Ch 16 Spielvogel Primary Source Readings

3 Prophet of Modern Science

Sir Francis Bacon (1561–1626), an English statesman and philosopher, vigorously supported the advancement of science and the scientific method. He believed that increased comprehension and mastery of nature would improve living conditions for people and therefore wanted science to encompass systematic research; toward this end, he urged the state to fund scientific institutions. Bacon denounced universities for merely repeating Aristotelian concepts and discussing abstruse problems—Is matter formless? Are all natural substances composed of matter?—that did not increase understanding of nature or contribute to human betterment. The webs spun by these scholastics, he said, were ingenious but valueless. Bacon wanted an educational program that stressed direct contact with nature and fostered new discoveries.

Bacon was among the first to appreciate the new science's value and to explain its method clearly. Like Leonardo da Vinci, Bacon gave supreme value to the direct observation of nature; for this reason he is one of the founders of the empirical tradition in modern philosophy. Bacon upheld the inductive approach—careful investigation of nature, accumulation of data, and experimentation—as the way to truth and useful knowledge. Because he wanted science to serve a practical function, Bacon praised artisans and technicians who improved technology.

Francis Bacon
ATTACK ON AUTHORITY AND ADVOCACY OF EXPERIMENTAL SCIENCE

Bacon was not himself a scientist; he made no discoveries and had no laboratory. Nevertheless, for his advocacy of the scientific method, Bacon is deservedly regarded as a prophet of modern science.

During the seventeenth and eighteenth centuries, the experimental method advocated by Bacon was increasingly employed in the various sciences. For example, experimenting with bodies in motion, Galileo formulated a law of falling bodies that he expressed mathematically. By "having frequent recourse to vivisections employing a variety of animals . . . and collating numerous observations," wrote William Harvey, he was able to demonstrate that all blood passes through a central organ, the heart, flowing away from the heart through the arteries and back to it through the veins, and that this constant, rotating circulation is caused by the rhythmic contractions of the heart muscle acting as a pump. In 1741, Herman Boerhaave wrote that the truths of chemistry are not deduced from pure thought but are arrived at through innumerable experiments: "We allow of no other theory in chemistry except which is built on general laws, which must originally have been deduced from a multitude

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of common incontestable facts always happening in the same manner, so as to authorize the enacting them into a general rule."

In the first passage from ***Redargutio Philosophiarum*** (The Refutation of Philosophies), written in 1609, a treatise on the "idols of the theater"—fallacious ways of thinking based on given systems of philosophy—Bacon attacks the slavish reliance on Aristotle.

But even though Aristotle were the man he is thought to be I should still warn you against receiving as oracles the thoughts and opinions of one man. What justification can there be for this self-imposed servitude [that] . . . you are content to repeat Aristotle after two thousand [years]? . . . But if you will be guided by me you will deny, not only to this man but to any mortal now living or who shall live hereafter, the right to dictate your opinions. . . . You will never be sorry for trusting your own strength, if you but once make trial of it. You may be inferior to Aristotle on the whole, but not in everything. Finally, and this is the head and front of the whole matter, there is at least one thing in which you are far ahead of him—in precedents, in experience, in the lessons of time. Aristotle, it is said, wrote a book in which he gathered together the laws and institutions of two hundred and fifty-five cities; yet I have no doubt that the customs of Rome are worth more than all of them combined so far as military and political science are concerned. The position is the same in natural philosophy. Are you of a mind to cast aside not only your own endowments but the gifts of time? Assert yourselves before it is too late. Apply yourselves to the study of things themselves. Be not for ever the property of one man.

In these excerpts from *The New Organon* (New System of Logic), in 1620 Bacon criticizes contemporary methods used to inquire into nature. He expresses his ideas in the form of aphorisms—concise statements of principles or general truths.

I. Man, being the servant and interpreter of Nature, can do and understand so much and so much only as he has observed in fact or in thought of the course of nature: beyond this he neither knows anything nor can do anything.

VIII. . . . The sciences we now possess are merely systems for the nice ordering and setting forth of things already invented; not methods of invention or directions for new works.

XII. The logic now in use serves rather to fix and give stability to the errors which have their foundation in commonly received notions than to help the search after truth. So it does more harm than good.

XIX. There are and can be only two ways of searching into and discovering truth. The one [begins with] the . . . most general axioms, and from these principles, the truth of which it takes for settled and immoveable, proceeds to judgment and to the discovery of middle axioms. And this way is now in fashion. The other derives axioms from the senses and particulars, rising by a gradual and unbroken ascent, so that it arrives at the most general axioms last of all. This is the true way, but as yet untried.

