



# **MODERN SCIENCE**

## **Threshold & Philosophical Problems**

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By:

**Jerry Obi-Okogbuo**

**Foreword: Msgr. Theophilus Okere**

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**Msgr. Theophilus Okere**

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DEDICATION

**TO**

Fellow Professors & my students without whose cross-fertilization this book  
would neither have been conceived nor born

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The motive to research the motif of this book was first roused by my cathartic experience of teaching philosophy at the Federal University of Technology, Owerri, FUTO, along side scientists and to science-students whose attitudes to philosophy range often from indifference to outright hostility and seldom enthusiasm and the proverbial wonder. This purging experience made me critical of both philosophy and science and I resolved to get to the root of the matter. The outcome is this book. I would therefore like to thank FUTO for the opportunity, my fellow Professors especially Rev. Fr. Prof. L.C. Asiegbu and my students at FUTO for the challenges you posed and the cooperation you gave. Without these, perhaps this book would neither have been conceived nor born.

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**Jerry Obi-Okogbuo**

## FOREWORD

In this narrative the author carefully shows the intricate web of an intimate relationship between philosophy and science, a web often obfuscated in the cloud of modern science's triumphal march. It was from Egypt River Nile that we got the world the pyramids, those monuments to immortality and the first recorded ideas of monotheism.

But the earliest philosophers were *physiocrats*, half philosopher and half scientist, while the first questions of philosophy - *ex qua material constituitur mundus*? Of what stuff is the world made? – suggest an intentionality of science built into philosophy and an intentionality of philosophy built into science. Philosophy slowly emerged as the pursuit of truth and knowledge crowned by wisdom.

The separation of these Siamese twins through a process that took centuries has not been neat, but history shows clearly that modern science is but a late descendant of philosophy, younger even than medicine in the line of genealogy.

The book starts by acknowledging the dominant status of science today especially that of “Big Science” where intense involvement with government is clearly changing the pure knowledge bias of science into that of service to power and money. Meantime, science itself has come to enjoy such a dominant position that, it has become the *ersatz* religion/ideology of the age.

Even so, widespread ignorance of the ideas of science goes hand in hand with a widespread addiction to the gadgets of science as well as ignorance or indifference to it. The two edged character of science means that it is beneficial in one way but extremely dangerous in the other.

The book's acclaimed purpose is to encourage a wholesome knowledge of science and to promote knowledge for its own sake. But understanding science gives power, not the power of violence, but the mastery by man over his environment. The book wants also to question science, to explain and demystify it and raise some of the problems scientists are silent about. It goes on to talk about the Scientific Revolution and then discourses the question of its continuity and discontinuity.

Finally it considers the relationship of science, technology and society, noting their mutual influence and impact, leading to the transformation of society by science and of science by society.

In this book, *Modern Science: Threshold and Philosophical Problems*, the author takes us through a vast panorama that weaves together the histories of both philosophy and of modern science. But more than their histories, it describes each one in some detail, analyzes their key concepts and methods, clearly emphasizing their strengths and their weaknesses, highlighting the fact that their points of strength are also their points of weakness.

The book bears testimony to an extraordinary effort of erudition in scope and in detail, in bringing together the awesome achievements in human knowledge accumulated over the ages in the areas of philosophy and science.

Their millennial rivalries, confluences and clashes and historic antagonisms, their mutual and reciprocal impact and influences, their dogmatisms, their successes and victories as well as their failures and subtle surrenders, - all these receive comment here and are at times expressly discussed, at other times only subtly hinted at. But running through the book are a number of themes, dominant among which is the thread of mutual critique and checking and balancing between science and philosophy.

This is a fair and sympathetic assessment of modern science by a philosopher, which means an appraisal full of ifs and buts of cautious admiration and absolute balance in presenting the glorious march of modern science with a philosopher's insistence on its merits within its limits.

One of the great merits of the book is the generous acknowledgement of the Egyptian/African contribution to science, a position first attested to by the great Greeks, Herodotus, Plato and Aristotle, but ignored and even denied by the racist and xenophobic genius of much later European philosophers such as Kant, Hegel and Hume.

The book's table of contents is a vast intellectual map of the rich heritage of both philosophy and science, starting from Egypt and Mesopotamia to Greece, through the European Middle Ages and Renaissance, the Industrial Revolution, the Revolution of modern science and the technological Revolution that came with it.

