

MAKING 20TH CENTURY SCIENCE

How Theories Became Knowledge

STEPHEN G. BRUSH



Making 20th Century Science

Other Books by Stephen G. Brush

Boltzmann's Lectures on Gas Theory (translator)

Kinetic Theory, 3 volumes (editor)

History in the Teaching of Physics: Proceedings of the International Working Seminar on the Role of the History of Physics in Physics Education (coeditor)

Resources for the History of Physics (editor)

Introduction to Concepts and Theories in Physical Science (coauthor, second edition)

The Kind of Motion We Call Heat: A History of the Kinetic Theory of Gases in the 19th Century (2 volumes)

The Temperature of History: Phases of Science and Culture in the Nineteenth Century

Maxwell on Saturn's Rings (coeditor)

Statistical Physics and the Atomic Theory of Matter, from Boyle and Newton to Landau and Onsager

Maxwell on Molecules and Gases (coeditor)

The History of Modern Physics: An International Bibliography (coauthor)

The History of Geophysics and Meteorology: An Annotated Bibliography (coauthor)

The History of Modern Science: A Guide to the Second Scientific Revolution, 1800–1950

History of Physics: Selected Reprints (editor)

The Origin of the Solar System: Soviet Research, 1925–1991 (coeditor)

Maxwell on Heat and Statistical Mechanics (coeditor)

A History of Modern Planetary Physics (3 volumes)

Physics, the Human Adventure: From Copernicus to Einstein and Beyond (coauthor)

Choosing Selection: The Revival of Natural Selection in Anglo-American Evolutionary Biology, 1930–1950

Making 20th Century Science

How Theories Became Knowledge

STEPHEN G. BRUSH WITH ARIEL SEGAL

OXFORD
UNIVERSITY PRESS

OXFORD
UNIVERSITY PRESS

Oxford University Press is a department of the University of Oxford.
It furthers the University's objective of excellence in research, scholarship,
and education by publishing worldwide.

Oxford New York
Auckland Cape Town Dar es Salaam Hong Kong Karachi
Kuala Lumpur Madrid Melbourne Mexico City Nairobi
New Delhi Shanghai Taipei Toronto

With offices in
Argentina Austria Brazil Chile Czech Republic France Greece
Guatemala Hungary Italy Japan Poland Portugal Singapore
South Korea Switzerland Thailand Turkey Ukraine Vietnam

Oxford is a registered trademark of Oxford University Press
in the UK and certain other countries.

Published in the United States of America by
Oxford University Press
198 Madison Avenue, New York, NY 10016

© Oxford University Press 2015

All rights reserved. No part of this publication may be reproduced, stored in a
retrieval system, or transmitted, in any form or by any means, without the prior
permission in writing of Oxford University Press, or as expressly permitted by law,
by license, or under terms agreed with the appropriate reproduction rights organization.
Inquiries concerning reproduction outside the scope of the above should be sent to the
Rights Department, Oxford University Press, at the address above.

You must not circulate this work in any other form
and you must impose this same condition on any acquirer.

Library of Congress Cataloging-in-Publication Data
Brush, Stephen G., author.
Making 20th century science : how theories became knowledge / Stephen G. Brush.
pages cm
Includes bibliographical references and index.
ISBN 978-0-19-997815-1 (alk. paper)
1. Science—Methodology—History—20th century. 2. Science—History—20th century. 3. Science-
-Methodology—History—19th century. 4. Science—History—19th century. I. Title. II. Title:
Making twentieth century science.
Q174.8.B78 2015
509.04—dc23
2014014220

9 8 7 6 5 4 3 2 1
Printed in the United States of America
on acid-free paper

To my granddaughter

Rebecca Nicole Roberts

CONTENTS

List of Illustrations [xiii](#)

Preface [xv](#)

PART ONE The Reception and Evaluation of Theories in the Sciences [1](#)

