

## Understanding Scientific Reasoning By Ronald N Giere

The articles in this volume deal with the main inferential methods that can be applied to different kinds of experimental evidence. These contributions - accompanied with critical comments - by renowned scholars in the field of philosophy of science aim at removing the traditional opposition between inductivists and deductivists. They explore the different methods of explanation and justification in the sciences in different contexts and with different objectives. The volume contains contributions on methods of the sciences, especially on induction, deduction, abduction, laws, probability and explanation, ranging from logic, mathematics, natural to the social sciences. They present a highly topical pluralist re-evaluation of methodological and foundational procedures and reasoning, e.g. focusing in Bayesianism and Artificial Intelligence. They document the second international conference in Vienna on "Induction and Deduction in the Sciences" as part of the Scientific Network on "Historical and Contemporary Perspectives of Philosophy of Science in Europe", funded by the European Science Foundation (ESF).

This is a collection of high-quality research papers in the philosophy of science, deriving from papers presented at the second meeting of the European Philosophy of Science Association in Amsterdam, October 2009.

UNDERSTANDING SCIENTIFIC REASONING develops critical reasoning skills and works with students to improve their level of scientific and technological literacy. Giere teaches students how to understand and critically evaluate scientific information they encounter in popular and professional media. With its focus on science, Understanding Scientific Reasoning helps students learn how to examine scientific reports with a reasonable degree of sophistication. Giere explains how to reason through case studies using the same informal logic skills employed by scientists. Students sharpen their abilities to analyze a complex series of propositions and hypotheses in the same manner as scientists. An argument that what makes science distinctive is its emphasis on evidence and scientists' willingness to change theories on the basis of new evidence. Attacks on science have become commonplace. Claims that climate change isn't settled science, that evolution is "only a theory," and that scientists are conspiring to keep the truth about vaccines from the public are staples of some politicians' rhetorical repertoire. Defenders of science often point to its discoveries (penicillin! relativity!) without explaining exactly why scientific claims are superior. In this book, Lee McIntyre argues that what distinguishes science from its rivals is what he calls "the scientific attitude"—caring about evidence and being willing to change theories on the basis of new evidence. The history of science is littered with theories that were scientific but turned out to be wrong; the scientific attitude reveals why even a failed theory can help us to understand what is special about science. McIntyre offers examples that illustrate both scientific success (a reduction in childbed fever in the



thorough enough in its coverage to be used as a core text in a class on scientific method, this text assists students in using the scientific method to design and assess experiments. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

This practical guide for teaching philosophy brings together essays by two dozen distinguished philosophers committed to pedagogy. Addressing primarily practical issues, such as how to motivate students, construct particular courses, and give educational exams, the essays also touch on theoretical issues such as whether moral edification is a proper goal of teaching ethics. An excellent sourcebook for graduate students just learning to teach as well as for professors searching for new strategies and inspiration or called upon to teach courses outside of their specialties.

Abstracts.

Political science is an intensely quantitative discipline, and models are central. Political scientists use models—formal and informal, statistical and qualitative—to investigate and illuminate causal mechanisms, generate comparative data, and understand the conditions under which certain outcomes are expected to occur. But how do we justify and rationalize the method? Why test predictions from a deductive, and thus truth-preserving, system? David Primo and Kevin Clarke tackle these central questions in this novel work of methodology.

The U.S. scientific community has long led the world in research on such areas as public health, environmental science, and issues affecting quality of life. These scientists have produced landmark studies on the dangers of DDT, tobacco smoke, acid rain, and global warming. But at the same time, a small yet potent subset of this community leads the world in vehement denial of these dangers. *Merchants of Doubt* tells the story of how a loose-knit group of high-level scientists and scientific advisers, with deep connections in politics and industry, ran effective campaigns to mislead the public and deny well-established scientific knowledge over four decades. Remarkably, the same individuals surface repeatedly—some of the same figures who have claimed that the science of global warming is "not settled" denied the truth of studies linking smoking to lung cancer, coal smoke to acid rain, and CFCs to the ozone hole. "Doubt is our product," wrote one tobacco executive. These "experts" supplied it. Naomi Oreskes and Erik M. Conway, historians of science, roll back the rug on this dark corner of the American scientific community, showing how ideology and corporate interests, aided by a too-compliant media, have skewed public understanding of some of the most pressing issues of our era.