XXIII. There is a great difference between . . . certain empty dogmas, and the true signatures and marks set upon the works of creation as they are found in nature.

XXIV. It cannot be that axioms established by argumentation should avail for the discovery of new works; since the subtlety of nature is greater many times over than the subtlety of argument. But axioms duly and orderly formed from particulars easily discover the way to new particulars, and thus render sciences active.

The Philosophy of Francis Bacon, ed. and trans. Benjamin Farrington (Liverpool: Liverpool University Press, 1970) pp. 114–115. Copyright © 1970 by Liverpool University Press. Reprinted with permission.

Novum Organum in *The Works of Francis Bacon*, vol. III, coll., ed., and trans. by James Spedding, Robert Leslie Ellis, and Douglas Dennon Heath (Boston: Taggard and Thompson, 1863), pp. 67–69, 71–72, 135–136, 142.

XXXI. It is idle to expect any great advancement in science from the superinducing [adding] and engrafting of new things upon old. We must begin anew from the very foundations, unless we would revolve for ever in a circle with mean and contemptible progress.

CIX. There is therefore much ground for hoping that there are still laid up in the womb of nature many secrets of excellent use, having no affinity or parallelism with anything that is now known, but lying entirely out of the beat of the imagination, which have not yet been found out. They too no doubt will some time or other, in the course and revolution of many ages, come to light of themselves, just as the others did; only by the method of which we are now treating they can be speedily and suddenly and simultaneously presented and anticipated.

REVIEW QUESTIONS

1. What intellectual attitude did Francis Bacon believe obstructed new scientific discoveries in his time?
2. What method of scientific inquiry did Bacon advocate?

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4 The Autonomy of the Mind

René Descartes (1596–1650), a French mathematician and philosopher, united the new currents of thought initiated during the Renaissance and the Scientific Revolution. Descartes said that the universe was a mechanical system whose inner laws could be discovered through mathematical thinking and formulated in mathematical terms. With Descartes' assertions on the power of thought, human beings became fully aware of their capacity to comprehend the world through their mental powers. For this reason he is regarded as the founder of modern philosophy.

The deductive approach stressed by Descartes presumes that inherent in the mind are mathematical principles, logical relationships, the principle of cause and effect, concepts of size and motion, and so on—ideas that exist independently of human experience with the external world. Descartes, for example, would say that the properties of a right-angle triangle ($a^2 + b^2 = c^2$) are implicit in human consciousness prior to any experience one might have with a triangle. These innate ideas, said Descartes, permit the mind to give order and coherence to the physical world. Descartes held that the mind arrives at truth when it "intuits" or comprehends the logical necessity of its own ideas and expresses these ideas with clarity, certainty, and precision.

René Descartes
DISCOURSE ON METHOD

In the *Discourse on Method* (1637), Descartes proclaimed the mind's autonomy and importance, and its ability and right to comprehend truth. In this work he offered a method whereby one could achieve certainty and thereby produce a comprehensive understanding of nature and human culture. In the following

passage from the *Discourse on Method*, he explained the purpose of his inquiry. How he did so is almost as revolutionary as the ideas he wished to express. He spoke in the first person, autobiographically, as an individual employing his own reason, and he addressed himself to other individuals, inviting them to use their reason. He brought to his narrative an unprecedented confidence in the power of his own judgment and a deep disenchantment with the learning of his times.

PART ONE

From my childhood I lived in a world of books, and since I was taught that by their help I could gain a clear and assured knowledge of everything useful in life, I was eager to learn from them. But as soon as I had finished the course of studies which usually admits one to the ranks of the learned, I changed my opinion completely. For I found myself saddled with so many doubts and errors that I seemed to have gained nothing in trying to educate myself unless it was to discover more and more fully how ignorant I was.

Nevertheless I had been in one of the most celebrated schools in Europe, where I thought there should be wise men if wise men existed anywhere on earth. I had learned there everything that others learned, and, not satisfied with merely the knowledge that was taught, I had perused as many books as I could find which contained more unusual and recondite knowledge. . . . And finally, it did not seem to me that our times were less flourishing and fertile than were any of the earlier periods. All this led me to conclude that I could judge others by myself, and to decide that there was no such wisdom in the world as I had previously hoped to find. . . .