But the presentation of these contents is in a way novel, that is, in the way the author strikes a balance between the two sides of science on the one hand and philosophy, theology on the other.

Particularly interesting is the subtle way the author highlights the mutual tension that has characterized the relationship of modern science and its elder relations, philosophy and theology. A lot of this book is taken up by mutual criticism of science by philosophy and of philosophy by science. Indeed the

progress that has been, made by either discipline has been, to a large extent, dependent on this critique to effect the adjustment that has given them the self-confidence they have today.

But it must be noted that most of philosophy's criticism of science has been mostly a criticism of the philosophers, theologians and the church when the protagonists overreach their knowledge limits or ignore *Wittgenstein's wise injunction: whereof one cannot speak, thereof must one be silent*. But the overcoming of both scientific and philosophic-theological dogmatism has paved the way to the progressive environment and the relative absence of the usual sterile quarrels we all witness today.

I consider that we have here before us a well thought out account, an organized, well researched book, an ambitious book indeed considering its subject matter but written with the confidence that comes from a mastery of the two main areas of study and written from a view point that is positively enthusiastic and mindful of its self-imposed limits and, of course, its temptations to overreach.

I would have liked a greater and bolder assertion of the authority of morality over science in maters human. I would have liked a hierarchy of values where, despite the stupendous achievements of science, humanity is rated higher than power and pleasure; where conscience ranks higher than prestige and money and comfort and "the American dream" and where justice and fairness is the minimum but universal norm.

Today, rather than that, we have a situation where the nuclear bomb and the ultimate power of violence it confers seems to have come to stay and where the brilliance of the marvels of science and technology had dazzled the world into the acquiescent acceptance of science as the ultimate truth, and materialism as the *ultimate summum bonum*. We live today in a world so mesmerized by science and technology as the one thing necessary, where, often in the name of freedom and individualism; it is really the ideology of selfishness that holds sway.

This is a tragic situation for man and it can only be reversed, not by repudiating or denying or otherwise denigrating science, but by finding of it correct and subordinate place in the scale of human values and keeping it within those limits. This book has the great merit of helping us perform that delicate balancing act.

**Msgr. Theophilus Okere**

President, Whelan Research Academy,  
International Centre, Owerri.

## PREFACE

Science is the dominant ideology of our age. Of all the competing ideologies today: Christianity, Islam, Magic, Mythicism and Mysticism; science is the most dominant. Is this assertion a mere claim or is there a way we can demonstrate its truth? Edwin A. Burt has an answer. He says, "The world view of any age can be discovered in various ways, but one of the best is to note the recurrent problem of its philosophers."<sup>1</sup> After its birth in the 17<sup>th</sup> century, science expelled man and his earth from the centre of the general scheme of things, where medieval model of the universe had proudly placed him, as the paragon of creation, to the periphery as just one of the cosmic phenomena. Since then, philosophers have been theorizing to re-establish man in the respected medieval pedestal. Thus science is the major world-view of our time. It is the magic wand for all human passion. It works for men and women, young and old, saints and sinners, proud and humble, theists and atheists, terrorists and pacifists, the scholars, politicians, businessmen and artists. Science is the outlet for contemporary man's multitudinous desires for it contains the critical and the dogmatic, the secular and the sacred, the profane and the sacrosanct. Doubtlessly, science is the pervading outlook of our age.

The dominant stature of science is even further accentuated from about the last one hundred years, since the World Wars. From then, science significantly scaled up to what is popularly described as 'Big Science'. This is sequel to the accentuation of collaboration between science and the industrial state. Science became necessary for the industrial state and through government science solves its problems. The scaling up remarkably changed the features of science such that today's science seems to be bound up with too many more or less extraneous things. Government meddlesome involvement with the direction of science appears to be shifting the character of scientific work from its knowledge aim to a sophisticated form of publicity-seeking and record-keeping by scientists. Fewer and fewer people, it appears, are becoming eligible to refute scientific knowledge-claims while scientific knowledge-claims are increasingly playing greater role in legitimizing public-policies, actions and events. 'Big science' implies, therefore, that as science today seems to be losing its original essence while it was 'Little science', it is becoming a more pervasive force as 'Big Science'.