This volume of articles (most published, some new) is a follow-up to the late Wesley C. Salmon's widely read collection *Causality And Explanation* (OUP 1998). It contains both published and unpublished articles, and focuses on two related areas of inquiry: First, is science a rational enterprise? Secondly, does science yield objective information about our world, even the aspects that we cannot observe directly? Salmon's own take is that objective knowledge of the world is possible, and his work in these articles centers around proving that this can be so. Salmon's influential standing in the field ensures that this volume will be of interest to both undergraduates and professional philosophers, primarily in the philosophy of science.

Not everything that claims to be science is. **UNDERSTANDING SCIENTIFIC REASONING** shows you easy-to-use principles that let you distinguish good science from bad information you encounter in both textbooks and the popular media. And because it uses the same processes that scientists use (but simplified), you'll know you're getting the most reliable instruction around. You'll also learn how to reason through case studies using the same informal logic skills employed by scientists.

"This volume presents an attempt to construct a unified cognitive theory of science in relatively short compass. It confronts the strong

program in sociology of science and the positions of various postpositivist philosophers of science, developing significant alternatives to each in a readily comprehensible style. It draws loosely on recent developments in cognitive science, without burdening the argument with detailed results from that source. . . . The book is thus a provocative one. Perhaps that is a measure of its value: it will lead scholars and serious student from a number of science studies disciplines into continued and sharpened debate over fundamental questions."—Richard Burian, *Isis* "The writing is delightfully clear and accessible. On balance, few books advance our subject as well."—Paul Teller, *Philosophy of Science*

Chiefly written as a textbook for 1st year university law students, this book encourages critical, responsible and creative thinking about law as a system of ideas and a social institution. Explore the relationship between law, logic and science. Although scientific models and simulations differ in numerous ways, they are similar in so far as they are posing essentially philosophical problems about the nature of representation. This collection is designed to bring together some of the best work on the nature of representation being done by both established senior philosophers of science and younger researchers. Most of the pieces, while appealing to existing traditions of scientific representation, explore new types of questions, such as: how understanding can be developed within computational science; how the format of representations matters for their use, be it for the purpose of research or education; how the concepts of emergence and supervenience can be further analyzed by taking into account computational science; or how the emphasis upon tractability--a particularly important issue in computational science--sheds new light on the philosophical analysis of scientific reasoning.

Spaceships travel through time at lightspeed, piloted by human clones and talking animals. Serious injuries are healed with the wave of a medical gizmo. The media make it all look so real. Can scientists hope to one day accomplish these feats? This book is a fun look at what can, and can't, be achieved with current technology.

A guide to the everyday decisions about right and wrong faced by physical scientists and research engineers. This book offers the first comprehensive guide to ethics for physical scientists and engineers who conduct research. Written by a distinguished professor of chemistry and chemical engineering, the book focuses on the everyday decisions about right and wrong faced by scientists as they do research, interact with other people, and work within society. The goal is to nurture readers' ethical intelligence so that they know an ethical issue when they see one, and to give them a way to think about ethical problems. After introductions to the philosophy of ethics and the philosophy of science, the book discusses research integrity, with a unique emphasis on how scientists make mistakes and how they can avoid them. It goes on to cover personal interactions among scientists, including authorship, collaborators, predecessors, reviewers, grantees, mentors, and whistle-blowers. It considers underrepresented groups in science as an ethical issue that matters not only to those groups but also to the development of science, and it examines human participants and animal



authors rely on ordinary language rather than mathematical terminology and emphasize the underlying logic of quantitative arguments rather than the details of the calculations. Understanding Quantitative History was sponsored by the Alfred P. Sloan Foundation.