1. Who Needs the Scientific Method? [3](#)
 - 1.1. The Rings of Uranus [4](#)
 - 1.2. Maxwell and Popper [6](#)
 - 1.3. What is a Prediction? A Mercurial Definition [8](#)
 - 1.4. Hierarchy and Demarcation [10](#)
 - 1.5. What's Wrong with Quantum Mechanics? [12](#)
 - 1.6. Was Chemistry More Scientific than Physics (1865–1980)? Mendeleev's Periodic Law [12](#)
 - 1.7. Scientific Chemists: Benzene and Molecular Orbitals [13](#)
 - 1.8. The Unscientific (But Very Successful) Method of Dirac and Einstein: Can We Trust Experiments to Test Theories? [15](#)
 - 1.9. Why was Bibhas De's paper rejected by *Icarus*? [18](#)
 - 1.10. The Plurality of Scientific Methods [18](#)
2. Reception Studies by Historians of Science [30](#)
 - 2.1. What is Reception? [30](#)
 - 2.2. The Copernican Heliocentric System [31](#)
 - 2.3. Newton's Universal Gravity [35](#)
 - 2.4. Darwin's Theory of Evolution by Natural Selection [41](#)
 - 2.5. Bohr Model of the Atom [49](#)
 - 2.6. Conclusions and Generalizations [52](#)
3. Prediction-Testing in the Evaluation of Theories: A Controversy in the Philosophy of Science [73](#)
 - 3.1. Introduction [73](#)
 - 3.2. Novelty in the Philosophy of Science [74](#)
 - 3.3. What is a Prediction? (Revisited) [78](#)
 - 3.4. Does Novelty Make a Difference? [78](#)
 - 3.5. Evidence from Case Histories [80](#)
 - 3.6. Are Theorists Less Trustworthy Than Observers? [87](#)

- 3.7. The Fallacy of Falsifiability: Even the Supreme Court Was Fooled 87
- 3.8. Conclusions 89

- 4. The Rise and Fall of Social Constructionism 1975–2000 99
 - 4.1. The Problem of Defining Science and Technology Studies 99
 - 4.2. The Rise of Social Constructionism 100
 - 4.3. The Fall of Social Constructionism 105
 - 4.4. Postmortem 114
 - 4.5. Consequences for Science Studies 128

PART TWO Atoms, Molecules, and Particles 155

- 5. Mendeleev's Periodic Law 157
 - 5.1. Mendeleev and the Periodic Law 159
 - 5.2. Novel Predictions 160
 - 5.3. Mendeleev's Predictions 160
 - 5.4. Reception By Whom? 162
 - 5.5. Tests of Mendeleev's Predictions 163
 - 5.6. Before the Discovery of Gallium 164
 - 5.7. The Impact of Gallium and Scandium 165
 - 5.8. The Limited Value of Novel Predictions 166
 - 5.9. Implications of the Law 168
 - 5.10. Conclusions 169

- 6. The Benzene Problem 1865–1930 176
 - 6.1. Kekulé's Theory 176
 - 6.2. The First Tests of Kekulé's Theory 178
 - 6.3. Alternative Hypotheses 181
 - 6.4. Reception of Benzene Theories 1866–1880 182
 - 6.5. New Experiments, New Theories 1881–1900 183
 - 6.6. The Failure of Aromatic Empiricism 1901–1930 187

- 7. The Light Quantum Hypothesis 191
 - 7.1. Black-Body Radiation 191
 - 7.2. Planck's Theory 191
 - 7.3. Formulation of the Light-Quantum Hypothesis 194
 - 7.4. The Wave Theory of Light 195
 - 7.5. Einstein's Heuristic Viewpoint 197
 - 7.6. What Did Millikan Prove? 197
 - 7.7. The Compton Effect 198
 - 7.8. Reception of Neo-Newtonian Optics before 1923 202
 - 7.9. The Impact of Compton's Discovery 205
 - 7.10. Rupp's Fraudulent Experiments 208
 - 7.11. Conclusions 209