Furthermore, if absolute dependence and ultimate commitment is taken as standards of religiosity, then our age may turn out to be the most religious and

science its religion. Our age is characterized by an absolute faith in our capacity to know by the methods of modern science and our ability to control the world by embodying that scientific knowledge in technology. If science fails contemporary man, his solution is more science. Science is a *fait accompli*: never suspected or questioned. Thus science enjoys for most people of this age a sacred status and the hopes of salvation.

Ironically, contemporary man who depends so much on science is largely ignorant of the ideas on which that science is based. Science lies beyond the intellectual grasp of most people. Contemporary man knows so little about science. Apart from how much it costs, the only other question usually asked of scientific research is what use is it? The only thing contemporary man knows is gadgets, their uses and their abuses. The only other thing he knows is to occasionally read the instruction manuals of these gadgets. Even in that use-respect, people have only slim, if any, control. The products of science that would most benefit people in a given area are not made available to them; economic and political pressures may be put on them to accept other products of science that they would otherwise not normally have use for. We are not suggesting that every person should know much actual science; this is unnecessary. What we are saying is that it is important that every person should know more about science.

Much ignorance about science came about not so much as a result of complacency nor because the ideas upon which science is based are unknowable but because actual science has, in about the past 100 years, become an extremely specialized endeavor, a game for experts, played with a jargon of esoteric terms. Physics, for instance, has become too abstract, mathematical and removed from common-sense. Hence, though science is very much around and felt, it is too remote from man.

Another reason contemporary man needs to wake from his science slumber is the awareness that his faith in the inevitability of progress through science has been shaken by the recognition, from about the last 100 years, of the two-edged characteristic of science such that the fire that warms the hearth can also burn the home. The power which scientific knowledge gives can be used for both good and evil. In the world today weapons of mass destruction and nuclear warheads enough to destroy the world stand ready to be exploded at the press of a button. This perhaps accounts for the ominous note in the tone of the few educated in science when they talk about science. For instance, William Faulkner in his acceptance speech for the Nobel Prize said: "There are no longer problems of the spirit. There

is only the question: when will I be blown up.”<sup>2</sup> Initially the more educated a person was the more approving he was about science. Today the reverse is the case. Why are people apprehensive of science? Could it be because science is so felt but remote from people?

*Modern Science: Threshold and Philosophical Problems* has the purpose to bring about wholesome knowledge of science. The purpose is to make science comprehensible. It is to bring as many people as possible to know more about science. As already stated, we are not suggesting that every person should know much actual science. It is not necessary to have total understanding of science. One can appreciate and take pleasure in the achievement of science even though one does not know much actual science. All one needs is to know much about science.

What then should be considered the significance or relevance of this book? I conceive the significance of this book not in the lower order of practical utility or economic-level relevance. I conceive the significance of this book in the higher order of knowledge-for-knowledge sake or philosophy-level relevance. Philosophy is undertaken basically to speculate, engage in idle curiosity and seek knowledge for its sake. Idle curiosity may be frowned at in an economic endeavor but philosophy achieves greater respectability the more it deliberately rises beyond practical immediate gains.

It follows that the purpose of this book, as already stated, is understanding; understanding science. Where or to what significance or relevance or practical ends this understanding will lead us cannot here and now be completely predicted. But be it borne in mind that in science, most of the time, the future needs of society have been served by researches who were seeking to understand more than by those who were seeking to solve particular problems. The most important discoveries in science were made by those who were merely seeking to understand; x-rays and penicillin were even discovered by chance.

Having said that, in practical terms, nevertheless, the knowledge of science will give ‘power’; ‘luciferous’ (enlightening) and ‘lucreferous’(utilitarian) advantages, to use terms ascribed to Francis Bacon. Again the knowledge of science aids us to gain better knowledge of ourselves and of the world around. This self-knowledge and knowledge of the world around us will give capacities and open up endless possibilities and this is our best hope of living peacefully, abundantly and happily.

*Science: Threshold and Philosophical Problems* wants to question science. It wants to explain science. It wants to demystify science. It wants to make science intelligible. As the title suggests, it wants to confront certain critical problematiques about science that the scientists would quite frankly not bother to address. It also attempts to expose certain hidden assumptions and tell the lie to certain claims of the scientists about science. It does this in four parts:

Part I is made up of chapters 1, 2 and 3. It presents the "Philosophical Issues Involved in the Definition of Science". This part begins the imparting of the knowledge of science by attempting to outline its subject matter, object, methodology and classification. This part exposes the difficulty in clearly delineating the boundary between philosophy and science.

