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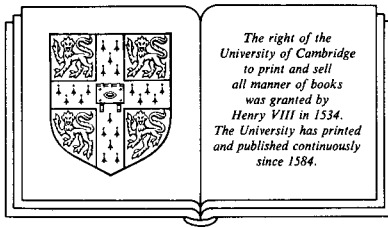
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To Peter Greig-Smith and Jack Rutter—
one taught me to recognise a pattern of distribution,
the other the corresponding environmental
and physiological patterns

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Preface

Lichenology has remained a fairly obscure branch of biology until relatively recently when it became evident that lichens were particularly good indicators of atmospheric pollution and could be used as experimental systems for monitoring ambient levels of sulphur dioxide or even particulate emissions from mining and smelting operations. During this same period there was an increasing awareness in plant ecology that the examination of physiological adaptations to specific environmental situations perhaps offered a more constructive research approach than was then apparent from the results obtained from the quantitative or energy-flow studies that had dominated ecology in the 1960s and early 1970s. Lichens particularly, played an important role in this development of our understanding of physiological adaptations in plants.

Lichens as terrestrial plants have a number of attributes which are particularly appealing when examining the physiological ecology of plants. They have no roots-organs, which present some formidable experimental problems in studies of higher plants. Equally they do not flower or have stomata, and as a result, examination of seasonal photosynthetic rates is considerably easier. Lastly, they can be contained in small and relatively simple cuvettes without undue stress to the thallus. Accordingly my initial interest in lichens was in terms of their robust qualities as experimental systems in the field of physiological ecology. Subsequently, however, as lichens are also a dominant component of much of the vegetation of northern Canada, our work on the ecology of low arctic ecosystems in general necessarily involved an understanding of the ecology of the more abundant lichen species.

The publication of *The Lichens* by Ahmadjian and Hale in 1973 provided a rounded summary of our knowledge at that time but also provided considerable stimulation to examine some of the

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gaps. The intent here is to provide an equivalent critical summary of our current understanding of the physiology of lichens, but only where it relates specifically to their ecology.

Since lichens are often in very close proximity to their substratum I have also dealt extensively with their thermal and ionic environments and particularly with their water relations. The seasonal metabolic responses of a lichen to temperature, moisture and light in terms of nitrogenase activity, net photosynthesis and respiration, form the central section of the book. Many of the examples covered in detail inevitably originate from our own work, particularly that in northern Canada. For this I should apologise, but I hope that it may stimulate a critical examination of some tropical species about which we know little. In the final chapter I have introduced a discussion on ecotypic and population differences and have attempted a provisional summary of the range of strategies which appear to be available to lichens, both in terms of their morphological and their photosynthetic attributes. This section is in part speculative but again it may serve to stimulate further work and discussion in this area.

It is with considerable pleasure I thank my colleagues in the lab for their stimulation, their criticisms and help, throughout much of the work that is included here, but especially during the preparation of the manuscript.

McMaster University, 1983

K.A.K.