- 8. Quantum Mechanics 219
 - 8.1. The Bohr Model 219

- 8.2. The Wave Nature of Matter 221
 - 8.3. Schrödinger's Wave Mechanics 224
 - 8.4. The Exclusion Principle, Spin, and the Electronic Structure of Atoms 228
 - 8.5. Bose-Einstein Statistics 230
 - 8.6. Fermi-Dirac Statistics 230
 - 8.7. Initial Reception of Quantum Mechanics 232
 - 8.8. The Community Is Converted 237
 - 8.9. Novel Predictions of Quantum Mechanics 239
 - 8.10. The Helium Atom 242
 - 8.11. Reasons for Accepting Quantum Mechanics After 1928 244
9. New Particles 269
- 9.1. Dirac's Prediction and Anderson's Discovery of the Positron 270
 - 9.2. The Reception of Dirac's Theory 272
 - 9.3. The Transformation of Dirac's Theory 275
 - 9.4. Yukawa's Theory of Nuclear Forces 276
 - 9.5. Discovery of the Muon and Reception of Yukawa's Theory 278
 - 9.6. The Transformation of the Yukon 283
 - 9.7. Conclusions 284
10. Benzene and Molecular Orbitals 1931–1980 291
- 10.1. Resonance, Mesomerism, and the Mule 1931–1945 291
 - 10.2. Reception of Quantum Theories of Benzene 1932–1940 297
 - 10.3. Chemical Proof of Kekulé's Theory 300
 - 10.4. Antiresonance and the Rhinoceros 301
 - 10.5. The Shift to Molecular Orbitals After 1950 302
 - 10.6. Aromaticity 303
 - 10.7. The Revival of Predictive Chemistry 309
 - 10.8. Reception of Molecular Orbital Theory By Organic Chemists 311
 - 10.9. Adoption of MO in Textbooks 312
 - 10.10. A 1996 Survey 313
 - 10.11. Conclusions 315
- PART THREE Space and Time 327**
11. Relativity 329
- 11.1. The Special Theory of Relativity 329
 - 11.2. General Theory of Relativity 334
 - 11.3. Empirical Predictions and Explanations 337
 - 11.4. Social-Psychological Factors 338
 - 11.5. Aesthetic-Mathematical Factors 339
 - 11.6. Early Reception of Relativity 340
 - 11.7. Do Scientists Give Extra Credit for Novelty? The Case of Gravitational Light-Bending 342
 - 11.8. Are Theorists Less Trustworthy Than Observers? 346
 - 11.9. Mathematical-Aesthetic Reasons for Accepting Relativity 347
 - 11.10. Social-Psychological Reasons for Accepting Relativity 348

- 11.11. A Statistical Summary of Comparative Reception 350
- 11.12. Conclusions 351

- 12. Big Bang Cosmology 361
 - 12.1. The Expanding Universe Is Proposed 361
 - 12.2. The Age of the Earth 363
 - 12.3. The Context for the Debate: Four New Sciences and One Shared Memory 364
 - 12.4. Cosmology Constrained by Terrestrial Time 366
 - 12.5. Hubble Doubts the Expanding Universe 367
 - 12.6. A Radical Solution: Steady-State Cosmology 369
 - 12.7. Astronomy Blinks: Slowing the Expansion 370
 - 12.8. Lemaître's Primeval Atom and Gamow's Big Bang 371
 - 12.9. Arguments for Steady-State Weaken 374
 - 12.10. The Temperature of Space 375
 - 12.11. Discovery of the Cosmic Microwave Background 376
 - 12.12. Impact of the Discovery on Cosmologists 379
 - 12.13. Credit for the Prediction 381
 - 12.14. Conclusions 382

- PART FOUR Heredity and Evolution 395**

- 13. Morgan's Chromosome Theory 397
 - 13.1. Introduction 397
 - 13.2. Is Biology Like Hypothetico-Deductive Physics? 397
 - 13.3. Precursors 398
 - 13.4. Morgan's Theory 399
 - 13.5. The Problem of Universality 402
 - 13.6. Morgan's Theory in Research Journals 403
 - 13.7. Important Early Supporters 405
 - 13.8. Bateson and the Morgan Theory in Great Britain 407
 - 13.9. The Problem of Universality Revisited 408
 - 13.10. Books and Review Articles on Genetics, Evolution, and Cytology 410
 - 13.11. Biology Textbooks 411
 - 13.12. Age Distribution of Supporters and Opponents 412
 - 13.13. Conclusions 412

- 14. The Revival of Natural Selection 1930–1970 422
 - 14.1. Introduction 422
 - 14.2. Fisher: A New Language for Evolutionary Research 424
 - 14.3. Wright: Random Genetic Drift, a Concept Out of Control 427
 - 14.4. Haldane: A Mathematical-Philosophical Biologist Weighs In 430
 - 14.5. Early Reception of the Theory 431
 - 14.6. Dobzhansky: The Faraday of Biology? 432
 - 14.7. Evidence for Natural Selection, Before 1941 434
 - 14.8. Huxley: A New Synthesis Is Proclaimed 436
 - 14.9. Mayr: Systematics and the Founder Principle 438