Part II consists of five chapters, 4,5,6,7 and 8. It presents one half of the general theme of the book, the "Threshold of Modern Science": the remote, mediate and immediate background of Modern Science. Modern science is commonly believed to be the outcome of a revolution, hence the *leitmotive* 'Modern Scientific Revolution'. In this revolutionary perspective, modern science means a turn away by the protagonists of modern science from the unchecked speculative mode of knowledge of ancient philosophers and the theologico-cosmological mode of medieval schoolmen to an experimental and mechanical mode. It implies a separation between science and philosophy on the one hand; and between science and theology on the other.

The early protagonists of modern science believed that they were carrying out a revolution. They were sure they were inaugurating a novel method and concept of knowledge. This view is supported by the fact that little or no allusion was made to earlier writers except to disagree with them. It is also supported by the confidence and frequency of their use of the word 'new' in the titles of their book advocating the revolution. Confer Francis Bacons *New Atlantis* and *New method*; Kepler's *New Astronomy*; and Galileos *Two New Sciences*. The 'new' in these titles has revolutionary import. The impression was that antecedent modes of knowledge were being radically rejected and replaced. In this respect, Alexander Koyre observes.

What the founders of modern science had to do was not to criticize and combat certain faulty theories and to correct or to replace them by better ones. They had to do something quite different. They had to destroy one world and to replace it by another. They had to reshape the framework of our intellect itself, to restate and to reform its concepts,

to evolve a new approach to Being, a new concept of knowledge, a new concept of science.<sup>3</sup>

The founders of modern science were clear in their minds that they were carrying out a revolution which eventuated in a special mode of knowledge later called science. The question is how are we to understand the use of 'revolution' in the context of 'modern scientific revolution'? Must revolution be understood as a radical, momentous, turn against or total break with the past? At what point does evolution become revolution and vice versa? Where do we draw the line between evolution and revolution? The critical question at issue is, did modern science spring, phoenix-like, fully grown, without precedent or progenitors, like Athena from the head of Zeus, from the heads of Kepler, Galileo, Descartes, Newton and other 17<sup>th</sup> century, protagonists of the modern scientific revolution or did modern science evolve from the remote past?

In the history of ideas, there are traditionally two ways to address the above problematique of modern science: there is the 'continuity thesis' and there is the 'discontinuity thesis'. The 'continuity thesis' (the evolution approach) asserts that modern science was a direct derivation from antecedent thought (Greek and medieval) but that the medieval period had contributed nothing (this is the so called medieval hiatus). This medieval hiatus, however, has been destroyed by the medievalists who present the claim of smooth flow of modern science from Greek science with medieval science as a half-way house. The continuity thesis is in agreement with the tripartite division of the history of civilization into glorious antiquity, medieval darkness, and the light of modern humanism.

The 'discontinuity thesis' (the revolution approach) asserts that modern science had a total break with the past. Modern science had a new start without any roots in the past. This is in tune with the so-called "vulgar triumphalist" view of the origin and development of science. This view holds that modern science had a complete and decisive break with antecedent thought: medieval and Greek.

This book as the part II shows treads a *via media* of the above two theses. It proposes the continuity-discontinuity thesis. This thesis asserts that the modern scientific revolution was prepared by evolutionary changes. It posits that modern science evolved through a recovery from antecedent thought but that the profundity of this recovery was so fundamentally novel and unprecedented that it amounts to a revolution. There was no total break with antecedent thought. Loren Eiseley rubs this point in. He writes: "...in science there is no such thing as total

independence from one's forerunners."<sup>4</sup> Thus in the continuity-discontinuity thesis proposed by this book, everything is not overthrown. There is a measure of continuity from antecedent thought: Middle Ages, Greece, and even Egypt. There is continuity of belief, for instance, in the organizing power of the human mind. There is continuity of belief in the intelligibility of nature. There is continuity in textual sources. This implies invariably continuity of terminology, such as matter, motion, time and force. There is continuity of problems, semantics, and context, and there is continuity of some basic assumptions. The last chapter of this part, chapter 8, deals with specific science areas where discontinuity (or revolution) occurred.

