The Logic Of Scientific Discovery Routledge Classics

Conjectures and RefutationsThe Two Fundamental Problems of the Theory of KnowledgePatterns of DiscoveryRevisiting Discovery and JustificationModels of DiscoveryPhilosophy, Science, and HistoryWhat I Do Not Believe, and Other EssaysThe Logic of Scientific DiscoveryDiscovery ScienceScience and HypothesisPhysics of Meteor Flight in the AtmosphereThe Logic of Scientific DiscoveryAll Life is Problem SolvingThe SAGE Dictionary of Qualitative InquiryScientific Discovery: Case StudiesThe Logic of Scientific DiscoveryThe Little Book of CosmologyThe Open UniverseScientific Discovery in the Social SciencesCriticism and the Growth of Knowledge: Volume 4Quantum Theory and the Schism in PhysicsRealism and the Aim of ScienceThe Logic of DiscoveryKarl Popper, Science and EnlightenmentInquiry as Inquiry: A Logic of Scientific DiscoveryCognitive Models of ScienceKarl Popper, Logik der ForschungWhat Science Is and How It WorksThe Logic of Scientific DiscoveryThe Logic of Scientific DiscoveryEvidence and EvolutionScientific Discovery, Logic, and RationalityPopper's 'The Logic of Scientific Discovery'Data Collection in ContextScientific DiscoveryComputational Discovery of Scientific KnowledgeAgainst MethodProofs and RefutationsReproducibility and Replicability in ScienceModern Social Theory

Conjectures and Refutations

It is fast becoming a cliche that scientific discovery is being rediscovered. For two philosophical generations (that of the Founders and that of the Followers of the logical positivist and logical empiricist

movements), discovery had been consigned to the domain of the intractable, the ineffable, the inscrutable. The philosophy of science was focused on the so-called context of justification as its proper domain. More recently, as the exclusivity of the logical reconstruc tion program in philosophy of science came under question, and as the critique of justification developed within the framework of logical and epistemological analysis, the old question of scientific discovery, which had been put on the back burner, began to emerge once again. Emphasis on the relation of the history of science to the philosophy of science, and attention to the question of theory change and theory replacement, also served to legitimate a new concern with the origins of scientific change to be found within discovery and invention. How welcome then to see what a wide range of issues and what a broad representation of philosophers and historians of science have been brought together in the present two volumes of the Boston Studies in the Philosophy of Science! For what these volumes achieve, in effect, is the continuation of a tradition which had once been strong in the philosophy of science - namely, that tradition which addressed the question of scientific discovery as a central question in the understanding of science.

The Two Fundamental Problems of the Theory of Knowledge

'Never before has there been so many and such dreadful weapons in so many irresponsible hands.' - Karl Popper, from the Preface All Life is Problem Solving is a stimulating and provocative selection of Popper's writings on his main preoccupations during the last twenty-five years of his life. This collection illuminates Popper's process of working out key formulations in his theory of science, and indicates his view of the state of the world at the end of the Cold War and after the collapse of communism.

Patterns of Discovery

Described by the philosopher A.J. Ayer as a work of 'great originality and power', this book revolutionized contemporary thinking on science and knowledge. Ideas such as the now legendary doctrine of 'falsificationism' electrified the scientific community, influencing even working scientists, as well as post-war philosophy. This astonishing work ranks alongside The Open Society and Its Enemies as one of Popper's most enduring books and contains insights and arguments that demand to be read to this day.

Revisiting Discovery and Justification

Proofs and Refutations is essential reading for all those interested in the methodology, the philosophy and the history of mathematics. Much of the book takes the form of a discussion between a teacher and his students. They propose various solutions to some mathematical problems and investigate the strengths and weaknesses of these solutions. Their discussion (which mirrors certain real developments in the history of mathematics) raises some philosophical problems and some problems about the nature of mathematical discovery or creativity. Imre Lakatos is concerned throughout to combat the classical picture of mathematical development as a steady accumulation of established truths. He shows that mathematics grows instead through a richer, more dramatic process of the successive improvement of creative hypotheses by attempts to 'prove' them and by criticism of these attempts: the logic of proofs and refutations.

