PREFACE

Many biologists, and I am one of them, live two lives at the same time. In one they work with organisms from day to day in the laboratory, or in the field. This is what keeps them in touch with their subjects—the real world that they find so fascinating. The other life is a concern for the big picture: how it all fits together. No one gives a better example of this double life than Charles Darwin, with his long and excruciatingly detailed study of barnacles, on the one hand, and his breathtaking excursion into evolution, on the other. From a biologist's point of view there can be no bigger picture than the latter.

In my case the microscopic cellular slime molds have been my barnacles, and my mini journeys into looking at the broader picture have been put forth in essays over the years. Often they have been concerned with bringing forth a hidden phenomenon, or showing connections between different realms of biology that are much more closely related than convention would have it. I have been led to seek the big picture, one that ties together facts and ideas that are generally thought of as entirely separate. For instance, years ago I was concerned that the study of

the development of organisms was limited to very few organisms, such as sea urchins and amphibians, yet the variety of organisms that develop is great. I felt that comparative studies of development would be essential for generating new insights into the venerable study of embryology and its relation to evolution. Later I was struck by the similarities between cell societies that make up a multicellular organism and animal societies, such as those of ants and other insects and mammalian societies as found in various species of monkey: the same forces make them tick. Then I became intrigued by the ways the essential communication between cells during development fell in neatly with the then new discoveries of that time of Nikolaas Tinbergen and Konrad Lorenz in the rising field of ethology; it was a different way of looking at the evolution of development.

My "big picture" kept changing. I soon realized the great importance of the concept of life cycles, and this led me to appreciate the importance of size. Life cycles of a multicellular organism (such as ourselves) start off as a minute fertilized egg and keeps getting larger and larger until maturity. This is as true for a small alga as it is for a blue whale. Furthermore, if one looks at the history of our planet, it is evident that the maximum size of animals and plants progressively increases over geologic time (a matter to be pursued further in the pages that follow). This size increase is fundamentally tied with an increase in complexity—what I have called the

"size-complexity rule." And all during this series of generalizations that I have indulged in over the years, I have kept my eye firmly fixed on the cellular slime molds, my barnacles.

This book is a continuation of my quest for the big picture. I work with microorganisms and I ask the question: Are they affected by natural selection the same way as large, complex ones? It is conventional to think that selection acts the same way on organisms of all sizes, and I make the case that it might not be so. I was delighted to find that in a brief passage, Darwin also suggested the same idea in one of the later editions of his *On the Origin of Species*.

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