Part III consists of ten chapters: 9 to 18. The general theme of this part is "Science, Technology and Society". The point at issue in this part is the relationship between science, science-based technology and society. Since the birth of modern science in the 17<sup>th</sup> century and its maturity and triumph in the 19<sup>th</sup>, society could no longer be insulated from it. Since this birth and triumph science via technology has especially from the Second Industrial Revolution (1850-1914) wrought tremendous transformation of society. In this way, science and science-based technology became major social and economic phenomena urgently needing understanding. Understanding the nature of this impact is the *raison d'être* of this part of this book, while analyzing the nature of the impact is the *leitmotif*. This is a critique, a philosophical reflection on the critical point of intersection where science, technology and society interplay and mutually influence one another. This also implies a reflection on the impact of science and technology on so many different aspects of human endeavor, intellectual, economic, political, social, cultural, and demographic.

At the center of the whole interplay is man. The reflection is by man. The impact is over and above on man. Therefore there is the need to enunciate a sound philosophical anthropology (Chap. 17). It is only against the canvas of such a philosophy of man that the critical evaluation of science-society impact via technology could be clearly perceived.

The initial trend in analyzing the nature of science-society impact was to focus on the view that science influences society. This is the view of a direct, single, one-dimensional flow of influence from science to society; a one-way cause-effect impact of science on society. This view is believed to be amply supported by examples in the history of the march of civilization. When sticks and stone were main technologies, we had Stone Age; when bron      we had the

Bronze Age; there was the Iron Age; and the Jet Age. These were science and technology inventions that profoundly fashioned attitudes and marked civilizations.

The current trend, however, is to focus on the notion of institutional interchange between science as an on-going intellectual activity and society as a web of relationships. This is the view of a reciprocal relationship between science and society. This is the view of a two-way flow of influence between science, and science-based technology on the one side and society on the other. Science influences society and society influences science. The initial view that it was science that influences society is steadily being abandoned. Thus when we today talk about the transformation wrought by science, we are actually talking about the mutual influence between science and society.

Thus analyzing the nature of science-society interplay, a lot of approaches could be used. Some focus on intellectual and attitudinal impacts: "The Age of Enlightenment" (See Chap. 9) and 'Scientism' (see Chap.11). Some focus on the paradoxes of science; the opportunities created by science and their attendant problems; see chapters 14 "Automation Technology"; 15 "Nuclear Technology"; 16 "Pollution"; 17 "Genetic Engineering"; and 18 "Globalization".

Part IV, the concluding part of this book, consists of four chapters: 19-22. The general theme is "Philosophy of Science". Defined in general terms as being co-terminus with knowledge, science has been with man. From inception man has always made attempt to understand and control his environment. In this sense, the origin of science is ontological or a-historical. In this context, it was the task of philosophy, precisely the philosophy of nature, to study nature. However, the "vulgar triumphalist" and the "discontinuity thesis" (revolutionary) accounts of the origin of science hold that modern science was revolutionarily born in the 17<sup>th</sup> century. When science was born it took over from philosophy the study of nature. The success and triumph of science in the 19<sup>th</sup> century made science a great phenomenon. There was the need to study this phenomenon. The philosophy of science emerged to provide for this need. Chapter 19 sketches the meaning, scope and nature of the philosophy of science. Chapter 20 presents a historical panorama of the philosophy of science. Chapter 21 presents some philosophies and philosophers of science. The last, but by no means the least, Chapter 22 attempts to look into the crystal ball and foretell the future of science. If science is an ideology, it is imaginable that another ideology might emerge to overthrow it. This chapter looks at three possible candidates: Post Modern Science, A Return to

Little Science, and the Dream of Final theory, who may be in the process of overthrowing modern science.

Jerry Obi-Okogbuo.

April, 2015.