Models of Discovery

This volume by an astrophysics pioneer concerns the phenomena occurring during the flight of meteors through the terrestrial atmosphere. Beginning with a historical view of the study of meteor activity, the text examines atmospheric conditions and the classification and physico-chemical properties of meteors. Also includes meteoroid energy transfer, ablation, atomic collisions, and meteor radiation.

Philosophy, Science, and History

This volume arose out of a symposium on Thomas Kuhn's work, with Karl Popper in the chair.

What I Do Not Believe, and Other Essays

This book consists of a collection of essays written between 1965 and 1981. Some have been published elsewhere; others appear here for the first time. Although dealing with different figures and different periods, they have a common theme: all are concerned with examining how the method of hy pothesis came to be the ruling orthodoxy in the philosophy of science and the quasi-official methodology of the scientific community. It might have been otherwise. Barely three centuries ago, hypothetico deduction was in both disfavor and disarray. Numerous rival methods for scientific inquiry - including eliminative and enumerative induction, analogy and derivation from first principles - were widely touted. The method of hypothesis, known since antiquity, found few proponents between 1700 and 1850. During the

last century, of course, that ordering has been inverted and - despite an almost universal acknowledgement of its weaknesses - the method of hypothesis (usually under such descriptions as 'hypothetico deduction' or 'conjectures and refutations') has become the orthodoxy of the 20th century. Behind the waxing and waning of the method of hypothesis, embedded within the vicissitudes of its fortunes, there is a fascinating story to be told. It is a story that forms an integral part of modern science and its philosophy.

The Logic of Scientific Discovery

Realism and the Aim of Science is one of the three volumes of Karl Popper's Postscript to the Logic of scientific Discovery. The Postscript is the culmination of Popper's work in the philosophy of physics and a new famous attack on subjectivist approaches to philosophy of science. Realism and the Aim of Science is the first volume of the Postcript. Popper here formulates and explains his non-justificationist theory of knowledge: science aims at true explanatory theories, yet it can never prove, or justify, any theory to be true, not even if is a true theory. Science must continue to question and criticise all its theories, even those that happen to be true. Realism and the Aim of Science presents Popper's mature statement on scientific knowledge and offers important insights into his thinking on problems of method within science.

Discovery Science

First published in 1988. Routledge is an imprint of Taylor & Francis, an informa company.

Science and Hypothesis

Described by the philosopher A.J. Ayer as a work of 'great originality and power', this book revolutionized contemporary thinking on science and knowledge. Ideas such as the now legendary doctrine of 'falsificationism' electrified the scientific community, influencing even working scientists, as well as post-war philosophy. This astonishing work ranks alongside The Open Society and Its Enemies as one of Popper's most enduring books and contains insights and arguments that demand to be read to this day.

Physics of Meteor Flight in the Atmosphere

This survey provides an introduction to computational approaches to the discovery of communicable scientific knowledge and details recent advances. It is partly inspired by the contributions of the International Symposium on Computational Discovery of Communicable Knowledge, held in Stanford, CA, USA in March 2001, a number of additional invited contributions provide coverage of recent research in computational discovery.

The Logic of Scientific Discovery

This volume offers selected papers exploring issues arising from scientific discovery in the social sciences. It features a range of disciplines including behavioural sciences, computer science, finance, and statistics with an emphasis on philosophy. The first of the three parts examines methods of social scientific discovery. Chapters investigate the nature of causal analysis, philosophical issues around scale development in behavioural science research, imagination in social scientific practice, and relationships between paradigms of inquiry and scientific fraud. The next part considers the practice of social science discovery. Chapters discuss the lack of genuine scientific discovery in finance where hypotheses concern the cheapness of securities, the logic of scientific discovery in macroeconomics, and the nature of that what discovery with the Solidarity movement as a case study. The final part covers formalising theories in social science. Chapters analyse the abstract model theory of institutions as a way of representing the structure of scientific theories, the semi-automatic generation of cognitive science theories, and computational process models in the social sciences. The volume offers a unique perspective on scientific discovery in the social sciences. It will engage scholars and students with a multidisciplinary interest in the philosophy of science and social science.