Philosophy of science used to be identified with the logical and methodological analysis of scientific theories, and any allusion to values was considered as a deplorable intromission in a philosophical investigation that should remain strictly epistemological. As a reaction against this view, an opposite «sociological» approach downplayed the usual virtues of scientific knowledge (such as logical rigor and empirical adequacy) as artificial imageries that cover the actual nature of science, that is a social product submitted to all the kinds of social conditionings and compromises. A more balanced view is badly needed today, when technoscience is permeating all aspects of our civilization and wise persons understand that we cannot survive without using science and technology but at the same time we need to steer their development in view of the real benefit of humankind. We must investigate how science, technology and values are legitimately interconnected and, in particular, how the discourses of ethics, politics and religion can enter a fruitful dialogue with science. The essays presented in this volume offer a valuable contribution to this interdisciplinary study. Scientific and philosophical literature on causality has become highly specialised. It is hard to find suitable access points for students, young researchers, or professionals outside this domain. This book provides a guide to the complex literature, explains the scientific problems of causality and the philosophical tools needed to address them.

This work resulted from a workshop on the implications of the cognitive sciences for the philosophy of science held under the auspices of the Minnesota Center for Philosophy of Science. The workshop's theme was that the cognitive sciences - identified for the purposes of this project with three disciplinary clusters: artificial intelligence, cognitive psychology, and cognitive neuroscience - have reached sufficient maturity that they are now a valuable resource for philosophers of science who are developing general theories of science as a human activity. The emergence of cognitive science has by no means escaped the notice of philosophers or philosophers of science. Within the philosophy of science one can detect an emerging speciality, the philosophy of cognitive science, which would be parallel to such specialities as the philosophy of physics or the philosophy of biology. But the reverse is also happening. That is, the cognitive sciences are beginning to have a considerable impact on the content and methods of philosophy, particularly the philosophy of language and the philosophy of mind, but also on epistemology. The underlying hope is that the cognitive sciences might now come to play the sort of role within the philosophy of science that formal logic played for logical empiricism or that history of science played for the historical school. This development might permit the philosophy of science as a whole finally to move beyond the opposition between "logical" and "historical" approaches that has characterized the field since

the 1960s. "Ronald N. Giere is Professor of Philosophy and Director of the Minnesota Center for Philosophy of Science at the University of Minnesota."

Attempts to correct common misconceptions about astronomy, from myths about the moon causing tide changes to those found in popular science fiction movies.

Economists and other social scientists in this century have often supported economic arguments by referring to positions taken by philosophers of science. This important new book looks at the reliability of this practice and--in the process--provides economists, social scientists, and historians with the necessary background to discuss methodological matters with authority. Redman presents an accurate, critical, yet neutral survey of the modern philosophy of science from the Vienna Circle to the present, focusing particularly on logical positivism, sociological explanations of science (Polanyi, Fleck, Kuhn), the Popper family, and the history of science. She then deals with economic methodology in the twentieth century, looking at a wide range of methodological positions, especially those supported by positions from the philosophy of science.

The book addresses a number of recent topics at the crossroad of philosophy and cognitive science, taking advantage of both the western and the eastern perspectives and conceptions that emerged and were discussed at the PCS2011 Conference recently held in Guangzhou. The ever growing cultural exchange between academics and intellectual belonging to different cultures is reverberated by the juxtaposition of papers, which aim at investigating new facets of crucial problems in philosophy: the role of models in science and the fictional approach; chance seeking dynamics and how affordances work; abductive cognition; visualization in science; the cognitive structure of scientific theories; scientific representation; mathematical representation in science; model-based reasoning; analogical reasoning; moral cognition; cognitive niches and evolution.

This book presents a "philosophy of science education" as a research field as well as its value for curriculum, instruction and teacher pedagogy. It seeks to re-think science education as an educational endeavour by examining why past reform efforts have been only partially successful, including why the fundamental goal of achieving scientific literacy after several "reform waves" has proven to be so elusive. The identity of such a philosophy is first defined in relation to the fields of philosophy, philosophy of science, and philosophy of education. It argues that educational theory can support teacher's pedagogical content knowledge and that history, philosophy and sociology of science should inform and influence pedagogy. Some case studies are provided which examine the nature of science and the nature of language to illustrate why and how a philosophy of science education contributes to science education reform. It seeks to contribute in general to the improvement of curriculum design and science teacher education. The perspective to be taken on board is that to





probability and induction developed; and a full bibliography of further reading.

Presents the scientific evidence for evolution and reasons why it should be taught in schools, provides various religious points of view, and offers insight to the evolution-creationism controversy.

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