

A Science and Religion PRIMER

Edited by
Heidi A. Campbell
and Heather Looy


BakerAcademic
a division of Baker Publishing Group
Grand Rapids, Michigan

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Published by Baker Academic
a division of Baker Publishing Group
P.O. Box 6287, Grand Rapids, MI 49516-6287
www.bakeracademic.com

Printed in the United States of America

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Library of Congress Cataloging-in-Publication Data

A science and religion primer / edited by Heidi A. Campbell and Heather Looy.

p. cm.

Includes index.

ISBN: 978-0-8010-3150-2 (pbk.)

1. Religion and science. I. Campbell, Heidi, 1970– II. Looy, Heather, 1961–
BL240.3.S349 2009
201'.65—dc22

2008037973

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Contents

Editorial and Advisory Board 8
List of Entries 9
Introduction
Heather Looy and Heidi A. Campbell 11

Section 1: Introductory Essays on Science and Religion

History of the Science and Religion Dialogue
Peter Harrison 19
The Role of Philosophy in the Science/Religion Dialogue
Nancey Murphy 23
Theology's Intersection with the Science/Religion Dialogue
Celia Deane-Drummond 28
Science and Technology in Light of Religion
Holmes Rolston III 33

Section 2: Entries

Entries 41

List of Contributors 223
Index 227

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Entries

Altruism
Anthropic Principle
Aquinas (Thomas Aquinas)
Aristotle
Augustine
Bacon, Francis
Biotechnology
Boyle, Robert
Causation
Chaos Theory
Christology (Incarnation)
Consciousness
Contingency
Copernicus, Nicholas
Cosmology
Creation/Creationism
Critical Realism
Darwin, Charles
Descartes, René
Determinism and Free Will
Divine Command
Ecofeminism
Ecotheology
Einstein, Albert
Emergence
Enlightenment
Environmentalism (Ecology)
Epistemology (Empiricism,
Rationalism)
Eschatology
Ethics
Evolutionary Biology
Evolutionary Psychology
Fideism
Fundamentalism
Galilei, Galileo
Genomics/Genetics
Gödel's Theorem
Handmaiden Metaphor
Hermeneutics
Idealism
Ideas of God (Theism, Deism,
Atheism)
Imago Dei
Indeterminacy
Intelligent Design
Kenosis
Kepler, Johannes

Laws of Nature (Scientific Laws)	Process Philosophy/Theology
Leibniz, Gottfried Wilhelm von	Ptolemy, Claudius (Ptolemaic System)
Materialism	Quantum Theory (Mechanics, Physics)
Merton Thesis	Quine-Duhem Thesis
Metaphysics	Realism, Antirealism
Mind/Body Problem (Dualism, Monism, Physicalism)	Reductionism
Miracles	Relationship between Science and Religion
Naturalism	Science (Scientist, Scientism)
Natural Law Morality	Scientific Method
Natural Philosophy	Scientific Revolution
Natural Theology	Secularization
Nature	Social Sciences
Newton, Isaac	Soteriology
Nominalism	Spinoza, Baruch/Benedict
Ontology	Supervenience (Top-down Causation)
Paley, William	Technology
Pantheism, Panentheism	Teleology
Person	Theodicy (Evil)
Plato	Trinity (Perichoresis)
Polanyi, Michael	Verification Principle
Positivism (Logical and Neo-Positivism)	
Posthuman	

Introduction

HEATHER LOOY, THE KING'S UNIVERSITY COLLEGE

AND

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The Need for a Science and Religion Dialogue

“A dialogue on science and religion? Must be a short conversation!” quipped a British customs officer at Heathrow Airport to one of us on her way to attend a monthlong seminar on science and religion at Oxford University. The customs officer’s surprise and skepticism reflects a widespread myth that science and religion are antagonistic, or at best unrelated, ways of viewing the world. Yet science and religion have always been inextricably intertwined, and recent years have seen a surge toward open, explicit dialogue and research on their relationships. “Science and Religion” is emerging as an interdisciplinary academic field of study, a claim that is justified by the growing number of undergraduate courses, graduate degree programs, and research institutes in this area.

The idea that science and religion are in conflict has been promoted by proponents of the secularization thesis and cultural critics of religion. Recently several well-publicized voices—such as Richard Dawkins in *The God Delusion* and Daniel Dennett in *Breaking the Spell: Religion as a Natural Phenomenon*—have decried religion in all its forms as “childish superstition,” “irrational,” and the main reason for current environmental and geopolitical crises. Religion is characterized as something to be discarded, rather than integrated. In their view, rational science must take the place of irrational religion if we are to find a way through our current and future crises.