- 14.10. Simpson: No Straight and Narrow Path for Paleontology 441
- 14.11. Stebbins: Plants Are Also Selected 443
- 14.12. Chromosome Inversions in *Drosophila* 444
- 14.13. Ford: Unlucky Blood Groups 446
- 14.14. Resistance to Antibiotics 448
- 14.15. Two Great Debates: Snails and Tiger Moths 450
- 14.16. Selection and/or Drift? The Changing Views of Dobzhansky and Wright 451
- 14.17. The Views of Other Founders and Leaders 453
- 14.18. The Peppered Moth 454
- 14.19. The Triumph of Natural Selection? 455
- 14.20. Results of a Survey of Biological Publications 457
- 14.21. Is Evolutionary Theory Scientific? 459
- 14.22. Context and Conclusions 464

PART FIVE Conclusions 485

- 15. Which Works Faster: Prediction or Explanation? 487
 - 15.1. Comparison of Cases Presented in this Book 487
 - 15.2. From Princip to Principe 488
 - 15.3. Can Explanation Be Better Than Prediction? 490
 - 15.4. Special Theory of Relativity: Explaining “Nothing” 491
 - 15.5. The Old Quantum Theory: Many Things Are Predicted, But Few Are Explained 492
 - 15.6. Quantum Mechanics: Many Things are Explained, But Predictions Are Confirmed Too Late 493
 - 15.7. Millikan’s Walk 495

Selected Bibliography 501

Index 513

LIST OF ILLUSTRATIONS

- 6.1. Kekulé's structure for benzene (Section 6.1) 177
- 6.2. Isomers of derivatives of benzene (Section 6.2) 180
- 6.3. Claus centric model for benzene (Section 6.3) 181
- 6.4. Ladenburg prism model for benzene, with modification by Lachman (Section 6.3) 182
- 6.5. Armstrong-Baeyer centric model (Section 6.5) 185
- 8.1. Only certain wavelengths will fit around a circle e.g. in (a) not in (b). (Section 8.9) 223
- 10.1. The five canonical structures contributing to the normal quantum mechanical state of the benzene molecule, as shown by Pauling and Wheland. (Section 10.1) 295
- 10.2. Coulson's model for benzene (Section 10.2) 299

PREFACE

Historians have chronicled the observations, experiments, and theories of scientists from antiquity to the present. This book could not have been written without surveying their publications. But only a few historians have presented evidence to answer the question: why were these theories accepted, at least for a while, as valid knowledge? Was it because the theories successfully *explained* the observations and experiments, or because they successfully *predicted* the results of observations and experiments not yet done?

This question seems to have been left for philosophers to answer. Yet it calls for historical research plus, in some cases, interviews with scientists. Philosophers sometimes seem more interested in discussing whether scientists *should* accept theories because of predictions or explanations, rather than what they actually *do*. So I have to persuade philosophers to consider historical evidence, and to convince historians that they should answer—in their reception studies—questions of interest to philosophers.

Of course the first thing I needed for my project was access to a good library. I was able to use the Library of Congress and the Princeton University libraries for short periods of time. The Niels Bohr Library at the American Institute of Physics in College Park, Maryland has a unique collection of textbooks, which happens to be just what I needed to study the reception of physics theories in the early twentieth century; the University of Maryland library, also in College Park, owns Max Born's personal library. The University of Pennsylvania Library and the Chemical Heritage Foundation, both in Philadelphia, have excellent collections of older chemistry books.

If you already know what book you need to look at, because someone else has cited it, you may have to rely on interlibrary loan. I have to thank the librarians at three institutions for efficiently obtaining books from other libraries for me: McKeldin Library at the University of Maryland, the Institute for Advanced Study at Princeton, and the Brandywine Hundred Library in Wilmington, Delaware.

What about archives of unpublished letters and manuscripts? In general I have not used these sources, for two reasons: First, to search the archives of the hundreds or thousands of scientists who *might* have recorded their opinions of one of the theories included in my project would be impractical. Therefore I have included only a few such documents, mainly those of Einstein and his correspondents that have been published in the *Collected Papers of Albert Einstein*. Second, published comments on a theory are likely to have more influence on the scientific community and (through textbooks) on the next generation.

