergone a corresponding alteration. This alteration also has been gradual, but complete; after a certain interval not a single species existing which had lived at the commencement of the period. This complete renewal of the forms of life also appears to have occurred several times.—That from the last of the geological epochs to the present or historical epoch, the change of organic life has been gradual: the first appearance of animals now existing can in many cases be traced, their numbers gradually increasing in the more recent formations, while other species continually die out and disappear, so that the present condition of the organic world is clearly derived by a natural process of gradual extinction and creation of species from that of the latest geological periods. We may therefore safely infer a like gradation and natural sequence from one geological epoch to another.

Now, taking this as a fair statement of the results of geological inquiry, we see that the present geographical distribution of life upon the earth must be the result of all the previous changes, both of the surface of the earth itself and of its inhabitants. Many causes, no doubt, have operated of which we must ever remain in ignorance, and we may, therefore, expect to find many details very difficult of explanation, and in attempting to give one, must allow ourselves to call into our service geological changes which it is highly probable may have occurred, though we have no direct evidence of their individual operation.

The great increase of our knowledge within the last twenty years, both of the present and past history of the organic world, has accumulated a body of facts which should afford a sufficient foundation for a comprehensive law embracing and

explaining them all, and giving a direction to new researches. It is about ten years since the idea of such a law suggested itself to the writer of this essay, and he has since taken every opportunity of testing it by all the newly-ascertained facts with which he has become acquainted, or has been able to observe himself. These have all served to convince him of the correctness of his hypothesis. Fully to enter into such a subject would occupy much space, and it is only in consequence of some views having been lately promulgated, he believes, in a wrong direction, that he now ventures to present his ideas to the public, with only such obvious illustrations of the arguments and results as occur to him in a place far removed from all means of reference and exact information.

A Law deduced from well-known Geographical and Geological Facts

The following propositions in Organic Geography and Geology give the main facts on which the hypothesis is founded.

GEOGRAPHY

1. Large groups, such as classes and orders, are generally spread over the whole earth, while smaller ones, such as families and genera, are frequently confined to one portion, often to a very limited district.

2. In widely distributed families the genera are often limited in range; in widely distributed genera well-marked groups of species are peculiar to each geographical district.

3. When a group is confined to one district, and is rich in species, it is almost invariably the case that the most closely allied species are found in the same locality or in closely adjoining localities, and that therefore the natural sequence of the species by affinity is also geographical.

4. In countries of a similar climate, but separated by a wide sea or lofty mountains, the families, genera, and species of the one are often represented by closely allied families, genera, and species peculiar to the other.

GEOLOGY

5. The distribution of the organic world in time is very similar to its present distribution in space.

6. Most of the larger and some small groups extend through several geological periods.

7. In each period, however, there are peculiar groups, found nowhere else, and extending through one or several formations.

8. Species of one genus, or genera of one family occurring in the same geological time, are more closely allied than those separated in time.

9. As, generally, in geography no species or genus occurs in two very distant localities without being also found in intermediate places, so in geology the life of a species or genus has not been interrupted. In other words, no group or species has come into existence twice.

10. The following law may be deduced from these facts: *Every species has come into existence coincident both in space and time with a pre-existing closely allied species.*

This law agrees with, explains, and illustrates all the facts connected with the following branches of the subject: 1st, The system of natural affinities. 2d, The distribution of animals and plants in space. 3d, The same in time, including all the phenomena of representative groups, and those which Professor Forbes supposed to manifest polarity. 4th, The phenomena of rudimentary organs. We will briefly endeavour to show its bearing upon each of these.

The Form of a true system of Classification determined by this Law

If the law above enunciated be true, it follows that the natural series of affinities will also represent the order in which the several species came into existence, each one having had for its immediate antitype a closely allied species existing at the time of its origin. It is evidently possible that two or three distinct species may have had a common antitype, and that each of these may again have become the antitypes from which other closely allied species were created. The effect of this would be, that so long as each species has had but one new species formed on its model, the line of affinities will be simple, and may be represented by placing the several species in direct succession in a straight line. But if two or more species have been independently formed on the plan of a