All Life is Problem Solving

One of the pathways by which the scientific community confirms the validity of a new scientific discovery is by repeating the research that produced it. When a scientific effort fails to independently confirm the computations or results of a previous study, some fear that it may be a symptom of a lack of rigor in science, while others argue that such an observed inconsistency can be an important precursor to new discovery. Concerns about reproducibility and replicability have been expressed in both scientific

and popular media. As these concerns came to light, Congress requested that the National Academies of Sciences, Engineering, and Medicine conduct a study to assess the extent of issues related to reproducibility and replicability and to offer recommendations for improving rigor and transparency in scientific research. Reproducibility and Replicability in Science defines reproducibility and replicability and examines the factors that may lead to non-reproducibility and non-replicability in research. Unlike the typical expectation of reproducibility between two computations, expectations about replicability are more nuanced, and in some cases a lack of replicability can aid the process of scientific discovery. This report provides recommendations to researchers, academic institutions, journals, and funders on steps they can take to improve reproducibility and replicability in science.

The SAGE Dictionary of Qualitative Inquiry

Scientific research is viewed as a deliberate activity and the logic of discovery consists of strategies and arguments whereby the best objectives (questions) and optimal means for achieving these objectives (heuristics) are chosen. This book includes a discussion and some proposals regarding the way the logic of questions can be applied to understanding scientific research and draws upon work in artificial intelligence in a discussion of heuristics and methods for appraising heuristics (metaheuristics). It also includes a discussion of a third source for scientific objectives and heuristics; episodes and examplars from the history of science and the history of philosophy. This book is written to be accessible to advanced students in philosophy and to the scientific community. It is of interest to philosophers of science, philosophers of biology, historians of physics, and historians of biology.

Scientific Discovery: Case Studies

The distinction between the contexts of discovery and justification has left a turbulent wake in the philosophy of science. This book recognizes the need to re-open the debate about the nature, development, and significance of the context distinction, about its merits and flaws. The discussion clears the ground for the productive and fruitful integration of these new developments into philosophy of science.

The Logic of Scientific Discovery

The Little Book of Cosmology

How does a scientist go about solving problems? How do scientific discoveries happen? Why are cold fusion and parapsychology different from mainstream science? What is a scientific worldview? In this lively and wide-ranging book, Gregory Derry talks about these and other questions as he introduces the reader to the process of scientific thinking. From the discovery of X rays and semiconductors to the argument for continental drift to the invention of the smallpox vaccine, scientific work has proceeded through honest observation, critical reasoning, and sometimes just plain luck. Derry starts out with historical examples, leading readers through the events, experiments, blind alleys, and thoughts of scientists in the midst of discovery and invention. Readers at all levels will come away with an enriched

appreciation of how science operates and how it connects with our daily lives. An especially valuable feature of this book is the actual demonstration of scientific reasoning. Derry shows how scientists use a small number of powerful yet simple methods--symmetry, scaling, linearity, and feedback, for example--to construct realistic models that describe a number of diverse real-life problems, such as drug uptake in the body, the inner workings of atoms, and the laws of heredity. Science involves a particular way of thinking about the world, and Derry shows the reader that a scientific viewpoint can benefit most personal philosophies and fields of study. With an eye to both the power and limits of science, he explores the relationships between science and topics such as religion, ethics, and philosophy. By tackling the subject of science from all angles, including the nuts and bolts of the trade as well as its place in the overall scheme of life, the book provides a perfect place to start thinking like a scientist.