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<sup>3</sup>Alexander Koyre, "Galileo and Plato", *Journal of the History of Ideas* 4, 1943, 400-428. Quoted in Lindberg C. David, "Conceptions of the Scientific Revolution from Bacon to Butterfield: A Preliminary Sketch", *Reappraisals of the Scientific Revolution*, David C. Lindberg and Robert S. Westman (eds.), New York: Cambridge University Press, 1990, P 17

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## CONTENTS

Dedication	v
Acknowledgements	vii
Foreword	ix
Preface	xiii
Contents	xxi

## PART I

Philosophical Issues Involved in the Definition of Science	1
<b>1 The Meaning of Science</b>	3
➤ Common Sense	3
➤ Philosophy and Science	7
➤ Modern Conception of Science	9
➤ Features of Modern Science	12
➤ Definition of Science	14
Reference	15
<b>2 The Method of Science</b>	17
➤ The Deductive Method	19
➤ The Inductive Method	20
• The Problem of Induction	21
• Probability	22
• Metaphysical Justification of Induction	24
• The Pragmatic Vindication of Induction	24
• Dissolution of The Problem of Induction	25
➤ The Hypothetico-Deductive Method	25
➤ Experimentation	27
➤ Significance of the Scientific Method	28
References	28
<b>3 The Classification of Science</b>	31
➤ Broad Classification: Pure and Applied	32
➤ Formal and Empirical/Real Sciences	33
➤ Mathematics	33

➤ Empirical or Real Sciences	35
➤ Physical Sciences	36
➤ Biological Sciences (Natural History)	40
➤ Cultural Studies (Humanities)	42
References	43

## PART II

The Threshold of Modern Scientific Revolution	45
---	----

### 4 Science in Ancient Egypt 47

➤ Pre-history Science	47
➤ Science in Ancient Egyptian	49
• Agriculture	53
• Geometry (Mathematics)	54
• Architecture	55
• Astronomy	57
• Medicine	58
• Alchemy (Chemistry)	60
• Writing	61
• Literature and Arts	62
• Administration	62
• Religion	63
➤ Ancient Egypt Ideal of Science	64
References	64

### 5 Science in Ancient Greece 67

➤ "Greek Science"	68
➤ Features of Pre-Socratic Scientific Theories	71
➤ Mythopoeic Background of Greek Science	73
• The Epic of Gilgamesh	74
• Homer	74
• Hesiod	75
➤ Significance of the Mythopoeic Background of Greek Science	76
➤ The Milesian School	77

• Thales	78
• Anaximander	79
• Anaximenes	80
• The Pythagoreans	81
➤ The Eleatic School	85
• Parmenides of Elea	86
• Zeno of Elea	87
➤ The Later Ionians:	89
• Heraclitus	89
• Empedocles	91
• Anaxagoras	92
➤ The Atomic School	93
• Leucippus and Democritus	93
➤ Sophism	95
• Protagoras and Gorgias	95
➤ Socrates	98
➤ Plato	99
➤ Aristotle	102
• Existence	103
• Motion	104
• Method	104
• Natural Science	106
• Biology	107
➤ Alexandrian or Hellenic Science	108
• Euclid	109
• Archimedes	111
• Ptolemy	111
• Galen	113
➤ Greek Ideal of Science	114
References	117
<b>6 Science in the Middle Ages</b>	<b>121</b>
➤ Periodization	121
• The High Middle Ages (The Dark Ages)	121

• The Late Middle Ages	127
➤ Scholasticism	128
➤ Grosseteste	129
➤ Roger Bacon	130
➤ Albert the Great	130
➤ Thomas Aquinas	130
➤ The Demolition of Aristotle	131
➤ Jean Buridan	131
➤ Nicolas Oresme	132
➤ John Duns Scotus and William of Ockham	133
➤ Voluntarism and Nominalism	133
➤ The Medieval Ideal of Science	134
References	137
<b>7 Renaissance Science</b>	<b>138</b>
➤ Periodization and Meaning of Renaissance	138
➤ Renaissance Socio-Anthropological Circumstances for the Scientific Revolution	140
• The Fall of Constantinople	140
• The Advent of Printing	141
- Hermeticism	142
- Esotericism	143
➤ The Discovery of New Worlds	147
➤ The Learned Societies	150
➤ Renaissance Progenitors of the Scientific Revolution	151
• Nicholas of Cusa	151
• Nicholas Copernicus	152
• Leonardo da Vinci	153
• Giordano Bruno	154
• Francis Bacon/Rene Descartes	155
- Bacon	156
- Descartes	162
➤ Renaissance Ideal of Science	167
References	168

