### Contents

List of figures	xii
List of tables	xiii
List of exercises	xiv
List of contributors	xv
How to use this book	xvii
Foreword J. Wentzel van Huyssteen	xix
Editor's note and acknowledgements	xxiv

#### **BOOK ONE**

## 1. An introduction to the debate between science and religion

Christopher Southgate and Michael Poole

#### Section A: Outlines of the debate (1.1-1.11)

1.1 Two views of the conversation between science and religion -1.2 Important sources, figures and developments -1.3 Typologies of the relationship -1.3.1 Natural theology vs theology of nature -1.4 Further typologies -1.5 Two crucial points -1.5.1 Science and religion, or science and *theology*? -1.6 The metaphor of the maps -1.7 Critical realism in science -1.8 Critical realism in theology -1.9 The central role of model and metaphor -1.10 Consonances -1.11 Was religion necessary to the rise of science?

3

### Section B: Three historical examples of tensions as science and theology developed (1.12–1.15)

1.12 Copernicanism and the Galileo Affair - 1.13 The love affair gone wrong: the eighteenth century - 1.14 A contemporary instance of interplay between consonance and conflict - 1.15 The Big Bang and the beginning of the universe

## Section C: Key principles for developing theology in the light of science (1.16–1.20)

1.16 Different types of causation and explanation -1.17 Determinism, indeterminism and their implications -1.18 Developing theology in the light of science -1.18.1 The interdependence of different aspects of a model -1.19 Three attributes of models of God, humanity and the cosmos -1.20Questions of value

1.21 Conclusion

# 2. The significance of the theology of creation within Christian tradition: systematic considerations 39

Paul D. Murray and David Wilkinson

2.1 What do we mean by the theology of creation? -2.2 Telling the story of creation -2.3 The creation narratives of Genesis 1-3-2.3.1 The sovereignty of God in creation -2.3.2 The place of human beings in creation -2.4 From Alpha to Omega: the theology of creation in the broader scriptural narrative -2.5 The development of the theology of creation within Christian tradition -2.5.1 Creatio ex nihilo -2.5.2 Aquinas, causes and design -2.5.3 The Reformation and the growth of science -2.5.4 The modern period

2.6 Conclusion

#### 3. Learning from the past

John Hedley Brooke

3.1 Introduction – 3.2 Why history? – 3.2.1 Myths and misconceptions: the Galileo Affair – 3.2.2 Myths and misconceptions: the Darwinian controversies – 3.3 The concept of science, viewed historically – 3.4 The problem of selectivity – 3.5 Four master narratives – 3.5.1 The thesis of conflict – 3.5.2 The thesis of harmony – 3.5.3 The thesis of secularization – 3.5.4 The thesis that certain developments in twentieth-century science created new spaces for human spirituality – 3.6 Mapping mutual relevance – 3.7 Lessons from the past

3.8 Conclusion

## 4. Truth and reason in science and theology: points of tension, correlation and compatibility 82

Paul D. Murray

4.1 Introduction

Section A: Early twentieth century: the challenge of logical positivism (4.2-4.6)

4.2 The verificationist criterion of meaning -4.3 Strict accommodation: noncognitive accounts of religious belief -4.4 Strict isolation: Christian existentialism -4.5 Relative accommodation: on the possible verification of Christian faith -4.6 Relative isolation: the Barthian emphasis upon the primacy of God's self-revealed Word

Section B: Mid-twentieth century: the unravelling of the positivist agenda (4.7-4.9)

4.7 The problem of induction and Popperian falsificationism -4.8 Falsifiability, fallibility and theology -4.9 The Duhem-Quine rejection of thesis fallibilism

Section C: Latter part of the twentieth century: revolution, anarchy and resistance in scientific theory change, and the need for tempered postfoundationalist accounts of scientific and theological rationality (4.10-4.13)

4.10 Thomas Kuhn's revolutionary account of scientific theory change -4.11 Feyerabendian anarchism -4.12 Imre Lakatos and Nancey Murphy's theological appropriation of Lakatos -4.13 Nicholas Rescher's pragmatic-idealist account of human rationality and its theological significance

4.14 Summary and conclusion

#### BOOK TWO

#### 5. Theology and the New Physics

Lawrence Osborn

5.1 Introduction

Section A: Classical physics and the Newtonian worldview (5.2-5.4) 5.2 The scientific revolution – 5.3 From method to worldview – 5.4 Change and continuity in the physical sciences

#### Section B: The rediscovery of time (5.5-5.9)

5.5 Classical physics and the exorcism of time -5.6 Relativity and the rediscovery of time -5.7 Relativity and the spatialization of time -5.8 Time and space -5.8.1 Spacelike time and determinism -5.8.2 Spacelike time and causality -5.9 Space, time and theology

