2007

Review of "Biomeasurement"

Philip M. Dixon

Iowa State University, pdixon@iastate.edu

Follow this and additional works at: http://lib.dr.iastate.edu/stat_las_pubs

Part of the Biology Commons, and the Statistics and Probability Commons

The complete bibliographic information for this item can be found at http://lib.dr.iastate.edu/stat_las_pubs/56. For information on how to cite this item, please visit http://lib.dr.iastate.edu/howtocite.html.
presents a reconstruction of his species concept that provides several surprises. For example, it turns out that for Darwin, a species could have multiple origins and the extinction of a species was not necessarily forever. Stamos argues that Darwin deliberately used his writing as if he held a non-realist view of the species category, while holding a realist view, as an argumentative tool to convince the audience of his beliefs.

This volume provides a fresh and well-researched analysis of what Darwin really thought about the nature of species and why his writings often suggest a different view than he actually held. In addition, it aims to set the record straight on the Darwinian revolution(s) with respect to its historiography and the understanding of how conceptual changes occurred in it. As such, this book will be valuable to Darwin scholars as well as to professional historians and philosophers of biology. However, a considerable level of background knowledge is presumed and, therefore, the volume is not for readers who want an introduction to Darwin’s ideas or an overview of the state of discussion on the species problem. An earlier book by Stamos addresses this latter topic.

Thomas Reydon, Center for Philosophy & Ethics of Science, Leibniz University, Hannover, Germany


This collection of essays (written over a period of 30 years) offers a systematic approach to understanding the reasoning processes involved in biological discoveries. Ten of the papers have appeared previously, and two are original contributions prepared for this volume. Part I, Biological Mechanisms, contains four papers, two of which were cowritten with Carl Craver and one with Craver and Peter Machamer. The focus of these essays is the thesis that the search for mechanisms (understood as entities and their associated activities) is a useful guiding strategy for making discoveries in science in general and biology in particular. The identification of biological mechanisms provides a window into the ontological commitments of biological theories, as well as serves as an organizing tool for the study of the history of science. Several search strategies are discussed liberally, as illustrated by examples drawn from neurobiology, genetics, cytology, and molecular biology.

Part II, Reasoning Strategies: Relating Fields, Resolving Anomalies, contains seven papers, including one cowritten with Nancy Maull and another with Joseph Cain. The focus of these papers is the role of interfield theories, that is, theories that draw upon the resources of two fields in making discoveries and resolving anomalies. Again the abstract analyses are vividly illustrated by examples drawn from the history of biology. Of particular interest is Chapter 9 (Strategies for Anomaly Resolution: Diagnosis and Redesign), which proposes strategies for using anomalies as productive tools for generating alternative hypotheses. Drawing on results from computational analyses of reasoning, Darden proposes that computational models might be constructed that would “automate” the scientific reasoning involved in the production of new theories.

Finally, Part III consists of a single essay that both reviews some of the critical responses to the proposals of the earlier chapters and suggests some promising lines for further development. This book will be of interest not only to those curious about the history and philosophy of biology, but also to anyone concerned with the underlying dynamics of the process of scientific discovery.

Michael Bradie, Philosophy, Bowling Green State University, Bowling Green, Ohio

GENERAL BIOLOGY

Biomeasurement.


In spite of the title, this is really a textbook for a one-semester, introductory statistics course for biologists. It covers the standard material: descriptive statistics, concepts of sampling, inference and testing, one- and two-sample Chi-square tests, one-, two-, and k-sample tests of location, regression, and correlation. Both parametric methods (e.g., one-way ANOVA) and nonparametric methods (e.g., the Kruskal-Wallis test) are presented. The style is very conversational and nonmathematical. Methods are illustrated using biological examples. Instructions are given for both hand calculation and the SPSS package. Each chapter includes self-help questions, with answers at the back of the volume, but there are no homework problems. Assignments from the author’s course at Anglia Ruskin University and other supporting material are included on a companion website, although some of the material is
password protected and available only to instructors who adopt the book for their course.

The strength of the volume is that statistical methods are integrated into biological research. The first chapter motivates the importance of statistics by describing the research process. The final chapter, focusing on graphical presentations, describes how results should be communicated. Recent papers in the biological literature are used to illustrate each statistical method. Quotes from those research papers are used to demonstrate how statistical results should be interpreted. The journal citation and a summary of the example paper are included with each chapter.

The book, however, takes the very narrow view that statistics equals hypothesis testing. Every method follows the litany: state the null hypothesis (H₀), choose a type 1 error rate, calculate a test statistic, and then accept or reject H₀. Almost completely missing is the notion that the size and precision of an effect are biologically useful. This is a shame because good science needs more than ‘is the difference zero? Accept or reject.”

PHILIP M DIXON, Statistics, Iowa State University, Ames, Iowa

Experimental Design for Biologists.


Over the past two decades, there has been a proliferation of new statistics books that have shifted the emphasis from computation to developing an understanding of the underlying concepts. This has come about, in part, due to the availability of the personal computer as well as user-friendly and relatively inexpensive statistical software. Two additional trends have been a growing emphasis on design of experiments and the availability of volumes that focus on a specific discipline. This book is based on a short course in experimental design that was developed by the author while working at a pharmaceutical company. Glass suggests that the target audience is prospective biologists in graduate school.

The volume contains 19 chapters. The first chapter deals with scientific methods, and the philosophical contributions of Francis Bacon, René Descartes, and Karl Popper are discussed. Chapters 2 through 5 describe how a hypothesis is framed, the distinction between critical rationalism and inductive reasoning, design of experiments where a formal hypothesis is not practical, and what constitutes proof. Chapters 6 to 11 provide actual design criteria such as replication and sampling over time. Several examples are given. Chapters 12 through 17 discuss controls in experimental design, positive, negative, subject, and reagents. Chapter 18 returns to the philosophy of science with a discussion of empiricism and David Hume. The final chapter is a three-page synopsis. After reading the book, it is clear that the use of Biologists in the title is intended to attract as wide an audience as possible. Unfortunately, where examples are used, they are pharmacological or are based on genetics or molecular biology. The best use for this volume is as an introduction to experimental design and scientific methods for prospective pharmacologists.

KARL SHEARER, Northwest Fisheries Science Center, National Marine Fisheries Service, Seattle, Washington

The Tree of Life: A Phylogenetic Classification.


Biomimicry is hot right now. The darling of advanced thinkers and movers and shakers in design and architecture, as well as feted at top salons such as the Aspen Institute, biomimicry bears an inspiring message. Look to nature and its designs (per- fected by millions of years of natural selection) to inspire new designs and stronger structures, as well as more efficient use of materials and energy, all so that people can exist in a friendlier and less im- posing relationship with nature. Unlike most mil- lenarian ideas, biomimicry is underpinned by a solid and optimistic foundation: the well-plowed story of Velcro, elegant structures that seemingly float on air, the awakening potential of composite materials, “smart” structures with sensory systems built in, and bird feathers. Like most millenarian ideas, however, ushering in the new age of biomi- micry will require everyone, not simply engineers and architects, to think differently about the world. As it has been expressed, biomimicry is not merely