reviews

How Nature works

Kenneth Mellanby

Why Big Fierce Animals are Rare: An Ecologist's Perspective. By Paul Colinvaux. Pp.236. (Princeton University Press: New Brunswick, New Jersey, 1978.) $9.50.

IT is an unusual pleasure to find a popular book with "ecology" in its title which is actually about the subject. Professor Colinvaux makes his views clear in his introduction when he writes: "Ecology is not the science of pollution, nor is it environmental science. Still less is it a science of doom". To him, as to me, ecology is about the relationships between organisms, (animals, plants and micro-organisms) and their environment. Professor Colinvaux considers that the true roots of ecology are in the writings of Charles Darwin, who was primarily concerned to show how the world worked. If ecological studies help us to prevent this process from grinding to a halt, and if they show us how to conserve our resources or to fight pollution, so much the better. But these admirable developments are manifestations of serendipity and not a necessary extension of the science.

The important questions posed, and at least partially answered, by this book are: "Why are there so many different kinds of plants and animals? Why are some common but others rare? Why are some large and others small?" We are introduced to the concept of the niche, the habitat and the ecosystem, words with precise meaning often muddled even by professional scientists. Early on in his text, Colinvaux states that every species has a breeding strategy which, operating through natural selection, leaves the largest possible number of surviving offspring. The tactics in breeding, however, differ from species to species. For instance, some birds lay only one egg each year, others have large clutches; but as a rule both have populations which remain more or less the same year after year. The reasons seem to be made clear, though I think that we may sometimes be made to think that a description of a phenomenon is the same as an explanation of why it operates. This is something for the reader to decide.

The question implied by the title—that is, why are big fierce animals rare?—is answered simply and convincingly. Large carnivores need a lot of food; they convert the flesh they eat even more inefficiently than their herbivorous prey converts the grass on which it grazes, so the world can only support small numbers. Large herbivores, being lower down the food chain, can exist in larger numbers, and their very size allows them to escape from all but the largest predators. The huge baleen whales, living on tiny plankton, do not really fit into the general picture—but then they are not fierce.

However, this book is much more than a discussion about animal numbers and energetics. It is a vivid picture of how the natural world works. It stresses how this is constantly changing, with an ordered succession of types of vegetation and of the animals related to that vegetation.

We learn why the sea is blue—because it is largely an unproductive desert. Thus, the potential value of the oceans to feed the growing human population is small. The way our present atmosphere arose and is maintained is discussed, and our adaptation to air with one-fifth part of oxygen, four-fifths of nitrogen and a tiny fraction of carbon dioxide (on which all life depends) is considered.

Professor Colinvaux deals firmly with the common belief of many so-called ecologists that Lake Erie is dead, and with the other even commoner misconception that eutrophication is a synonym for pollution. He explains the natural succession of inland waters, from the infertile oligotrophic state to the more fertile eutrophic condition. Although man, by gross ill-treatment of the environment by uncontrolled additions of toxic pollutants, may upset this process, his damage may usually be reversed. But we must remember that eutrophic means well nourished, not polluted, and that eutrophic lakes contain much more life than those poor in nutrients. It is only that we prefer clean sterile water to rich pea soup.

The only point I would query in this book is its account of the plant succession in the development of woodland. We are told how abandoned farmland (originally made by clearing the forest) is invaded by weeds, then by shrubs and, perhaps only after many years, by the type of trees which comprised the original vegetation. But this is not always the case. In southern England the clay soils were mostly covered with oak forest before being cleared by Iron Age and Saxon farmers. When an area which has grown arable crops for hundreds of years is left alone, it is true that weeds like charlock immediately take over, to be replaced by shrubs (briar roses and hawthorn) in a few years. But oak seedlings, from acorns introduced by jays and other birds, may be present from the start, often occurring in very large numbers (many hundreds to the acre). Unless destroyed by the exotic rabbit, many of these survive and grow slowly and steadily, emerging from the herbaceous and shrubby vegetation as saplings in five to ten years. The succession is more apparent than real, for the main species of the climax vegetation may be present from the start.

However, this is a minor criticism, and probably does not apply to other forests with which I am unfamiliar. I consider that Professor Colinvaux has produced an excellent and very readable book. It should do much to widen the vision of professional ecologists and serious students, as well as educating the non-specialists for whom it was primarily written. □

Kenneth Mellanby is an Honorary Professorial Fellow in the Department of Botany at University College, Cardiff.

Characterisation of minerals

Physical Methods in Determinative Mineralogy. (Second edition.) Edited by J. Zussman. Pp. 720. (Academic: London, New York and San Francisco, 1977.) £23.50; $45.90.

THERE is no doubt that the first edition of this book, which appeared in 1967, met a widely-felt need for clear and concise descriptions of the most important techniques used in the separation, identification, and chemical and physical characterisation of minerals. The past decade has seen useful progress in the application of new methods of chemical analysis, and important advances in the