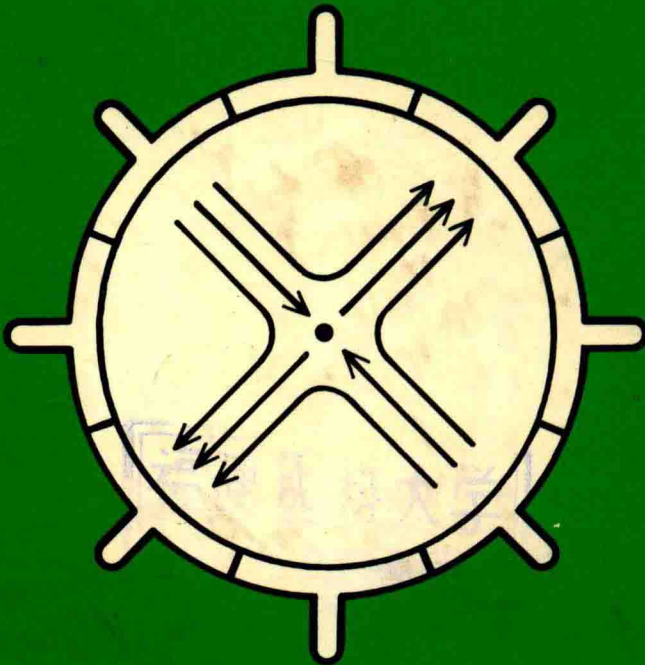


The Fungal Community

Its Organization and Role in the Ecosystem



Edited by

Donald T. Wicklow

George C. Carroll

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^{2/}The FUNGAL COMMUNITY

ITS ORGANIZATION AND ROLE IN THE ECOSYSTEM

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The FUNGAL COMMUNITY

MYCOLOGY SERIES

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- Volume 1** Viruses and Plasmids in Fungi, *edited by Paul A. Lemke*
- Volume 2** The Fungal Community: Its Organization and Role in the Ecosystem,
edited by Donald T. Wicklow and George C. Carroll
- Volume 3** Fungi Pathogenic for Humans and Animals (in three parts),
(in preparation), *edited by Dexter H. Howard*

INTRODUCTION TO THE SERIES

Mycology is the study of fungi, that vast assemblage of microorganisms which includes such things as molds, yeasts, and mushrooms. All of us in one way or another are influenced by fungi. Think of it for a moment--the good life without penicillin or a fine wine. Consider further the importance of fungi in the decomposition of wastes and the potential hazards of fungi as pathogens to plants and to humans. Yes, fungi are ubiquitous and important.

Mycologists study fungi either in nature or in the laboratory and at different experimental levels ranging from descriptive to molecular and from basic to applied. Since there are so many fungi and so many ways to study them, mycologists often find it difficult to communicate their results even to other mycologists, much less to other scientists or to society in general.

This Series establishes a niche for publication of works dealing with all aspects of mycology. It is not intended to set the fungi apart, but rather to emphasize the study of fungi and of fungal processes as they relate to mankind and to science in general. Such a series of books is long overdue. It is broadly conceived as to scope, and should include textbooks and manuals as well as original and scholarly research works and monographs.

The scope of the Series will be defined by, and hopefully will help define, progress in mycology.

Paul A. Lemke

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FOREWORD

What justification can there be for producing a book on fungal ecology? Learned volumes abound, written by specialists, for specialists, and probably read by none other than specialists. Is this to be the fate of this volume? It is certainly not the aim of the editors or the contributors. The aim indeed is nothing less than evangelical. Too long, say the editors, have the ecologists working with fungi and the ecologists working with other organisms labored in isolation and ignorance of one another. It is time they joined forces. By this fusion they enrich both mycology and mainstream ecology. The need for this fusion and the means whereby it might be achieved are clearly spelled out in the Preface and reiterated through the text. Quite simply, it could be put like this: Fungal ecology has a wealth of observation and a great potential for experimentation but a dearth of hypotheses; mainstream ecology has a superabundance of theory, much of which has proved difficult to test. From this book mycologists can learn to interpret their data, ecologists to substantiate their theory.

