SCIENTIFIC BOOKS

RULES OF GEOGRAPHIC VARIATION

Darwinism and Geographic Regularities in Variation of Organisms. By E. I. LUKIN. 311 pp. In Russian. Academy of Sciences of U.S.S.R., Moscow-Leningrad.

THE existence of rules in the geographic variation of organisms has been known for more than a century, but until recently these rules were exploited chiefly by Lamarckians as a support for their views. About ten years ago, B. Rensch, himself originally a Lamarckian, conceded that the rules may as well or better be interpreted in accordance with the theory of natural selection. E. I. Lukin, professor of the University of Tomsk, completes the process by insisting that the facts described by these rules are contrary to any form of Lamarckism and compatible only with selectionism. To this reviewer, Lukin's arguments are convincing. But whether one agrees with Lukin or not, there is no doubt that his book, dated December, 1940, but only now received in this country, is the best on the subject in any language. It must be noted in particular that Lukin reviews numerous investigations published by various authors during the last decade and a half in Russian journals which are difficult of access even for those American biologists who read Russian; this fact alone would make the book valuable.

The book consists of three parts—a historical introduction, a summary of the evidence and a general interpretation. The following rules are discussed: (1) Bergmann's rule—in warm-blooded vertebrates races characterized by small body sizes are found usually in the southern, warmer parts of the species ranges, and large races in colder northern parts. Whether or not this rule is applicable to poikilothermal animals is uncertain. (2) In higher plants tall races occur chiefly in humid and short races in drier countries (based on investigations of O. K. Fortunatova). (3) Allen's rule—in mammals and birds the protruding body parts are relatively longer in warm and shorter in cold countries. (4) Gloger's rule—melanin pigmentation in mammals and birds increases in warm and humid and the phaeomelanin pigmentation in arid countries. (5) Darkly pigmented races of insects are found in countries with humid and lightly pigmented races in countries with arid climates. (6) The studies of K. S. Maslova show that the glumes of wheat varieties develop a red pigmentation in countries with much precipitation during the period of the ear development and a black pigmentation in countries which are dry and hot during the same periods. (7) Plants of warm countries form fats which contain greater proportions of saturated fatty acids, while plants of cold countries produce greater proportions of unsaturated fatty acids (N. N. Ivanov and many others). (8) Optimal temperatures for the development of soil bacteria are higher in warm than in cold countries (E. N. Mishustin and others); similar relationships are observed in many animal and plant species. (9) Races of mammals which inhabit localities at high elevations have more erythrocytes and more hemoglobin in their blood than do races of low altitudes; increases of the numbers of erythrocytes and of the amounts of hemoglobin occur when individuals born at low elevations are transferred to high altitudes. N. I. Kalabukhov has, however, shown that no decrease of the number of erythrocytes or of the amount of hemoglobin is observed if the high altitude race of the rodent *Apodemus sylvaticus ciscaucasicus* is kept at a low altitude (the corresponding increases are observed following the transfer of the low altitude race of the same species to the alpine zone). (10) Tropical and subtropical plants are mostly "short day," and temperate zone and subpolar species are mostly "long day" plants; exceptions from this rule are mostly explicable if one takes into account the special biological peculiarities of the respective species.

Every one of the above rules as well as many other facts quoted in the book show, according to Professor Lukin, that the process of race formation is governed by natural selection. The arguments of Lukin, sometimes couched in a sharp polemic language, are invariably interesting and frequently brilliant. His general ideas about evolution are based on the conceptions of modern genetics. This is especially gratifying as a sign that the misguided campaign against genetics waged by the partisans of T. D. Lysenko has spent itself. An echo of this campaign may perhaps be perceived in Lukin's attitude toward Darwin and his selection theory, expressed in several statements such as the following: "First of all, Darwinism is the only right theory, which has splendidly explained the fundamental moving agents of the organic development. Hence, any evolutionary problem may be solved only in the light of Darwinism." What, however, is Darwinism? Darwin himself modified and developed his views during his lifetime. Then came the period of neo-Darwinism with Weismann as the leading representative. In the last decade or two the progress of genetics has led to theories of evolution which this reviewer proposed to label "inductive Darwinism." We may claim for the modern theories an unbroken ideological succession from Darwin's heritage, but we need not go as far as to regard all Darwin's views inviolable. Like any living scientific theory, that of Darwin has changed greatly, and we may only hope that it will continue to evolve and

change further. Probably the most important change which has and is taking place and which should be welcomed is that evolution theories are being removed from the realm of abstract speculations and placed on experimental and quantitative basis.