During the three decades I have worked on this project, I have enjoyed valuable assistance from many historians, philosophers, and scientists: Peter Achinstein (Chapter 3), Stephen Adler (Chapter 9), Gar Allen (Chapters 1, 13, 14), Ralph Alpher (Chapter 12), Gustav Arrhenius (Chapter 1), Francisco Ayala (Chapter 14), John Beatty (Chapter 14), Richard Bellon (Chapter 2), Vincent Brannigan (Chapter 1), Dieter Brill (Chapter 11), L. M. Brown (Chapters 3 and 9), Louis Brown (Chapter 8), David Cassidy (Chapter 3), Matt Chew (Chapter 14), John Connerney (Chapter 1), David L. Cooper (Chapter 10), David P. Craig (Chapter 10), James Crow (Chapter 14), Lindley Darden (Chapters 3, 13, and 14), Bibhas De (Chapter 1), Alex Dessler (Chapter 1), Igor Dmitriev (Chapter 5), Tim Eastman (Chapter 1), C.W.F. Everitt (Chapter 11), John Gaffey (Chapters 1 and 15), Joseph Garratt (Chapter 10), George Garratty (Chapter 14), Owen Gingerich (Chapter 12), Thomas Gold (Chapter 12), George Gorin (Chapter 5), O. Wally Greenberg (Chapter 9), Ivan Gutman (Chapter 10), J. L. Heilbron (Chapter 7), Sandra Herbert (Chapter 14), Robert Herman (Chapter 12), Robert B. Hermann (Chapter 10), Norris Hetherington (Chapter 12), Richard Highton (Chapter 14), Roald Hoffman (Chapter 10), Gerald Holton (Chapter 11), Ruth Kastner (Chapter 13), Margaret Kivelson (Chapter 1), Alexei Kozhevnikov (Chapter 7), Helge Kragh (Chapters 2 and 3), Larry Laudan (Chapters 1, 2, and 3), Aleksey Levin (Chapters 9 and 12), Richard Lewontin (Chapter 14), Jane Maienschein (Chapter 13), David Matthews (Chapter 1), Deborah Mayo (Chapter 3), Robert McColley (Chapter 1), Edward McKinnon (Chapter 3), Arthur I. Miller (Chapters 3 and 11), Peter Morris (Chapter 10), Gonzalo Munevar (Chapters 3 and 7), Ludmilla Nekoval-Chikhaovi (Chapter 5), Norman F. Ness (Chapter 1), Sally Newcomb (Chapters 2, 5, and 12), Mary Jo Nye (Chapter 5), David O'Brochta (Chapter 14), Denis Papadopoulos (Chapter 1), D. J. Pasto (Chapter 10), Lewis Pyenson (Chapter 11), Anya Plutynski (Chapter 14), Duncan Porter (Chapter 2), Helmut Rechenberg (Chapter 3), Alan Rocke (Chapter 5, 6, and 10), William K. Rose (Chapter 12), Theodore Rosenberg (Chapter 1), David Rudge (Chapter 14), Christopher T. Russell (Chapter 1), Halley Sanchez (Chapter 11), Mendel Sachs (Chapter 11), Carl Sagan (Chapter 1), Eric Scerri (Chapters 3 and 5), Wilfried Schroeder (Chapter 1), S. S. Schweber (Chapter 9), Ezra Shahn (Chapter 14), Sason Shaik (Chapter 10), Dudley Shapere (Chapter 9), Stanley Shawhan (Chapter 1), V. Betty Smocovitis (Chapter 14), George A. Snow (Chapter 9), Michael Sokal (Chapters 1, 5, and 11), Carol Sokolski (Chapter 14), Katherine Sopka (Chapter 3), David Stern (Chapter 1), Roger Stuewer (Chapter 7), Frank Sulloway (Chapter 11), Frederik Suppe (Chapter 3), Roger Thomas (Chapter 14), Virginia Trimble (Chapters 1 and 12), Ron Westrum (Chapter 1), Polly Winsor (Chapter 14), John Worrall (Chapter 3), and Nick Zimmerman (Chapter 14).

In a class by himself is my excellent assistant Ariel Segal, who tracked down many missing facts and references essential to this book.

Funding for my research was provided by the Institute for Physical Science and Technology and the General Research Board at the University of Maryland, the Institute for Advanced Study at Princeton with the aid of the Andrew Mellon Foundation, the National Science Foundation, the National Endowment for the Humanities, and a fellowship from the John Simon Guggenheim Foundation.