Yet those who become even superficially familiar with the history and complexity of the relationships between science and religion quickly realize that these recent claims of the triumph of atheism are neither new nor do they acknowledge the very

real, vital, and subtle ways in which religion and science have always been inextricably intertwined. The popular view that the relationship between science and religion is primarily antagonistic (based on a mythologized and grossly distorted telling of the Galileo story) is simply wrong. There is a tendency to simplify, polarize, and turn public discussion into science *against* religion, with little reflection on what is meant by either term, and to perceive a conflict or dialogue between two utterly independent entities.

There is a real need for thoughtful, historical, philosophical, and scientific engagement with questions of science and religion. How have we come to perceive science and religion as separate and often incompatible entities? How do we understand their historic and current interactions? In what ways does science challenge or confirm religion? And how does religion challenge or even enrich science? Whether one is a student of science, theology, philosophy, or history, engaging these questions and conversations in the public sphere requires a certain understanding of the real and the perceived relations between science and religion.

Conversations between science and religion have taken many forms and currently bring together diverse disciplines, from biology and physics to philosophy and theology. Those trying to enter into the conversation may feel like strangers in a foreign country where a hybrid of multiple languages and customs prevail, some familiar and many utterly new and bewildering. The *Science and Religion Primer* is intended to serve as a “phrase book” and cultural crib sheet that provides a basic and essential guide for those seeking to navigate this fascinating but potentially confusing territory.

The *Science and Religion Primer* Story

The *Science and Religion Primer* was born from the experience of the editors as participants in the John Templeton Oxford Seminars in Science and Christianity, organized by the Council for Christian Colleges and Universities (<http://www.cccu.org/projects/templeton/default.asp>). For three summers (2003–5), thirty-five scholars from around the world met in Wycliffe Hall in Oxford, England, to listen, learn, and engage in dialogue with many luminaries in the broad terrain of science and religion (SR), including among many others Simon Conway Morris, Malcolm Jeeves, Wolfhart Pannenberg, and Arthur Peacocke. This was the second such series (the first occurring from 1998 to 2001) seeking to bring together scholars from a variety of disciplines who had common research interests in the interrelationships between the sciences and religion.

During the first seminar session in 2003 it quickly became apparent that, due to the interdisciplinary nature of the conversation, some key concepts and contributors in the science/religion dialogue (SRD) were not widely known or understood by all the participants. Scientists needed to become more familiar with basic philosophical concepts and historical figures, while philosophers were often unfamiliar with basic scientific terms and issues. Most of the suggested readings for the seminars assumed a working knowledge of these concepts and key individuals. Even more difficult to

grasp were the contexts and controversies associated with key ideas. Collectively, the participants had all the needed knowledge, so through networking, library interactions, and intense conversations around the dinner table during the seminars they were able to seek out the necessary information with relative ease. However, outside of the seminar context access to this important pool of knowledge proved to be difficult. What was needed was a quick guide into this world, something one could carry in a briefcase and consult during a lecture or while reading books about SR.

Other excellent guides to SRD exist, such as the *Science and Religion Encyclopedia* (Van Huyssteen 2003) and *The Oxford Handbook on Science and Religion* (Clayton and Simpson 2006). However, these are far more in-depth and require a preliminary working knowledge of SR, or are expensive and so available only in libraries. Online SR resources are available, including Metanexus (<http://www.metanexus.net/Institute/>) and Counterbalance (<http://www.counterbalance.net/>), that provide brief biographies, definitions, and useful links related to SR. However, one cannot always access the Internet while reading or listening. This primer is meant to provide a relatively inexpensive and portable guide for new scholars and students interested in SR, and to serve as a companion for those doing interdisciplinary work. Herein one will find the collective wisdom and insight of noted senior and junior scholars in SR who seek to provide a succinct introduction to key concepts and figures in the field.

How to Use This Book

We hope the *Science and Religion Primer* will be a valuable tool for many individuals and communities, such as those in science and religion courses and programs, discussion groups, adult education classes, individual scholars venturing into this territory, and anyone with an interest in the historical and current dialogues between science and religion. We encourage you to take this book along to lectures or seminars on SR topics, to keep it beside you when you read popular books or academic literature on SR, and to use it as a crib sheet to get a very basic understanding of the concepts or key figures encountered. The book focuses on four core areas: history, philosophy of science, science and technology, and theology, with key concepts and individuals from each of these areas represented. The primer places emphasis on science and Christianity, rather than religion in general, in an effort to focus the discussion on the dominant discourse of much of the historical and current SRD.