<b>8 The Modern Scientific Revolution:</b>	
<b>Major Science-Areas of the Revolution</b>	170
➤ A New Physical Model of the World	170
➤ A New Conception of Physis	176
➤ A New Conception of Physics	179
• Plato's Physics	179
• Aristotle's Physics	181
• Rene Descartes	184
• Isaac Newton	185
➤ A New Conception of Gravity	187
➤ Revolution in the Method of Science	192
• The New Method	194
➤ Revolution in the Application of Science	199
➤ The Modern Ideal of the Motive of Science	203
➤ The Formalization and Professionalization of Science	206
References	211
 <b>PART III</b>	
<b>Science, Technology and Society</b>	213
<b>9 The Nature of Science-Society Impact</b>	215
References	218
 <b>10 The Industrial Revolution</b>	219
References	223
 <b>11 Scientism</b>	225
References	228
 <b>12 A Sound Philosophical Anthropology:</b>	
<b>A Correct Theory of Human Nature</b>	229
References	232
 <b>13 Philosophical Issues Involved In Conceptualizing Technology</b>	235

➤ Historical Sources of Technology	237
➤ Science and Technology	238
➤ Philosophy and Technology	239
➤ Features of Technology	240
➤ Technology: Amalthea's Horn or Pandora's Box	241
References	247
<b>14 Automation Technology</b>	<b>249</b>
➤ Effects of Automation	250
➤ Beneficial Effects of Automation	250
➤ Adverse Effects of Automation	252
➤ Solutions	254
References	254
<b>15 Nuclear Technology</b>	<b>255</b>
➤ Nuclear Reaction	256
➤ Fission	256
➤ Fusion	257
➤ The Import of Nuclear Technology	257
➤ The Dangers of Nuclear Technology	258
➤ Nuclear Explosion	258
➤ Thermal Radiation	260
➤ Radiation	261
➤ Short-Term Effects	262
➤ Long-Term Effects	262
References	263
<b>16 Pollution</b>	<b>265</b>
➤ Air Pollution	266
➤ Nuclear Pollution	267
➤ Fallout	267
➤ Ozone Layer Depletion	268
➤ Thermal Pollution	269
➤ Land Pollution	271
➤ Nuclear Technology: Philosophical Evaluation	273
References	273

<b>17 Genetic Engineering</b>	275
➤ Meaning	275
➤ Genetic Engineering: Historical Development	279
➤ Justification and Usefulness of Genetic Engineering	282
➤ Artificial Insemination	282
➤ The Dangers of Genetic Engineering	287
References	292
<b>18 Globalization: Technoscience-Driven</b>	295
➤ Conceptualization	295
➤ Economic Globalization	297
➤ Globalization of Culture	298
➤ Political Globalization	298
➤ Demographic Globalization	298
➤ Technoscience	299
➤ Developing Nations	300
➤ Globalization is Technoscience-Driven	304
➤ Cost-Benefit Analysis of Globalization	306
➤ The Challenges of Globalization	311
• Conceptual Challenges	311
• Cultural Challenges	312
• Economic Challenges	312
• The Challenge of Poverty	313
• The Challenge of Profiteering	314
• Demographic Challenge	315
• The Challenge of Borderlessness	316
• The Challenge of Media Imperialism	317
References	319
<b>PART IV</b>	323
<b>Meaning &amp; Scope of the Philosophy of Science</b>	323
<b>19 The Philosophy of Science: Nature and Scope</b>	325

➤ Subject-Matter	325
➤ Definition	325
➤ The Language of the Philosophy of Science	327
➤ Branches of the Philosophy of Science	328
➤ Tasks or Problems of the Philosophy of Science	328
➤ Purpose of the Philosophy of Science	333
References	335
<b>20 The History of the Philosophy of Science</b>	<b>337</b>
➤ Immanuel Kant	338
➤ Auguste Comte	340
➤ William Whewell	343
➤ John Stuart Mill	347
➤ Whewell versus Mill	352
➤ The Father of Modern Philosophy of Science?	355
References	357
<b>21 Logical Positivism and Philosophers of Science</b>	<b>359</b>
➤ Logical Positivism	359
➤ Karl Raimund Popper	362
➤ Imre Lakatos	373
➤ Thomas Samuel Kuhn	376
➤ Paul Karl Feyerabend	380
References	385
<b>22 The Future of Science</b>	<b>389</b>
➤ Post-Modern Science	391
➤ A Return to "Little Science"	394
➤ The Dream of a Final Theory	396
➤ Implications of a Final Theory	399
References	401
<b>23 Name Index</b>	<b>402</b>
Subject Index	407