I revered our theology, and hoped as much as anyone else to get to heaven, but having learned on great authority that the road was just as open to the most ignorant as to the most learned, and that the truths of revelation which lead thereto are beyond our understanding, I would not have dared to submit them to the weakness of my reasonings. I thought that to succeed in their examination it would be necessary to have some extraordinary assistance from heaven, and to be more than a man.

I will say nothing of philosophy except that it has been studied for many centuries by the most outstanding minds without having produced anything which is not in dispute and consequently doubtful. I did not have enough presumption to hope to succeed better than the others; and when I noticed how many different opinions learned men may hold on the same subject, despite the fact that no more than one of them can ever be right, I resolved to consider almost as false any opinion which was merely plausible. . . .

This is why I gave up my studies entirely as soon as I reached the age when I was no longer under the control of my teachers. I resolved to seek no other knowledge than that which I might find within myself, or perhaps in the great book of nature. I spent a few years of my adolescence traveling, seeing courts and armies, living with people of diverse types and stations of life, acquiring varied experience, testing myself in the episodes which fortune sent me, and, above all, thinking about the things around me so that I could derive some profit from them. For it seemed to me that I might find much more of the truth in the cogitations [reflections] which each man made on things which were important to him, and where he would be the loser if he judged badly, than in the cogitations of a man of letters in his study, concerned with speculations which produce no effect, and which have no consequences to him. . . .

. . . After spending several years in thus studying the book of nature and acquiring experience, I eventually reached the decision to study my own self, and to employ all my abilities to try to choose the right path.

René Descartes, *Discourse on Method*, trans. Laurence J. Lafleur (New York: Macmillan Publishing Company, 1956), pp. 3–7, 9–12, 14, 20–21.

This produced much better results in my case, I think, than would have been produced if I had never left my books and my country. . . .

PART TWO

. . . As far as the opinions which I had been receiving since my birth were concerned, I could not do better than to reject them completely for once in my lifetime, and to resume them afterwards, or perhaps accept better ones in their place, when I had determined how they fitted into a rational scheme. And I firmly believed that by this means I would succeed in conducting my life much better than if I built only upon the old foundations and gave credence to the principles which I had acquired in my childhood without ever having examined them to see whether they were true or not. . . .

. . . Never has my intention been more than to try to reform my own ideas, and rebuild them on foundations that would be wholly mine. . . . The decision to abandon all one's preconceived notions is not an example for all to follow. . . .

As for myself, I should no doubt have . . . [never attempted it] if I had had but a single teacher or if I had not known the differences which have always existed among the most learned. I had discovered in college that one cannot imagine anything so strange and unbelievable but that it has been upheld by some philosopher; and in my travels I had found that those who held opinions contrary to ours were neither barbarians nor savages, but that many of them were at least as reasonable as ourselves. I had considered how the same man, with the same capacity for reason, becomes different as a result of being brought up among Frenchmen or Germans than he would be if he had been brought up among Chinese or cannibals; and how, in our fashions, the thing which pleased us ten years ago, and perhaps will please us again ten years in the future, now seems extravagant and ridiculous; and I felt that in all these ways we are much more greatly influenced by custom and example than by any certain knowledge. Faced with this divergence of opinion, I could not accept the testimony of the majority, for I thought it worthless as a proof of anything somewhat difficult to discover, since it is much more likely that a single man will have discovered it than a whole people. Nor, on the other hand, could I select anyone whose opinions seemed to me to be preferable to those of others, and I was thus constrained to embark on the investigation for myself.

Nevertheless, like a man who walks alone in the darkness, I resolved to go so slowly and circumspectly that if I did not get ahead very rapidly I was at least safe from falling. Also, I did not want to reject all the opinions which had slipped irrationally into my consciousness since birth, until I had first spent enough time planning how to accomplish the task which I was then undertaking, and seeking the true method of obtaining knowledge of everything which my mind was capable of understanding. . . .

Descartes' method consists of four principles that place the capacity to arrive at truth entirely within the province of the human mind. One finds a self-evident principle, such as a geometric axiom. From this general principle, other truths are deduced through logical reasoning. This is accomplished by breaking a problem down into its elementary components and then, step by step, moving toward more complex knowledge.

. . . I thought that some other method [besides that of logic, algebra, and geometry] must be found to combine the advantages of these three and to escape their faults. Finally, just as the multitude of laws frequently furnishes an excuse for vice, and a state is much better governed with a few laws which are strictly adhered to, so I thought that instead of the great number of precepts of which logic is composed, I would have enough with the four following ones, provided that I made a firm and unalterable resolution not to violate them even in a single instance.

