PREFACE

This is a book about plant diversity and about evolution as the ultimate cause of diversity. Man's activities in the 20th century have been increasingly exploitative, threatening both plant and animal diversity, including the continuing existance of man himself. Hopefully, the 21st century will be one of conservation rather than exploitation as man becomes more aware of his ecological niche and attempts to become one with nature. This is possible only to the extent that our educational and political leaders of tomorrow—our students of today—understand and appreciate biological diversity and its causes.

The 20th century has also been a century of exploration and discovery, not so much in the geographical sense, but in the discovery of ideas and development of scientific theories and concepts. Progress in developing new ideas and concepts in any discipline begins with careful observation and analysis of materials; this book is about plants, the materials that a botanist uses in his search for new knowledge. The student is introduced to each class of plants and learns what its members look like, when in the past they most likely originated, what their basic ecological requirements and contributions are, how they are or may be used in world economy, and what their potential in scientific research seems to be. These are the things that appear to be of greatest value and interest to our students: those who study botany in order to expand their appreciation of the role of science in modern culture, and those who plan on using plants in research or teaching or as raw materials to be processed for human use.

It is axiomatic that some plants are better suited for certain experiments than are other plants. Mendel would never have discovered the basic laws of heredity had he chosen oaks instead of peas for his experiments, nor would we today understand as much as we do about the basic processes of photosynthesis without the help of bacteria and green algae. In this book, all classes and divisions of plants are examined. We do not know which group will be of greatest significance in future research, but we can be grateful that over the years there were always a few people who were well acquainted with some of the so-called "obscure" groups of plants. Our knowledge of genetics today is greater than it would otherwise have been because someone had studied the life cycles in the "insignificant" Sphaeriales and could see the possibilities for research possessed by *Neurospora crassa, Chlorella pyrenoidosa, Streptomyces griseus, Vinca rosea,* and *Evernia prunastri* are other "unimportant" members of obscure families or classes which today are being used in research or medicine to the benefit of mankind.

The information in this book has been organized in such a way that similarities among closely related taxa are emphasized in order to make the task of remembering them easier for the student. I have used the simplest classification system consistent with the facts of evolution that I could find. Traditionally, all living things have been classified as either plant or animal, and I have held with this tradition. I like the convenience of a two-kingdom system partly because in our teaching and research we still have botanists and zoologists, and while they often work on very similar problems, there are often sharp differences in their research interests and methods. I have classified the Plant Kingdom into three subkingdoms: in each may be found simple, unicellular plants and highly complex, multicellular plants differentiated into distinct

tissues and organs. Fossil evidence indicates that since the late Precambrian, plant evolution has been going on within each of these three subkingdoms.

Those who have helped make possible the writing and publication of this book include numerous teachers, colleagues, and students. My own hypotheses of evolution among plants stem in part from the stimulus provided by four great teachers over 20 years ago at a Botanical Society of America-sponsored summer institute: John Couch, who introduced me to significant differences in plant flagellation; Harold Strain, who shared his findings on pigmentation in plants; E. G. Pringsheim, who greatly stimulated my curiosity in basic differences among the different groups of algae; and Harlan Banks, under whom I collected and studied plant fossils. Edmund Williams, my colleague in field studies at Ricks College, and Blaine Passey, Rexburg physician and enthusiastic student of paleontology, have helped me locate and date fossils. Other colleagues at Ricks College and Uppsala University—especially Delbert Lindsay, Ray Brown, Jerald Oldham, Elisabet and Lars Eric Henriksson, Nils and Lisbet Fries, Rolf Santesson, and Angelica von Hofsten—have brought to my attention numerous kinds of plants and pointed out interesting patterns of plant diversity. Hundreds of students have added interest and purpose to my field studies: a cousin, Bill Pearson, my daughter, Suzanne Benson, Tom Gallup, Bob Walpole, Demetrios Agathangelides, Monica Williams, and many others, have made significant contributions to my knowledge of plant diversity and evolution. Howard Peterson and William Bennett at Utah State University; Seville Flowers, Walter Cottam, and Robert Vickery at the University of Utah; and Donald Lawrence, Ernst Abbe, and Clyde Christensen at the University of Minnesota are among the teachers who very early stimulated my interest in plant diversity and evolution. Suzanne Young, Laura Jensen, Tara Williams, and Laura Clark typed some of the earlier drafts, and Laura Pearson typed the final draft of the manuscript. Ellen Pearson did most of the art work; Arlen Wilcock and his associates, espetially Steve Klamm and Wendy Wilcock, most of the graphics. My wife, my daughters, and my sister helped out with art work and with the assemblying of illustrations, tables, and text; my wife put up with me and provided moral and spiritual support. I acknowledge the help of all of these and numerous other teachers, colleagues, and friends with sincere gratitude.