For permission to reprint substantial portions of articles previously published in journals and books, I thank the American Association for the Advancement of Science, publisher of *Science* (Chapter 11); the American Philosophical Society, publisher of *Choosing Selection* in its *Transactions* (Chapter 14); Elsevier Science Ltd.,

publisher of *Studies in History and Philosophy of Science* (Chapters 6 and 10); the Geological Society (London), publisher of *The Age of the Earth from 4004 BC to AD 2002* (Chapter 12); Kluwer Academic Publishers, publisher of *Journal of the History of Biology* (Chapter 13); the University of Chicago Press, publisher of *Isis* (Chapter 5); the Philosophy of Science Association (Chapter 3); the MIT Press, publisher of *Perspectives on Science* (Chapter 12); the Regents of the University of California (Chapter 7); and Springer Science and Business Media, publisher of *Physics in Perspective* (Chapter 11).

Part One discusses general issues such as the role of prediction and explanation in science, the concept of “reception” as used by historians of science, and the debate about whether science is “socially constructed.” Part Two applies these concepts in the history of atomic and molecular chemistry and physics, especially the role of quantum mechanics. Part Three covers relativity theory and cosmology. Part Four discusses a selected sequence of theories in biology including chromosome theories of heredity and the revival of Darwin's theory of evolution by natural selection. Part Five summarizes the results and compares the success of prediction and explanation. Notes for the chapters are followed by a selected bibliography and an index.

Making 20th Century Science

PART ONE

The Reception and Evaluation of Theories in the Sciences

Who Needs the Scientific Method?

Most Americans have never met a scientist, and despite having been ‘taught science’ at school, most have no real idea of how a scientific consensus is reached. . . . Every adult should have a base of scientific understanding about how the world works. But understanding the process through which scientific knowledge develops is equally critical.

—BRUCE ALBERTS, *former president of the U. S. National Academy of Sciences (2010)*

Among the work to be done is to achieve some understanding of what is actually involved in rational acceptance and proof in science, of what, in Boyle’s words, deserves ‘a wise man’s acquiescence.’ . . . This job involves exploring the diverse range of contexts, historical and contemporary, in which inquiry is carried out.

—ARTHUR FINE, *professor of philosophy of science at Northwestern University and later the University of Washington (1996)*

How do theories become scientific knowledge? I try here to answer that question by using several examples from the history of modern science. I have selected examples from chemistry, physics, astronomy, and biology. All of them are well known and most have been studied carefully by historians, so we know something about how the theories were developed and tested. The one thing often missing is the final stage of the process: the adoption of the idea by the relevant scientific community. We know that it *was* accepted, but often we don’t know much about *why* it was accepted.

The process of acceptance (or rejection) of new theories—their reception, as historians call it—has been widely discussed but not well understood. Most reception studies focus on one of a few famous cases—the theories of Darwin, Freud, and Einstein—and tell us more about the response of the public or by the scientific community as a whole than about the *reasons* why *experts* accepted those theories. When authors do suggest reasons they often just give their own opinions, rather than citing publications or letters that would provide reliable evidence for the views of experts at the time the new theory was published.

- [XYZ: The Architecture of Dagmar Richter online](#)
- [Unflinching Courage: Pioneering Women Who Shaped Texas pdf, azw \(kindle\), epub](#)
- [download Full Stack Python Guide to Deployments](#)
- [click Advanced Sports Nutrition \(2nd Edition\) pdf, azw \(kindle\), epub](#)
- [**click Einstein's Mistakes: The Human Failings of Genius book**](#)

- <http://www.uverp.it/library/New-Directions-in-Sex-Therapy--Innovations-and-Alternatives--2nd-Edition-.pdf>
- <http://aircon.servicessingaporecompany.com/?lib/Unflinching-Courage--Pioneering-Women-Who-Shaped-Texas.pdf>
- <http://reseauplatoparis.com/library/Full-Stack-Python-Guide-to-Deployments.pdf>
- <http://twilightblogs.com/library/Honor-of-the-Regiment---Bolos-1---Bolo--Book-4-.pdf>
- <http://yachtwebsitedemo.com/books/Experiencing-the-World-s-Religions--Tradition--Challenge--and-Change--5th-Edition-.pdf>