The first rule was never to accept anything as true unless I recognized it to be evidently such: that is, carefully to avoid precipitation

and prejudgment, and to include nothing in my conclusions unless it presented itself so clearly and distinctly to my mind that there was no occasion to doubt it.

The second was to divide each of the difficulties which I encountered into as many parts as possible, and as might be required for an easier solution.

The third was to think in an orderly fashion, beginning with the things which were simplest and easiest to understand, and gradually and by degrees reaching toward more complex knowledge, even treating as though ordered materials which were not necessarily so.

The last was always to make enumerations so complete, and reviews so general, that I would be certain that nothing was omitted. . . .

What pleased me most about this method was that it enabled me to reason in all things, if not perfectly, at least as well as was in my power. In addition, I felt that in practicing it my mind was gradually becoming accustomed to conceive its objects more clearly and distinctly. . . .

Descartes was searching for an incontrovertible truth that could serve as the first principle of philosophy. His arrival at the famous dictum "I think, therefore I am" marks the beginning of modern philosophy.

PART FOUR

. . . As I desired to devote myself wholly to the search for truth, I thought that I should . . . reject as absolutely false anything of which I could have the least doubt, in order to see whether anything would be left after this procedure which could be called wholly certain. Thus, as our senses deceive us at times, I was ready to suppose that nothing was at all the way our senses represented them to be. As there are men who make mistakes in reasoning even on the simplest topics in geometry, I judged that I was as liable to error as any other, and rejected as false all the reasoning which I had previously accepted as valid demonstration. Finally, as the same precepts which we have when awake may come to us when asleep without their being true, I decided to suppose that nothing that had ever entered my mind was more real than the illusions of my dreams. But I soon noticed that while I thus wished to think everything false, it was necessarily true that I who thought so was something. Since this truth, *I think, therefore I am*, was so firm and assured that all the most extravagant suppositions of the sceptics[1] were unable to shake it, I judged that I could safely accept it as the first principle of the philosophy I was seeking.

[1]The skeptics belonged to the ancient Greek philosophic school that held true knowledge to be beyond human grasp and treated all knowledge as uncertain.—Eds.

REVIEW QUESTIONS

1. Why was René Descartes critical of the learning of his day?
2. What are the implications of Descartes' famous words: "I think, therefore I am"?
3. Compare Descartes' method with the approach advocated by Francis Bacon.

5 The Mechanical Universe

By demonstrating that all bodies in the universe—earthly objects as well as moons, planets, and stars—obey the same laws of motion and gravitation, Sir Isaac Newton (1646–1723) completed the destruction of the medieval view of the universe. The idea that the same laws governed the movement of earthly and heavenly bodies was completely foreign to medieval thinkers, who drew a sharp

division between a higher celestial world and a lower terrestrial one. In the *Principia Mathematica* (1687), Newton showed that the same forces that hold celestial bodies in their orbits around the sun make apples fall to the ground. For Newton, the universe was like a giant clock, all of whose parts obeyed strict mechanical principles and worked together in perfect precision. To Newton's contemporaries, it seemed as if mystery had been banished from the universe.

Isaac Newton
PRINCIPIA MATHEMATICA

In the first of the following passages from *Principia Mathematica*, Newton states the principle of universal law and lauds the experimental method as the means of acquiring knowledge.

RULES OF REASONING IN PHILOSOPHY

Rule I. We are to admit no more causes of natural things than such as are both true and sufficient to explain their appearances.

To this purpose the philosophers say that Nature does nothing in vain, and more is in vain when less will serve; for Nature is pleased with simplicity, and affects not the pomp of superfluous causes.

Rule II. Therefore to the same natural effects we must, as far as possible, assign the same causes.

As to respiration in a man and in a beast; the descent of stones [meteorites] in *Europe* and in *America*; the light of our culinary fire and of the sun; the reflection of light in the earth, and in the planets.

Rule III. The qualities of bodies, which . . . are found to belong to all bodies within the reach of our experiments, are to be esteemed the universal qualities of all bodies whatsoever.

