SCIENCE AND RELIGION

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Religions have always been opposed to the bold flights of philosophers and men of science.

According to ancient legend, Prometheus was chained to a rock in the Caucasus Mountains by the gods of Mount Olympus because he sought to enlighten human minds. This myth is linked with the biblical tale of man driven out of the Garden of Eden for having tasted of the fruit of the tree of knowledge.

Religious persecutions have occurred in every age.

Democritus, the Greek philosopher, was driven out of Abdera, and Heraclitus banished from Ephesus. The Catholic Church imprisoned Galileo, tortured Campanella, and burned at the stake Giordano Bruno in Rome and Vanini in Toulouse. At the time of the Inquisition, it made five million human beings mount the executioner's scaffold or rot in its dungeons.

The Geneva Protestants burned at the stake Michael Servetus, a doctor and unorthodox theologian.

The Jewish rabbis excommunicated Spinoza, author of the admirable *Tractatus Theologico-Politicus,* in which he commented on the Bible as a freethinker, and forced his banishment from Amsterdam.

Descartes, architect of modern thought, left France in order to be free. For twenty years he took refuge in the republic of Holland, in order to escape persecution from the Church. He no longer wished to live in the "blind man's cave."

In recent years, Darwin and followers of Darwinism were condemned in court by Protestant Fundamentalists in the United States.

In a passionate speech delivered on January 15, 1850, before the Legislative Assembly, Victor Hugo interpellated the religious sectarians and flung the following challenge at them:

Whom are you against? I will tell you.
You are against human reason!
Why? Because it brings the daylight!

It may be said that every forward step of science causes religion to retreat. It may even be asserted that science denies God and religion.

When Napoleon received Laplace and congratulated him on his work on celestial mechanics, he asked the scientist why he had not spoken of God in his book. The great mathematician replied to the Emperor: "Sire, I have never had need of that hypothesis!"

All scientists could adopt as their own this famous remark by Laplace.

Between religion and science, one must choose.

Their conflict is in evidence throughout the history of human thought. At the very beginning of history, men divide into two groups: those who have confidence in the human mind, and that alone, to explain the world; and, in the other camp, mystics and religious-minded people who resort to extra-human explanations, to sentimental acts of faith.

The first, when they remain consistent, are materialists and atheists. The second are, in a variety of forms, advocates of idealism.

The first Greeks who tried to unravel the mystery of things spoke a materialist language. That is the meaning of the many different attempts to interpret nature which developed at the beginning of Greek thought. They were more mythical and legendary than really philosophical. Thales, Anaximenes, Anaximander, and the Orphics were the principal creators of those poetic myths which explained the origin of things in terms of the elements.

To Thales, water is the first principle from which everything arises by successive transformations. From the cloud in the sky beneficent rain falls, mingling with the vast body of nature and nourishing all its seeds. In a marriage union, the sky takes possession of the fertile earth, and begets grain and herds of animals. To Anaximenes, the first principle is the air – the ether, the wind, a vague immanent force agitated by primitive chaos, indistinct matter from which everything proceeds by separation. To the Orphics, the world was born of Love, the most beautiful of the immortals, Love, a force of nature subduing the hearts of men and gods. To still others, like Empedocles, everything was born of struggle, of war, mother and queen of everything that exists.

At a later period, attempts to think abstractly were substituted for these brilliant creations of the Greek imagination. There arose philosophers who looked to rational values in order to explain the universe. Leucippus and Democritus were among these first Greek philosophers, and like the myth- makers they declared themselves definitely materialists.

They conceived the world as a composite of very small material molecules which they called atoms. By alternately coming together and separating, these atoms determine the formation and destruction

of all things: of all bodies first of all; and also of the mind (or soul), which is made of the loosest, the most mobile and most subtle atoms.

Death is the separation of atoms. The gods too are composed of atoms just like mortals. They do not bother with the world, which is governed by strict determinism.

On the basis of this materialist conception, Epicurus, the great disciple of Democritus, taught three centuries before Jesus a moral code which was widely received in the pre- Christian world of the Greeks and Latins.

The aim of this morality was to assure man his happiness on earth. And Epicurus chose the physics of Democritus because it gave a solid basis to his moral code. For what are the fundamental obstacles to man's happiness? The fear of the gods and the fear of death. But the soul is mortal since it is composed of elements that separate. Hence death is not to be feared since it is nothing, and after it there is nothing. As for the gods, themselves mortal, they never participated in the creation of the world, which is eternal. They are not at all concerned with the affairs of the universe, of which they know nothing. Why fear them then, since to us they are as if they did not exist?

Freed of the fears of death and the even worse terrors of religion, man can live happily by cultivating his reason.

Morality counsels him to enjoy fully, but with moderation, the material, goods of this world. And the wise man's happiness is completed by friendship which links him with other men freed like himself from vain religious fears.

Epicurus' morality long attracted many of the human elite in Greece and Rome; the memory of the garden in which the philosopher taught his disciples was evoked by Anatole France, "a tranquil atheist," in one of his books. And all lovers of literature still admire the magnificent poem of the Latin poet Lucretius, *De Rerum Natura,* which exalts the system of Epicurus whom Lucretius considered the greatest benefactor of humanity.