This is a bold claim and perhaps the editors may not thank me for so overstating it. But I believe there should be no apology for such boldness, for I see little danger of failure. The stimulus is bound to work. Those of us privileged to work in the International Biological Programme know how persuasive the atmosphere of integrated ecological work is. For better or worse we (and our subject) will never be the same again. This book, I suggest, is the next step in that educational process, a further juxtaposition of differing concepts and approaches which are surely bound to mix and interpenetrate. But this is not an easy process nonetheless. "Uncertainty" said Bertrand Russell (1946), "in the presence of vivid hopes and fears, is painful, but must be endured if we wish to live without the support of comforting fairy tales."^{*} To venture beyond the relatively safe confines of one's own data, terminology, and conceptual framework is certainly to tempt the gods, not to mention the reviewers; but the attempt must be made. It is only by being bold enough to ask fundamental questions that we earn the rights to some of the answers.

Is this merger something of merely academic importance? No, for the main ecological significance of fungi lies in their quantitative importance in ecosystems as

^{*} Russell, B. (1946). *A History of Western Philosophy*. Allen and Unwin, London.

decomposers and plant pathogens. All estimates show that in most terrestrial ecosystems fungi form a crucial bridge between the plants and the rest of the biotic community, a bridge which is the pathway for the main flow of nutrients to and from the plant. This in itself is surely justification enough for looking more closely at the ecology of this group. But this has not till now been the case. Only compare the number of references to birds and to fungi in any standard ecological text and then compare these two groups on the basis of their significance to almost any aspect of the functioning and structure of communities and ecosystems; this will give a measure of the present dire state of integration.

But even when the awaited marriage takes place, the story is only just begun. While fungi offer tremendous potential for certain types of ecological investigation their study is also beset by many practical problems. Any survey of the literature of fungal ecology shows an obsession with methods. Many fundamental parameters of fungal activity can still not be estimated with any precision. To paraphrase the words of one of the pioneers of modern microbial ecology, S. D. Garrett (1952): "What you can measure you can't identify and what you can identify you can't measure!"^{*} But it is equally true that, as Burgess (1965) has said, "micro-organisms are simpler than human beings"[†] and therefore lend themselves to investigation under circumstances where other organisms are totally unsuitable.

This has proved of tremendous value in other aspects of science. If an up-to-date microbiologist had been asked in the 1950s what the state of the art in microbial genetics would be in the 1980s his answer would have undoubtedly been horrendously wrong. Dare we hope that in the year 2000 the perspective of microbial ecology will have changed equally dramatically and with equally far-reaching effects?

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^{*} Garrett, S. D. (1952). The soil fungi as a microcosm for ecologists. *Sci. Progr.* 40: 436-450.

[†] Burgess, A. (1965). The soil microflora--its nature and biology. In *Ecology of Soil-Borne Plant Pathogens*, K. F. Baker and W. C. Snyder (Eds.). Murray, London, pp. 21-32.

PREFACE

We have organized this volume in response to a need for a single, adequately integrated, up-to-date book covering research pertaining to the ecology of fungi within the current conceptual framework of the ecological sciences. This book is designed for the mycologist who is being asked to become more directly involved in problems of ecological relevance and for the ecologist who finds himself examining fungal communities for the first time. Our aim is to present mycological ecology as a rational, organized body of knowledge and to promote the interfacing of mycological data with ecological theory. We considered that the most effective way of achieving this aim was to invite contributions from ecologists as well as mycologists. The ecologists were asked to introduce generalizations, definitions, and ecological ideas, while the mycologists were encouraged to provide relevant examples extracted from their own research or from the voluminous mycological literature. Both groups of researchers faced difficult tasks; the ecologist in assessing the potential value of fungi as tools for examining ecological ideas and the mycologist in identifying those aspects of mycological research that may be of importance to ecology. A synthesis of the two disciplines constitutes a challenge for the 1980s and beyond.

The editors acknowledge with gratitude the invaluable help of Gordon L. Adams, who superbly handled various editorial tasks, and Elsie Mumbach, who produced the camera-ready copy in its final form.

Donald T. Wicklow

George C. Carroll

The FUNGAL COMMUNITY

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