For since the qualities of bodies are only known to us by experiments, we are to hold for universal all such as universally agree with experiments. . . . We are certainly not to relinquish the evidence of experiments for the sake of dreams and vain fictions of our own devising; nor are we to recede from the analogy of Nature, which [is] . . . simple, and always consonant to itself. We no other way know the extension of bodies than by our senses, nor do these reach it in all bodies; but because we perceive extension in all that are sensible, therefore, we ascribe it universally to all others also. That abundance of bodies are hard, we learn by experience; and because the hardness of the whole arises from the hardness of the parts, we, therefore, justly infer the hardness of the undivided particles not only of the bodies we feel but of all others. That all bodies are impenetrable, we gather not from reason, but from sensation. The bodies which we handle we find impenetrable, and thence, conclude impenetrability to be an universal property of all bodies whatsoever. That all bodies are moveable, and endowed with certain powers (which we call . . . {*inertia*}) of persevering in their motion, or in their rest, we only infer from the like properties observed in the bodies which we have seen. The extension, hardness, impenetrability, mobility, . . . of the whole, result from the extension, hardness, impenetrability, mobility, . . . of the parts; and thence we conclude the least particles of all bodies to be also all extended, and hard and impenetrable, and moveable, . . . And this is the foundation of all philosophy. . . .

Sir Isaac Newton, *The Mathematical Principles of Natural Philosophy*, Book III, trans. Andrew Motte (London: H. D. Symonds, 1803), II, pp. 160–162, 310–314.

Lastly, if it universally appears, by experiments and astronomical observations, that all bodies about the earth gravitate towards the earth, and that in proportion to the quantity of matter which they severally contain; that the moon likewise, according to the quantity of its matter, gravitates towards the earth; that, on the other hand, our sea gravitates towards the moon; and all the planets mutually one towards another; and the comets in like manner towards the sun; we must, in consequence of this rule, universally allow that all bodies whatsoever are endowed with a principle of mutual gravitation. . . .

Rule IV. In experimental philosophy we are to look upon propositions collected by general induction from phenomena as accurately or very nearly true, notwithstanding any contrary hypotheses that may be imagined, till such time as other phenomena occur, by which they may either be made more accurate, or liable to exceptions.

This rule we must follow, that the argument of induction may not be evaded by hypotheses.

Newton describes further his concepts of gravity and scientific methodology.

GRAVITY

Hitherto, we have explained the phenomena of the heavens and of our sea by the power of gravity, but have not yet assigned the cause of this power. This is certain, that it must proceed from a cause that penetrates to the very centres of the sun and planets, without suffering the least diminution of its force; that operates not according to the quantity of the surfaces of the particles upon which it acts (as mechanical causes used to do) but according to the quantity of the solid matter which they contain, and propagates its virtue on all sides to immense distances, decreasing always in the duplicate portion of the distances. . . .

Hitherto I have not been able to discover the cause of those properties of gravity from the phenomena, and I frame no hypothesis; for whatever is not deduced from the phenomena is to be called an hypothesis; and hypotheses, whether metaphysical or physical, whether of occult qualities or mechanical, have no place in experimental philosophy. In this philosophy particular propositions are inferred from the phenomena, and afterward rendered general by induction. Thus it was the impenetrability, the mobility, and the impulsive forces of bodies, and the laws of motion and of gravitation were discovered. And to us it is enough that gravity does really exist, and acts according to the laws which we have explained, and abundantly serves to account for all the motions of the celestial bodies, and of our sea.

A devout Anglican, Newton believed that God had created this superbly organized universe.

GOD AND THE UNIVERSE

This most beautiful system of the sun, planets, and comets could only proceed from the counsel and dominion of an intelligent and powerful Being. And if the fixed stars are the centers of other like systems, these, being formed by the like wise counsel, must be all subject to the dominion of One, especially since the light of the fixed stars is of the same nature with the light of the sun and from every system light passes into all the other systems; and lest the systems of the fixed stars should, by their gravity, fall on each other mutually, he hath placed those systems at immense distances from one another.

This Being governs all things not as the soul of the world, but as Lord over all; and on account of his dominion he is wont to be called "Lord God" . . . or "Universal Ruler." . . . It is the dominion of a spiritual being which constitutes a God. . . . And from his true dominion it follows that the true God is a living, intelligent and powerful Being. . . . he governs all things, and knows all things that are or can be done. . . . He endures for ever, and is every where present; and by existing always and every where, he constitutes duration and space. . . .