#### Section C: The rediscovery of the observer (5.10-5.14)

5.10 The observational basis of quantum theory -5.10.1 The ultraviolet catastrophe -5.10.2 The photoelectric effect -5.10.3 Collapsing atoms and spectral lines -5.10.4 When is a particle a wave? -5.11 The quantum revolution -5.12 Shaking the foundations -5.13 Schrödinger's cat and the meaning of quantum theory -5.14 Quantum consciousness

#### Section D: Modern cosmology and universal history (5.15-5.19)

5.15 The beginnings of scientific cosmology -5.16 The Big Bang -5.16.1Evidence for a Big Bang? -5.17 The shape of things to come -5.18 Is the Big Bang a moment of creation? -5.19 From Big Bang to inflation

## Section E: Modern cosmology and the rediscovery of purpose? (5.20-5.24)

5.20 Some contemporary cosmological enigmas -5.20.1 The chemical composition of the universe -5.20.2 'Anthropic features' -5.21 Possible responses to the 'anthropic coincidences' -5.22 The Weak Anthropic Principle -5.23 The Strong Anthropic Principle -5.23.1 Is it science? -5.24 Anthropic design arguments

#### viii God, Humanity and the Cosmos

Section F: The rediscovery of complexity (5.25-5.28)

5.25 'Newtonian' limits to Newtonian physics - 5.26 Recognizing chaos - 5.27 Coming to terms with chaos - 5.28 Implications for the philosophy of science

5.29 Conclusion

#### 6. Theology and evolutionary biology

Christopher Southgate, Michael Robert Negus and Andrew Robinson

6.1 Introduction

#### Section A: Human evolution (6.2-6.4)

6.2 The discovery of pre-history - 6.3 Human evolution and the Genesis accounts of creation - 6.3.1 Made in the image of God - 6.3.2 The Fall - 6.4 The timescale of evolution

#### Section B: Darwin and Darwinism (6.5-6.7)

6.5 Evolutionary ideas before Darwin - 6.6 Darwin's theory of evolution by natural selection - 6.7 Scientific and theological responses to Darwin's theory

#### Section C: Darwinism evolving (6.8-6.10)

6.8 Genetic Darwinism: the neo-Darwinian synthesis – 6.9 DNA and the molecular revolution in biology – 6.10 Hard neo-Darwinism and expanded neo-Darwinism – 6.10.1 The Darwinian research programme – 6.10.2 Gradualism, punctuated equilibrium and radical contingency – 6.10.3 Adaptation, self-organization and complexity – 6.10.4 The rhetoric of Darwinism – 6.10.5 A note on natural theology and design – 6.10.6 Intelligent Design Theory

#### Section D: Reduction, reductionism and religion (6.11-6.13)

6.11 An analysis of reduction and reductionism - 6.11.1 Notes on methodological issues - 6.12 Genetic reductionism - 6.13 New prophets of conflict - 6.13.1 Francis Crick and the 'ultimate aim' of biology - 6.13.2 Jacques Monod and the problems of cross-explanatory reductionism - 6.13.3 E.O. Wilson and sociobiology - 6.13.4 Richard Dawkins and the selfish gene -6.13.5 Religion, evolution and naturalism

6.14 Conclusion

#### 7. Psychology and theology

Fraser Watts

#### 7.1 Introduction

#### Section A: Human nature (7.2-7.7)

7.2 Perspectives on human nature -7.3 Brain and consciousness -7.4 Theological concerns about neuroscience -7.5 The scope of artificial intelligence -7.6 Theological issues about artificial intelligence -7.7 Immortality

154

#### Section B: Religion (7.8–7.12)

7.8 Psychological approaches to religion - 7.9 Freud's critique of religion - 7.10 Alternative psychoanalytic approaches to religion - 7.11 Complementary approaches to religious experience - 7.12 Neurological approaches to religious experience

7.13 Conclusion

#### **BOOK THREE**

#### 8. Some resources for Christian theology in an ecological age 213 Christopher Southgate

8.1 Introduction – 8.2 Process thought – 8.2.1 A 'dipolar' God – 8.3 Questions of theodicy – 8.4 The critique of patriarchy – 8.4.1 Ecological theology and the science-religion debate – 8.4.2 'Realist' and 'pragmatist' approaches – 8.4.2.1 An evolutionary approach to 'realism vs pragmatism' – 8.4.2.2 A theological approach to 'realism vs pragmatism' – 8.4.3 The development and assessment of theological models – 8.5 Some models discussed: 8.5.1 David Pailin, 8.5.2 Jay McDaniel, 8.5.3 Criticisms of process thought, 8.5.4 Sallie McFague, 8.5.5 Rosemary Radford Ruether, 8.5.6 Jürgen Moltmann, 8.5.7 Criticisms of Moltmann, 8.5.8 Paul Fiddes, 8.5.9 Fallenness and resistance in creation, 8.5.10 Keith Ward – 8.6 Recurrent motifs – 8.6.1 Perspectives on panentheism – 8.6.2 Perspectives on divine kenosis and divine suffering – 8.6.3 Some recent contributions from evangelical theology