The Open Universe

Scientific Discovery in the Social Sciences

In this Fourth Edition of The SAGE Dictionary of Qualitative Inquiry Thomas A. Schwandt provides a guide to the terms and phrases that help shape the origins, purpose, logic, meaning, and methods of the practices known as qualitative inquiry. This edition features 20 additional terms as well as a restructured Reader's Guide. Key references have been updated and select terms and phrases from previous editions have been reorganized and greatly expanded. Together, the dictionary entries provide a guide to the

methodological and epistemological concepts and theoretical orientations of qualitative inquiry. This one-of-a-kind resource is ideal for readers who are navigating various perspectives on qualitative inquiry, working on a qualitative dissertation, or are launching their own investigations into the issues covered.

Criticism and the Growth of Knowledge: Volume 4

Quantum Theory and the Schism in Physics

The history of science is articulated by moments of discovery. Yet, these 'moments' are not simple or isolated events in science. Just as a scientific discovery illuminates our understanding of nature or of society, and reveals new connections among phenomena, so too does the history of scientific activity and the analysis of scientific reasoning illuminate the processes which give rise to moments of discovery and the complex network of consequences which follow upon such moments. Understanding discovery has not been, until recently, a major concern of modem philosophy of science. Whether the act of discoyery was regarded as mysterious and inexplicable, or obvious and in no need of explanation, modem philosophy of science in effect bracketed the question. It concentrated instead on the logic of scientific explanation or on the issues of validation or justification of scientific theories or laws. The recent revival of interest in the context of discovery, indeed in the acts of discovery, on the part of philosophers and historians of science, represents no one particular method'ological or philosophical orientation. It proceeds as much from an empiricist and analytical approach as from a sociological or

historical one; from considerations of the logic of science as much as from the alogical or extralogical contexts of scientific tho'¢tt and practice. But, in general, this new interest focuses sharply on the actual historical and contem porary cases of scientific discovery, and on an examination of the act or moment of discovery in situ.

Realism and the Aim of Science

We respect Herbert A. Simon as an established leader of empirical and logical analysis in the human sciences while we happily think of him as also the loner; of course he works with many colleagues but none can match him. He has been writing fruitfully and steadily for four decades in many fields, among them psychology, logic, decision theory, economics, computer science, management, production engineering, information and control theory, operations research, confirmation theory, and we must have omitted several. With all of them, he is at once the technical scientist and the philosophical critic and analyst. When writing of decisions and actions, he is at the interface of philosophy of science, decision theory, philosophy of the specific social sciences, and inventory theory (itself, for him, at the interface of economic theory, production engineering and information theory). When writing on causality, he is at the interface of methodology, metaphysics, logic and philosophy of physics, systems theory, and so on. Not that the interdisciplinary is his orthodoxy; we are delighted that he has chosen to include in this book both his early and little-appreciated treatment of straightforward philosophy of physics - the axioms of Newtonian mechanics, and also his fine papers on pure confirmation theory.

The Logic of Discovery

In a letter of 1932, Karl Popper described Die beiden Grundprobleme der Erkenntnistheorie □ The Two Fundamental Problems of the Theory of Knowledge □ as □a child of crises, above all of the crisis of physics.□ Finally available in English, it is a major contribution to the philosophy of science, epistemology and twentieth century philosophy generally. The two fundamental problems of knowledge that lie at the centre of the book are the problem of induction, that although we are able to observe only a limited number of particular events, science nevertheless advances unrestricted universal statements; and the problem of demarcation, which asks for a separating line between empirical science and non-science. Popper seeks to solve these two basic problems with his celebrated theory of falsifiability, arguing that the inferences made in science are not inductive but deductive; science does not start with observations and proceed to generalise them but with problems, which it attacks with bold conjectures. The Two Fundamental Problems of the Theory of Knowledge is essential reading for anyone interested in Karl Popper, in the history and philosophy of science, and in the methods and theories of science itself.