Among the concluding chapters of Lukin's book, that devoted to a consideration of the parallelism between the phenotypic and the genotypic variability is most interesting. It is well known that organisms frequently respond to environmental changes by adaptive phenotypic modifications; yet the same adaptive characters may be genotypically fixed in races normally living in the corresponding environments (see the above quoted example of the changes in the composition of the blood in low altitude and high altitude mammals). Adaptation may be attained either by development of a norm of reaction which responds favorably to the variety of external conditions in which the species usually occurs or else by development of a variety of genotypes with specialized norms of reaction fitting the different ecological niches. Lukin points out that the history of the species and its biology determine which one of these two methods of adaptation is more efficient. Genotypic specialization is preferable to phenotypic plasticity where an early appearance of an adaptive character in the ontogeny is desirable. For example, skin callosities may develop either as a response of the skin to pressure or as a genetically fixed character arising already in embryos without the stimulus of pressure. The former method exposes the animal to risks during the process of formation of callosities, while the latter protects it from the birth on. Phyletic advances are usually accompanied by genotypic specialization. According to Mashkovcev, the lung development in lower amphibians (axolotl) depends on the functional stimulus of respiration by air; in higher ones the lung development is partly (in frogs) or completely (toad) independent of functional stimuli.

TH. DOBZHANSKY

COLUMBIA UNIVERSITY

THE STUDY OF POLLEN IN PEAT

An Introduction to Pollen Analysis (*with a foreword by Roger P. Wodehouse*). By G. ERDTMAN. 239 pp., 28 plates, 3 portrait plates, 15 text figs., some multiple; new series Plant Science Books, vol. 12; Waltham, Mass.: Chronica Botanica Company; New York: G. E. Stechert and Company. 1943. $5.00.

THE well-known and much-admired Swedish botanist, G. Erdtman, here gives to the world a partial harvest of the many years that he has devoted to the study of pollen analysis. This branch of botanical-geological science stems from the resistance to decay of the cuticle of pollen grains, entrapped in the peaty deposits of swamps, or, to a large extent, in fine-grained muds, silts and sands deposited by various agencies. As peat bogs afford an almost perfect trap for pollen, the preserved pollen represents the pollen rains throughout the period of growth of the bog. Pollen analysis is the process of study of the stratigraphic distribution of pollen, its separation from decayed vegetable matter and mineral grains, its identification and the interpretation of results in terms of the environment of the bog throughout its history. The pollen of plants growing on or near the borders of the bog records the local conditions, whereas pollen of upland plants reflects the ecology of the general neighborhood and hence the climate of the time. In practice 150 grains of tree pollen are counted from each sample in a vertical peat section. Percentages of the tree pollen, omitting corylloid pollen, are calculated and plotted in a graph. Increase or decrease is considered much more significant than absolute percentage of any tree species. Opposite trends, as of spruce and of mixed hardwoods, are considered of the highest importance as indicating a pronounced change in the forest association and hence in climate.

The discovery of these relationships is a noble scientific accomplishment in which Swedish scientists have taken a leading part. Erdtman's historical account somewhat overemphasizes the accomplishments of his countrymen. Nevertheless, it is perhaps fair enough to say that the systematic attack on paleoclimatological problems by means of pollen analysis of bogs dates from von Post's paper of 1916 and is based largely on Lagerheim's techniques. Since 1916, activity in the field has been astonishing. Erdtman's useful biennial bibliographies record an average of 150 papers a year in Europe alone, with contributions from all over the world. The study of the Postglacial and Interglacial peats absorbs most of the workers, but the pollen of the Tropics and of Tertiary and Cretaceous coals, as well as the spores of Cretaceous and Carboniferous coals afford opportunities for researches of great botanical interest.

Erdtman's book is primarily a manual for botanists and contains chapters on the chemistry of peat by E. Erdtman, on field and laboratory methods for the collection and preservation of fresh and fossil pollen, on the identification of pollen and on methods of presenting an analysis. Important to botanists are six chapters devoted to the morphology and identification of pollen with elaborate references to the literature.

The discussion of the output and dissemination of pollen, the composition of pollen rains, the distance of transport and loss of pollen by decay is presented with ample references to the literature. Here is the heart of the subject, the area in which the greatest possible errors lie. Unfortunately the author is not so