8.7 Conclusion

## 9. Some resources for theological thinking on God and the world from outside the Christian tradition 242

Michael Robert Negus and Christopher Southgate

9.1 Introduction – 9.2 Two Jewish philosophers – 9.3 The contributions of Eastern thought – 9.4 Hindu metaphysics – 9.5 Taoism – 9.6 The contribution of Buddhism – 9.6.1 Buddhist spirituality – 9.7 The Gaia Hypothesis – 9.8 Deep ecology – 9.9 'New paradigm' thinking

9.10 Conclusion

#### 10. A test case: divine action

Christopher Southgate

10.1 Introduction – 10.2 General comments – 10.3 God 'edged out'? – 10.3.1 Law and chance

Section A: What God is doing: providence and miracle (10.4-10.12.1)10.4 How to think about providential agency – 10.5 Theodicy – 10.6 Determinism, compatibilism and the nature of physical law – 10.7 Personal

#### x God, Humanity and the Cosmos

agency -10.7.1 The mind and the brain -10.7.2 The mind-brain debate -10.8 Views of God's action -10.9 The causal joint -10.10 Peacocke and Polkinghorne compared -10.11 Process schemes and double agency -10.12 Conclusion to the debate on special divine action -10.12.1 The contribution of Robert J. Russell

Section B: What God has done: the history of the universe (10.13-10.19)

10.13 The Big Bang and 'before' -10.14 Anthropic considerations -10.15 The early universe -10.16 The origin of life -10.17 The evolutionary development of life -10.18 Questions of theodicy in respect of evolution -10.18.1 The probability of self-conscious beings -10.19 Possible theologies of divine action in respect of evolution

Section C: What God will do (10.20) 10.20 Eschatology

10.21 Conclusion

#### **BOOK FOUR**

#### 11. Science and education

Michael Poole

11.1 Introduction to Book Four - 11.2 Science education and the sciencereligion debate - 11.3 Meeting-points - 11.3.1 The content of science - 11.3.2 The nature of science - 11.3.3 The applications of science - 11.3.4How science operates as a social activity - 11.4 Some educational questions - 11.5 A *modus operandi* - 11.6.1 One way for science education to make a contribution - 11.6.2 A second way - 11.6.3 A third way - 11.7 Recent developments in England - 11.7.1 Primary education - 11.7.2 Secondary education - 11.7.3 Tertiary education

#### 12. Islam and science

Michael Robert Negus

12.1 Introduction -12.2 The concept of God -12.3 The religious dimensions of Islam -12.4 The universe and its Creator -12.5 The Golden Age of Islam -12.6 The Islamic paradigm of the universe -12.7 Islam and modern science -12.8 Identifying problems and recognizing points of agreement -12.9 Proposals for the regulation and Islamization of science -12.10 Islam and Darwinism

12.11 Conclusion

#### 13. Technology and Christianity

Jacqui Stewart

13.1 Introduction -13.2 What is technology? -13.3 Is technology good or bad? -13.4 Technology and Christianity in the history of Western Europe -

303

321

13.5 The technical ideal: does technology have inherent values? -13.6 The 'defining' role of technology -13.7 Does the origin of a technology have implications for its effects? -13.8 Relation to religious values: Mumford, Tillich and Reinhold Niebuhr -13.9 Ends and means: Ellul and William Temple -13.10 Current issues: technology and the information revolution -13.11 Two contemporary theologians' responses: Barbour and Susan White -13.12 Technosapiens 13.13 One technologist's reflection

13.14 Conclusion

#### **14.** Biotechnology: a new challenge to theology and ethics 361 Celia Deane-Drummond

14.1 What is biotechnology? -14.2 Genetic engineering in medicine -14.3 Genetic engineering and screening in humans -14.4 Genetic engineering in the production of food -14.5 What are the dangers? -14.6 Some hidden agendas -14.7 Public responses to genetic engineering 14.7.1 Religious dimensions to the public response -14.8 The possibility of human cloning -14.9 Theological issues -14.10 Ethical questions -14.11 A rediscovery of wisdom: some lessons from biotechnology -14.11.1 Wisdom in theology -14.11.2 Wisdom in practice

14.12 Conclusion

#### **BOOK FIVE**

#### 15. A look to the future

Christopher Southgate

15.1 Introduction – 15.2 One-way traffic – 15.3 Looking to the future – 15.3.1 Exploration across a range of religions – 15.4 Three key areas of scientific advance – 15.4.1 The implications of the new genetics – 15.4.2 The status of animals and the uniqueness of *Homo sapiens* – 15.4.3 The science and theology of consciousness – 15.5 Three theological projects – 15.5.1 Eschatology in conversation with science – 15.5.2 Further investigations of theological anthropology – 15.5.3 The role of wonder – 15.6 Physics – 15.7 The integration of science, technology, religion and ethics

Appendix: A note for teachers	401
References and bibliography	403
Index	433