Karl Popper, Science and Enlightenment

How should the concept of evidence be understood? And how does the concept of evidence apply to the controversy about creationism as well as to work in evolutionary biology about natural selection and common ancestry? In this rich and wide-ranging book, Elliott Sober investigates general questions about probability and evidence and shows how the answers he develops to those questions apply to the

specifics of evolutionary biology. Drawing on a set of fascinating examples, he analyzes whether claims about intelligent design are untestable; whether they are discredited by the fact that many adaptations are imperfect; how evidence bears on whether present species trace back to common ancestors; how hypotheses about natural selection can be tested, and many other issues. His book will interest all readers who want to understand philosophical questions about evidence and evolution, as they arise both in Darwin's work and in contemporary biological research.

Inquiry as Inquiry: A Logic of Scientific Discovery

Quantum Theory and the Schism in Physics is one of the three volumes of Karl Popper's Postscript to the Logic of scientific Discovery. The Postscript is the culmination of Popper's work in the philosophy of physics and a new famous attack on subjectivist approaches to philosophy of science. Quantum Theory and the Schism in Physics is the third volume of the Postscript. It may be read independently, but it also forms part of Popper's interconnected argument in the Postscript. It presents Popper's classic statement on quantum physics and offers important insights into his thinking on problems of method within science and physics as a whole.

Cognitive Models of Science

Philosophy, Science, and History: A Guide and Reader is a compact overview of the history and philosophy of science that aims to introduce students to the groundwork of the field, and to stimulate

innovative research. The general introduction focuses on scientific theory change, assessment, discovery, and pursuit. Part I of the Reader begins with classic texts in the history of logical empiricism, including Reichenbach's discovery-justification distinction. With careful reference to Kuhn's analysis of scientific revolutions, the section provides key texts analyzing the relationship of HOPOS to the history of science, including texts by Santayana, Rudwick, and Shapin and Schaffer. Part II provides texts illuminating central debates in the history of science and its philosophy. These include the history of natural philosophy (Descartes, Newton, Leibniz, Kant, Hume, and du Châtelet in a new translation); induction and the logic of discovery (including the Mill-Whewell debate, Duhem, and Hanson); and catastrophism versus uniformitarianism in natural history (Playfair on Hutton and Lyell; de Buffon, Cuvier, and Darwin). The editor's introductions to each section provide a broader perspective informed by contemporary research in each area, including related topics. Each introduction furnishes proposals, including thematic bibliographies, for innovative research questions and projects in the classroom and in the field.

Karl Popper, Logik der Forschung

This book constitutes the refereed proceedings of the First International Conference on Discovery Science, DS'98, held in Fukuoka, Japan, in December 1998. The volume presents 28 revised full papers selected from a total of 76 submissions. Also included are five invited contributions and 34 selected poster presentations. The ultimate goal of DS'98 and this volume is to establish discovery science as a new field of research and development. The papers presented relate discovery science to areas as formal logic, knowledge processing, machine learning, automated deduction, searching, neural networks,

database management, information retrieval, intelligent network agents, visualization, knowledge discovery, data mining, information extraction, etc.

What Science Is and How It Works

The cutting-edge science that is taking the measure of the universe The Little Book of Cosmology provides a breathtaking look at our universe on the grandest scales imaginable. Written by one of the world's leading experimental cosmologists, this short but deeply insightful book describes what scientists are revealing through precise measurements of the faint thermal afterglow of the big bang—known as the cosmic microwave background, or CMB—and how their findings are transforming our view of the cosmos. Blending the latest findings in cosmology with essential concepts from physics, Lyman Page first helps readers to grasp the sheer enormity of the universe, explaining how to understand the history of its formation and evolution in space and time. Then he sheds light on how spatial variations in the CMB formed, how they reveal the age, size, and geometry of the universe, and how they offer a blueprint for the formation of cosmic structure. Not only does Page explain current observations and measurements, he describes how they can be woven together into a unified picture to form the Standard Model of Cosmology. Yet much remains unknown, and this incisive book also describes the search for ever deeper knowledge at the field's frontiers—from quests to understand the nature of neutrinos and dark energy to investigations into the physics of the very early universe.

