

PREFACE

Many of the discussions of the day involve the subject of ecology, and for that reason we have a vital interest in knowing some its principles. Everyone needs to be an ecologist to understand the biological issues that arise over climate change, disease outbreaks, endangered species, and the origins of antibiotic resistance in bacteria. Ecology is the science that deals with the general question of how all the animals and plants of Earth interact with their environment; we have serious problems when we ignore its basic principles. If we eliminate wolves, we may have an excess of deer to manage. If we have an excess of deer we may have an excess of ticks carrying Lyme disease, and humans may begin to get ill. If we use antibiotics on farmed chickens we may select for pathogenic bacteria that are resistant to all known antibiotics. Evolutionary changes can occur rapidly, and when they do so they have ecological consequences.

We all learn when we are young that we cannot ignore the basic principles of physics—we can walk and run but we cannot fly like the birds. We rely then on technology to produce airplanes to overcome this limitation. But what kinds of principles exist in ecology, and what do scientists know about them? That is the subject of this book. How does the natural world work? Is everything connected to everything else in nature? No, an ecologist would answer, but some species are connected to others, and by describing and understanding these connections we can manage our impacts on the Earth much better. If you aspire to be a dentist or an accountant or an astronaut you will still be tied to ecological systems about which some knowledge is useful. No matter what we do, we must eat food produced in agricultural enterprises that are a form of applied ecology, we must breathe the air that we have and realize that it is purified by plants, we must live in a healthy climate and should be concerned about the rising carbon dioxide level from fossil fuels. We may not be directly involved in protecting biodiversity in the tropics, but we might be sympathetic to the search for plant chemicals that can alleviate cancer or other emerging diseases.

There are many books on ecology and sources on the Internet that you could read. The best ones are highly specialized on the details of a few species of birds or butterflies, and these are most useful and readable.

Textbooks on ecology are usually very sound in details that are needed by a professional ecologist but too much for someone who is not a specialist. The Internet is useful for some particular information, but it does not offer an overview of ecological science. This book tries to hit the middle ground by providing an overview sprinkled with details. I have gathered 12 principles that cover the main ideas that are important in understanding how the biological world works. I have avoided jargon as much as possible, and tried to give examples of ecological insights that are presented in enough detail to capture the key ideas and issues that are unresolved at the present time. Ecology could be classified as a slow science in that it depends on data gathered over long time periods. Experiments that we hear about in the media are often carried out in a few months or years. Ecological insight may come only after 10–30 years of detailed studies and experiments. Glacial geologists used to laugh when they would discuss who could sit and watch a glacier move, but in these days of rapid climate change this is no longer a joke. Ecological science, in a similar way, is moving more rapidly as more and more research on how the world works is carried out around the globe.

I have arranged the main ideas of ecology into 12 chapters that proceed from a simple question of the geographical distribution of life on Earth to problems of populations, and then to more difficult issues of how groups of organisms get along in communities and ecosystems. So complexity grows as you move through these chapters. Much is known but much more is not yet well understood. In each chapter of this book I provide references to the scientific literature in case a particular question captures your interest and deserves follow-up. The ecological literature grows larger every day, and the insights that ecologists unravel enrich our lives by increasing our understanding of what is going on outside the windows of our house.

I am indebted to Alice Kenney for her assistance in helping to gather the material. There are two sets of heroes and heroines in ecology. The first set is all the field ecologists who have worked long hours to unravel the secrets of the ecosystems of the Earth. They are little appreciated, they get no Nobel Prizes, yet they are the scientists that our grandchildren will most appreciate. The second set of heroes and heroines are those providing funding for ecological research—governmental agencies that have made the brave decision to fund ecological research, knowing that some of the findings will be embarrassing to current government policies—and the private individuals and foundations who think ecological research well

worth supporting. Little ecological research generates dollar bills, so it is often overlooked as a science of little importance in a world run by the mania of economic growth. But it enriches our lives, and perhaps that is more important than money.

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