No book of this scale can cover all the relevant concepts and figures, and as you read you may well wish for entries we have not included. We have tried to cover a basic spectrum of core concepts and figures, those we repeatedly encountered and about which we wanted further information. Consider this primer as a “way in,” just as a foreign language phrase book merely gets you started. Once you enter the “culture” of SR, you will find other resources (books, online sources, colleagues, and mentors) that will bring depth to your understanding.

The book is divided into two sections. Section one provides insight into SRD through introductory essays in each of the four main topic areas of the primer, writ-

ten by leaders in SR. Peter Harrison, the Andreas Idreos Professor of Science and Religion and Fellow of Harris Manchester College, Oxford University, provides a succinct introduction to historical aspects of SRD by discussing the myths, realities, and complexities of the relationships between science and religion throughout Western history.

Nancey Murphy, professor of Christian philosophy at Fuller Theological Seminary, offers a clear synthesis of the role philosophy has played in shaping SRD. For Murphy, philosophy is crucial in developing conceptual schemes that are consonant with, and enable us to make sense of, the data of science and of theology. Philosophers are challenged to bring coherence to what is often a “balkanized intellectual world.”

Holmes Rolston III, University Distinguished Professor of Philosophy at Colorado State University and recipient of the Templeton Prize, highlights how discoveries in and development of the sciences and technology have led scientists to raise questions of truth, beauty, and being that engage religious beliefs and discourse. He reveals the power, the potential, and the dangers of science and technology, and points to religion as offering a necessary dimension to our meaningful engagement with the natural and human-manipulated worlds.

Celia Deane-Drummond, professor of theology and biological sciences at the University of Chester, shows how Christian theologies approach and respond to science on issues ranging from human personhood, origins, and the environment. She underscores the postmodern view that no approach, including scientific approaches, is truly neutral, and that engagement with science requires acknowledgment of one’s foundational beliefs.

The second section is an alphabetical listing of entries dealing with a variety of philosophical, historical, scientific, and theological concepts, individuals, and events related to SRD. Each entry is divided into three parts: a brief summary/definition of the concept; a section on key points and challenges, identifying significant issues or debating the way the entry relates to SRD; and a section on “further reading” that lists key sources addressing the topic in more detail. This key sources section will enable readers to explore issues of interest related to these topics in greater depth.

Acknowledgments

This project would not have been possible without the assistance and inspiration of a number of groups and individuals. First we are grateful that the John Templeton Foundation provided generous and key financial resources to make this project a reality.

We also give special thanks to the Council for Christian Colleges and Universities (CCCU) and the work of Ronald Mahurin and Stanley Rosenberg in their organization of the John Templeton Oxford Seminars in Science and Christianity, and the tireless and gracious efforts of Nita Stemmler, who made the seminars a rich and pleasant experience.

Many senior scholars in SR offered mentoring, support, encouragement, and feedback. We want to thank Seminar Director Alister McGrath, who has a more extensive

bibliography in his head than most people have in their libraries, for his leadership and mentoring during the summer sessions. Also John Roche, senior consultant and administrator, who valiantly served as seminar organizer, administrator, punting tutor extraordinaire, and humble mentor to many, even in the face of significant health issues.

We would have been lost without the astoundingly generous and patient assistance of the members of our first class advisory board of recognized scholars in SR, who gave of their time and expertise through every stage of developing and editing the primer. They include Craig Boyd, Celia Deane-Drummond, George Ellis, Peter Harrison, Nancey Murphy, and Holmes Rolston III. We thank them for their advice, which greatly improved the quality of the primer. Any remaining errors or omissions are our responsibility.

The development of the primer was informed and encouraged by our fellow seminar participants, many of whom contributed entries to this project. We appreciate every one of you. Particular thanks go to the “Isis Frogs” (you know who you are!) for their friendship and support.

Many thanks to project research assistants Zachary Rathke and Tara Oslick, whose careful work and attention helped make the primer come to reality. We also thank Erin Welke, whose teaching assistance freed up time to work on the primer, and who also diligently completed the index. Last, but by no means least, we thank our patient contributors and the remarkably helpful and encouraging staff at Baker Academic, most notably our editor Bob Hosack.

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Clayton, Philip, and Zachary Simpson, eds. 2006. *The Oxford Handbook on Science and Religion*. Oxford: Oxford University Press.