The Logic of Scientific Discovery

The Logic of Scientific Discovery

Is a genuine logic of scientific discovery possible? In the essays collected here, Hintikka not only defends an affirmative answer; he also outlines such a logic. It is the logic of questions and answers. Thus inquiry in the sense of knowledge-seeking becomes inquiry in the sense of interrogation. Using this new logic, Hintikka establishes a result that will undoubtedly be considered the fundamental theorem of all epistemology, viz., the virtual identity of optimal strategies of pure discovery with optimal deductive strategies. Questions to Nature, of course, must include observations and experiments. Hintikka shows, in fact, how the logic of experimental inquiry can be understood from the interrogative vantage point. Other important topics examined include induction (in a forgotten sense that has nevertheless played a role in science), explanation, the incommensurability of theories, theory-ladenness of observations, and identifiability.

Evidence and Evolution

First published in English in 1959, this book revolutionized contemporary thinking about science and knowledge and is one of the most widely read books about science written in the twentieth century. It presents succinctly Popper's view of science and his solutions to two fundamental problems of the theory of knowledge: the demarcation of science from non-science, and the role of induction in the growth of scientific knowledge.

Scientific Discovery, Logic, and Rationality

Kantorovich analyzes the notion of discovery. He views the process as inference and questions whether there is logic or method to discovery. He provides an alternative perspective on scientific discovery that explains the difficulties in finding a satisfactory method of discovery. Within the framework of evolutionary epistemology, discovery is treated as a phenomenon in its own right having psychological and social dimensions. Science is viewed as a continuation of the evolutionary process whereby creative discovery plays a role similar to blind mutation in biological evolution. From this perspective, serendipity and tinkering are key notions in understanding the creative process.

Popper's 'The Logic of Scientific Discovery'

Described by the philosopher A.J. Ayer as a work of 'great originality and power', this book revolutionized contemporary thinking on science and knowledge. Ideas such as the now legendary doctrine of 'falsificationism' electrified the scientific community, influencing even working scientists, as well as post-war philosophy. This astonishing work ranks alongside The Open Society and Its Enemies as one of Popper's most enduring books and contains insights and arguments that demand to be read to this day.

Data Collection in Context

Here is an idea that just might save the world. It is that science, properly understood, provides us with the methodological key to the salvation of humanity. A version of this idea can be found in the works of Karl Popper. Famously, Popper argued that science cannot verify theories but can only refute them, and this is how science makes progress. Scientists are forced to think up something better, and it is this, according to Popper, that drives science forward.But Nicholas Maxwell finds a flaw in this line of argument. Physicists only ever accept theories that are unified – theories that depict the same laws applying to the range of phenomena to which the theory applies – even though many other empirically more successful disunified theories are always available. This means that science makes a questionable assumption about the universe, namely that all disunified theories are false. Without some such presupposition as this, the whole empirical method of science breaks down.By proposing a new conception of scientific methodology, which can be applied to all worthwhile human endeavours with problematic aims, Maxwell argues for a revolution in academic inquiry to help humanity make progress towards a better, more civilized and enlightened world.

Scientific Discovery

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.".

Computational Discovery of Scientific Knowledge

Modern philosophy of science has paid great attention to the understanding of scientific 'practice', in contrast to concentration on scientific 'method'. Paul Feyerabend's acclaimed work, which has contributed greatly to this new emphasis, shows the deficiencies of some widespread ideas about the nature of knowledge. He argues that the only feasible explanations of scientific successes are historical explanations, and that anarchism must now replace rationalism in the theory of knowledge. The third edition of this classic text contains a new preface and additional reflections at various points in which the author takes account both of recent debates on science and on the impact of scientific products and practices on the human community. While disavowing populism or relativism, Feyerabend continues to

insist that the voice of the inexpert must be heard. Thus many environmental perils were first identified by non-experts against prevailing assumptions in the scientific community. Feyerabend's challenging reassessment of scientific claims and understandings are as pungent and timely as ever.

Against Method

A Reader's Guide to a key text in the philosophy of science, widely studied by undergraduate philosophy students.

Proofs and Refutations

Reproducibility and Replicability in Science

Modern Social Theory