

Emergence: Contemporary Readings in Philosophy and Science

edited by Mark A. Bedau and Paul Humphreys

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Preface

Thirty years ago emergence was largely ignored in philosophy and science. Its ethos ran counter to the reductionist views of the time, and it seemed to invoke mystical and unexplainable levels of reality. Things have changed. Emergence is now one of the liveliest areas of research in both science and philosophy. This activity holds out great promise for understanding a wide variety of phenomena in ways that are intriguingly different from more traditional approaches. The reason for this change is complicated, but it results in part from developments in a number of vigorous and successful research programs within complexity theory, artificial life, physics, psychology, sociology, and biology. In parallel, although often driven by independent developments in the philosophy of science and the philosophy of mind, philosophers have been developing new conceptual tools for understanding emergent phenomena.

This book covers the principal approaches to emergence found in contemporary philosophy and science. All of the chapters are contemporary classics that either have played a significant role in the development of thinking about emergence or capture and refine widely held pretheoretical positions on emergence. They originally were published in widely scattered and intellectually diverse sources. This volume for the first time collects them all in one easily accessible place. We have included selections that represent most, if not all, of the major contemporary approaches to emergence. However, in emphasizing the interactions between the philosophical and scientific approaches to emergence, we are striking out deliberately in a particular direction. For entirely understandable reasons, much of the recent philosophical literature on emergence, not to mention the broader public's attention, has been motivated by an interest in whether specifically mental features, such as consciousness, emerge from brain states and properties. We have included selections from that tradition, but we believe that progress in understanding emergence will be helped by a familiarity with work in areas outside psychology and the philosophy of mind. By understanding how emergent phenomena occur and are represented in physics and artificial life, for example, those with a philosophical interest in the subject can acquire a broader perspective on what is peculiar to emergence. Conversely, the abstractness and conceptual clarity

characteristic of philosophy can provide a much broader perspective from which scientists can see connections with kinds of emergence that lie outside their own disciplines.

And so this collection has a variety of intended audiences. It aims to be informative to both philosophers and scientists, but we also hope that many others, including students, will find the selections helpful and thought provoking. Most of the chapters can be understood by an intelligent reader who is not an expert in the specific discipline represented by a given author, and the third section can be used as a reference source on somewhat more specialized topics. Although we believe that our ordering provides a natural progression of ideas within each section, readers with different backgrounds no doubt will find it natural to begin with different sections. Our part introductions put the chapters into context, explain how they are connected, and pose some key questions for further exploration. The chapters in this book form only the tip of the iceberg of the emergence literature in contemporary philosophy and science, and further reading material is listed in the bibliography. Those who wish to use the collection as the basis for a course or seminar on emergence in some specific area easily can supplement our readings with more specialized and technical material.

Above all, we have endeavored to include selections that provide constructive and useful methods for understanding emergence. Throughout the introductions, we have posed questions, many of them currently lacking definitive answers. We hope that readers who work through this book will be well positioned to advance and eventually solve those problems.

Our book has an associated Web site containing supplementary material. Among other things, the site contains links to software including flocking and schooling simulations, the Game of Life, and self-organizing systems, as well as links to other reputable sites on emergence. We encourage readers to download and experiment with the simulations because many aspects of emergence have an essentially dynamic component that can only be understood through firsthand experience. The site also contains links to some classic publications that are now in the public domain, and updates about important new publications on emergence will be added periodically. As new resources arise over time, the site will grow and evolve. The Web site can be found at:

<http://mitpress.mit.edu/emergence>

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Sources

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