Counterbalance Foundation, <http://www.counterbalance.net/>.

Metanexus Institute on Religion, Science and the Humanities, <http://www.metanexus.net/Institute/>.

Van Huyssteen, Wentzel, ed. 2003. *Encyclopedia of Science and Religion*. 2 Vols. New York: MacMillan.

Analysis of arguments from the world (cosmos) to God's existence based on causation, including some discussion of primary/secondary causation.

Tooley, Michael, and Ernest Sosa, eds. 1993. *Causation*. Oxford: Oxford University Press.

An anthology containing classical and contemporary readings on causation, with a historical and philosophical introduction.

Neal Judisch, University of Oklahoma

□ Chaos Theory

Chaos theory describes the behavior of systems that exhibit sensitive dependence on initial conditions, such as the weather, or turbulent smoke from a fire. While most of classical Newtonian mechanics studies linear systems—in which, for example, doubling the cause (e.g., force) doubles the effect (e.g., acceleration)—the behavior of nonlinear systems (in which doubling a cause could triple or negate the effect) has been shown to exhibit chaos. This does not mean that nonlinear systems behave in completely random or arbitrary ways; instead, stable patterns (known as “strange attractors”) of an intricate geometrical (“fractal”) nature do emerge when the mathematical representation of the system's development over time is examined. The “butterfly effect” is a general property of chaotic systems: the tiny difference between any two starting points grows exponentially as time goes on. The term *butterfly effect* comes from the belief that the precise way a single butterfly flutters significantly affects large-scale features of the atmosphere, such as the fizzling of a hurricane, over time.

Because we cannot know all such long-range interactions, a nonlinear chaotic system cannot be truly isolated or indefinitely predicted, even if we were to know its initial conditions perfectly (which is impossible).

Key Points/Challenges

- Chaos theory is controversially suggested by some, most notably Polkinghorne (1998), as a means of divine and/or human free action in the world, in which “active information” allows for selection of particular paths along the strange attractors.
- There is some debate about whether chaos is deterministic (see **determinism**) or whether this matters. Most authors suggest that it is, citing the well-understood classical physics that leads to chaos. But Polkinghorne's critical realist position (see **critical realism**) emphasizes a holistic treatment, because of a chaotic system's dependence on its total environment, and points out that the deterministic Newtonian mechanics in which chaos arises is exact only in a limiting

sense (slow motion, for example). Insofar as chaos is indeterministic, similar questions regarding divine action arise as they do in quantum theory.

- Precisely how **quantum mechanics** adjusts chaos theory remains an area of research in physics; different views of how this might be resolved are played out in the science/religion field as well.
- The holistic character of chaotic systems, in which there is dependence on literally everything in the universe, is a grand theme evoking thoughts of the unity of the creation due to its one Creator.
- In the face of chaotic systems, humankind's lack of universal knowledge demonstrates a fundamental limitation to a goal to attain to a "theory of everything" in physics. Such limits, because they show our humble position, are often considered an impetus to draw us to God.

Further Reading

Gleick, James. 1987. *Chaos: Making a New Science*. New York: Viking.

The most frequently cited introduction to the historical development and conceptual ideas of chaos theory.

Murphy, Nancey, Robert J. Russell, and Arthur Peacocke, eds. 1995. *Chaos and Complexity: Scientific Perspectives on Divine Action*. Vatican City: Vatican Observatory Publications; Berkeley: Center for Theology and the Natural Sciences.

A substantial volume presenting a range of scholarly opinion by leading thinkers on the possibility that chaos theory might help in understanding God's interaction with creation, particularly because of its sensitivity to small changes.

Polkinghorne, John. 1998. "Does God Act in the Physical World?" In *Belief in God in an Age of Science*, 48–75. New Haven: Yale University Press.

An explanation and promotion of the view that chaotic dynamics is the "causal joint" of divine action, the means through which God acts in the physical world.

Smedes, Taede A. 2004. *Chaos, Complexity, and God: Divine Action and Scientism*. Leuven: Peeters.

A significant clarification of the questions concerning divine action in the world, giving thorough critical reviews of the positions of Polkinghorne and Peacocke.

Stewart, Ian. 1997. *Does God Play Dice? The New Mathematics of Chaos*. New York: Penguin.

A rare and accessible combination of all of the technical aspects, with philosophical and everyday ramifications presented in a witty conversational style. This book proposes a chaotic answer to Einstein's famous question about quantum theory.