In him are all things contained and moved; yet neither affects the other: God suffers nothing from the motion of bodies; bodies find no resistance from the omnipresence of God. . . . As a blind man has no idea of colors so we have no idea of the manner by which the all-wise God preserves and understands all things. He is utterly void of all body and bodily figure, and can therefore neither be seen, nor heard, nor touched; nor ought to be worshipped under the representation of any corporeal thing. We have ideas of his attributes, but what the real substance of any thing is we know not. . . . Much less, then, have we any idea of the substance of God. We know him only by his most wise and excellent contrivances of things. . . . [W]e reverence and adore him as his servants; and a god without dominion, providence, and final causes, is nothing else but Fate and Nature. Blind metaphysical necessity, which is certainly the same always and everywhere, could produce no variety of things. All that diversity of natural things which we find suited to different times and places could arise from nothing but the ideas and will of a Being necessarily existing. . . . And thus much concerning God; to discourse of whom from the appearances of things does certainly belong to Natural Philosophy.

REVIEW QUESTIONS

1. What did Isaac Newton mean by universal law? What examples of universal law did he provide?
2. What method for investigating nature did Newton advocate?
3. Summarize Newton's arguments for God's existence.
4. For Newton, what is God's relationship to the universe?

6 The Limitations of Science

Most seventeenth- and eighteenth-century thinkers regarded the discoveries of Newton and others as a great triumph for civilization. These discoveries uncovered nature's mysteries, provided a method for exploring nature further, and demonstated the capacity of the human mind.

In later centuries, further implications of the new cosmology caused great anguish. The conviction that God had created the universe for them, that the earth was fixed beneath their feet, and that God had given the earth the central position in his creation had brought medieval people a profound sense of security. They knew why they were here, and they never doubted that heaven was the final resting place for the faithful. Copernican astronomy dethroned the earth, expelled human beings from their central position, and implied an infinite universe. In the sixteenth and seventeenth centuries, few thinkers grasped the full significance of this displacement. However, in succeeding centuries, this radical cosmological transformation proved as traumatic for the modern mind as did Adam and Eve's expulsion from the Garden of Eden for the medieval mind. Today we know that the earth is one of billions and billions of celestial bodies, a tiny speck in an endless cosmic ocean, and that the universe is some twelve billion years old. Could such a universe have been created just for human beings? Could it contain a heaven that assures eternal life for the faithful and a hell with eternal fires and torments for sinners?

Blaise Pascal
PENSÉES

Few people at the time were aware of the full implications of the new cosmology. One who did understand was Blaise Pascal (1623–1662), a French scientist and mathematician. A devout Catholic, Pascal was frightened by what he called "the eternal silence of these infinite spaces" and realized that the new science could stir doubt, uncertainty, and anxiety, which threatened belief—as the following excerpts from his *Pensées* illustrate.

67. The vanity of the sciences.—Physical science will not console me for the ignorance of morality in the time of affliction. But the science of ethics will always console me for the ignorance of the physical sciences.

76. To write against those who made too profound a study of science: Descartes.

77. I cannot forgive Descartes. In all his philosophy he would have been quite willing to dispense with God. But he had to make Him give a fillip to set the world in motion; beyond this he has no further need of God.

83. We must thus begin the chapter on the deceptive powers. Man is only a subject full of error, natural and ineffaceable, without grace. Nothing shows him the truth. Everything deceives him. These two sources of truth, reason and the senses, besides being both wanting in sincerity, deceive each other in turn. The senses mislead the reason with false appearances, and receive from reason in their turn the same trickery which they apply to her; reason has her revenge. The passions of the soul trouble the senses, and make false impressions upon them. They rival each other in falsehood and deception.

194. I see those frightful spaces of the universe which surround me, and I find myself tied to one corner of this vast expanse, without knowing why I am put in this place rather than in another, nor why the short time which is given me to live is assigned to me at this point rather than at another of the whole eternity which was before me or which shall come after me. I see nothing but infinites on all sides, which surround me as an atom, and as a shadow which endures only for an instant and returns no more. All I know is that I must soon die, but what I know least is this very death which I cannot escape.

205. When I consider the short duration of my life, swallowed up in the eternity before and after, the little space which I fill, and even can see, engulfed in the infinite immensity of spaces of which I am ignorant, and which know me not, I am frightened, and am astonished at being here rather than there; for there is no reason why here rather than there, why now rather than then. Who has put me here? By whose order and direction have this place and time been allotted to me?

206. The eternal silence of these infinite spaces frightens me.

Pascal's Pensées, introduction by T. S. Eliot (New York: E. P. Dutton & Co., 1958), pp. 15, 23, 27, 55, 61.

REVIEW QUESTIONS

1. What was Pascal's reaction to the new directions in science?
2. In today's world, what developments in science and technology cause great concern?