Arnold E. Sikkema, Trinity Western University

□ Christology (Incarnation)

Belief in the incarnation of the divine Logos (the “Word” made flesh) in the life of Jesus of Nazareth is one of the distinctive doctrines of the Christian religion. Articulating this belief has traditionally been understood as the main task of Christology, the study of Jesus Christ. The term *incarnation* is derived from the Bible: “The Word became flesh” (John 1:14 NRSV). The classical formulation of this doctrine, developed at the Council of Chalcedon (AD 451), asserted that “one and the same Son,” our “Lord Jesus Christ,” was of the same substance with God the Father (and thus truly divine) and of the same substance with humanity (and thus truly human).

For the science/religion dialogue, it is important to note the mutually shaping relationship between anthropology and Christology that structured the debates among the early church fathers over the nature of Christ. Two schools of thought emerged in early Christianity: Alexandrians and Antiochenes. The Alexandrians tended to place a strong emphasis on the substantial unity of the soul and the body in each person. The Antiochenes preferred a more dualistic anthropology, in which the substances of the body and soul were more radically distinguished. These philosophical intuitions about human nature affected their understanding of the relationship between the divine nature and the human nature in the person of Jesus Christ. Both schools took the soul/body relationship as an analogy for the deity/humanity relationship. The underlying question is the same: how can two different substances truly be united in one person? Alexandrians emphasized that Jesus’s divinity and humanity were not divided or separated but substantially united in one person, while the Antiochenes stressed that the two distinct natures that made up the one person of Christ were not fused or changed in the union. Both positions were affirmed at the Council of Chalcedon (AD 451). Among the early Reformers one can trace an Alexandrian tendency in Martin Luther and an Antiochene influence in John Calvin; this difference continues to shape many of the ongoing debates related to Christology.

Key Points/Challenges

- Because this Christian doctrine has to do with the relationship between divinity and humanity, its formulation is inherently shaped by assumptions of the doctrine of God and theological anthropology. Contemporary sciences such as psychology and neurobiology have challenged ancient models of human nature, and this has implications for the way theologians articulate the doctrine of the incarnation (see **mind/body problem**).
- Much of Western philosophy relied on the categories of “substance” and “sameness,” but many late modern philosophers have emphasized the concepts of “relationality” and “difference.” Many sciences also reflect the significance of relationships and differentiation in their interpretations of the world (e.g., “object relations” or “systems” theory in psychology). This shift has altered the concep-

tual space within which interdisciplinary discourse now occurs, providing an opportunity for theology to explore new ways of formulating the relationality between God and humanity revealed in Jesus Christ.

- The science/religion dialogue has tended to focus more on generic ideas of God and on the problems inherent in body/soul dualism than it has on the particular claims of Christology. The late modern embrace of the particularity of religious experience has opened up new opportunities for reconstructing Christology in dialogue with contemporary science, illustrated in some of the references below.

Further Reading

Peacocke, Arthur. 1993. *Theology for a Scientific Age*. Minneapolis: Fortress.

A depiction of the incarnation in light of the biological and natural sciences, as the communication of divine self-limitation in Jesus of Nazareth, who manifests the ideal of human becoming.

Shults, F. LeRon. 2008. *Christology and Science*. Aldershot, UK: Ashgate.

An exploration of the relationship between philosophy, science, and Christology, providing three case studies on incarnation and evolutionary biology, atonement and cultural anthropology, and parousia and physical cosmology.

Torrance, T. F. 1969. *Space, Time and Incarnation*. Oxford: Oxford University Press.

An examination of the way that conceptions of space and time shaped the doctrine of the incarnation in the patristic and Reformation periods, and an explanation of the implications for Christology after Einstein's relativity theory.

Wildman, Wesley. 1998. *Fidelity with Plausibility: Modest Christologies in the Twentieth Century*. Albany: State University of New York Press.

An overview of the social scientific challenges to Christology, including the popular debates over "the myth of God incarnate."

F. LeRon Shults, University of Agder

□ Consciousness

Consciousness is subjective awareness, the ability to "experience" objects at all. The separation of consciousness from other attributes of mind, such as rationality and emotion, is a modern phenomenon, implied in the writings of **René Descartes** (1596–1650) and then developed explicitly by later philosophers and theologians (e.g., John Locke, Friedrich Schleiermacher). In the twentieth century, consciousness became a contested category as scholars either dismissed its significance or saw the use of consciousness and other psychological terms as the result of linguistic confu-