In another direction, twentieth century physicists, following those of the nineteenth century, have borrowed from Democritus the thesis that matter is not infinitely divisible.

The English scientist Dalton assured the atomic theory of a scientific foundation. The atomic hypothesis, adopted by modern sci-

ence, is the one which best accounts for the inner structure of bodies.

What a tribute to the brilliant foresight of the Greek founders of materialism!

Completely opposed to these conceptions of Democritus and Epicurus, the great Greek philosophers, Socrates, Plato, and Aristotle, developed theories of spiritualism and idealism in the fifth and fourth centuries B.C. For more than a thousand years these theories were destined to eclipse the materialism of the first Greek thinkers.

For Democritus and the disciples of his school the soul, like the body, was composed of material atoms and all thought derived from sensations, *i.e.,* from impressions that the soul receives from objects through the senses. Plato on the other hand preached extreme idealism.

Spirit is absolutely distinct from the body. Over against sensations and illusory sensory perceptions, there exist general ideas, eternal types of transient things. These ideas have a real existence outside the material world. Reason coming from the gods, and not the body, is alone capable of making us know these ideas, which are the laws of thought, the models on which things are copied.

So the good, the beautiful, the true, and morality are not ideas coming from us, from our individual experience by way of the senses and experience. They are eternal realities. Bodies pass, they remain. They have nothing in common with matter. Matter is, to Plato, a blemish, an embarrassment, a waste. Ideas do not come from the body – the body is a chain and the sensory world is to the sour a prison, a place of punishment. We must absolutely separate spirit from the body, which draws us to the earth and keeps us there with soles of lead. The soul feels itself in exile in the world of the senses. It seeks to fuse with the absolute, with the pure idea which is out of the world. It wishes to flee the prison of senses, the prison of the body. One and immortal, it strives to get away from the focus of evil – the material world – in order to unite with the supreme idea which is God, eternal creator of ideas and personification of the good.

Thus idealism in its Platonist form was opposed to the materialism of the Epicureans. To idealists our ideas do not come from sensations. They are anterior to matter which is only a state of decay. To materialists sensation (modification of the body) precedes

thought which is linked with it and comes from it. It is not possible to conceive of a thought without a sensation and without a material brain which elaborates it.

The idealist conceptions of Plato and those, less absolute, of Aristotle won out even in the ancient world over the conceptions of Democritus and Epicurus. Plato's genius in dialectics, his rich imagination, and his language sweet as Attic honey contributed to the success of his philosophy. But it was particularly when Christianity began to develop and after it had adopted certain theories from Platonist idealism that materialism, in its primitive form, had to yield for many long centuries.

Christianity, born of the Judaism of the Prophets and the teachings of Jesus, was, above all, a moral code giving men rules of conduct. But it lacked a philosophy. The doctrines of Jesus were addressed, by his own admission, to the most downtrodden of creatures. They had not sought to probe the origin of men's ideas as had subtle Greek thought. So when Christianity spread throughout Greece and the Near East in the first centuries of our era, the Greek fathers of the Church, anxious to give Christianity a philosophy, borrowed from Plato his explanation of the origin of ideas.

They adapted Plato's method and his entire system to the demands of Christian propaganda. From Greek philosophy they retained such conceptions as that of the Trinity. They developed in a Christian sense Plato's theses on matter as a principle of evil and the body as a chain and prison for the soul. So it was that the idealism born of the fusion of pagan philosophy and the messianic dream of a tribe in Syria conquered the world, after Emperor Constantine installed Catholicism in the purple robes of rule.

During the closing era of the ancient world and all during the Middle Ages, the domination of the Catholic Church, now all-powerful, assured idealism of an unchallenged superiority. So it was until the Renaissance in the sixteenth century. But from that moment on, the ideas of materialism were championed by a number of vigorous minds, several of whom paid for their boldness with their lives. Since that time, materialist ideas have gone forward to the degree that the natural sciences have developed. They substitute their increasingly rational explanations for the mystical conceptions of Platonism and the childish legends of the Book of Genesis on the origin of the world. A struggle, often a merciless struggle, has been waged between the men of free thought and the intransigent devo-

tees of religion. This struggle is still going on, although the Catholic religion today accepts some scientific truths which but recently it considered blasphemous, and sanctions some discoveries which in ages past it condemned as mortal sins.

This is not the place to recall the high points in this long secular fight. Let us simply point out that the Montaignes, the Rabelais, the Molieres, the Gassendis, and the Saint-Evremonds refused to follow the religious doctrinaires. The seventeenth century knew numerous "libertines" who provoked violent attacks from Bossuet; and La Bruyere devoted a whole chapter in his *Characters* to denounce them. At the beginning of the eighteenth century, Fontenelle and Bayle continued in France this tradition of free thought. And after them came the Encyclopedists who boldly took a stand for frank and logical materialism.

Their names are well known: La Mettrie, Helvetius, d'Holbach. Diderot is the most brilliant and courageous representative of this group.

In the nineteenth and twentieth centuries, materialism spread far and wide with the development and application of scientific discoveries. And little by little even the accusations leveled against it in the course of history by idealism and the various religions have weakened.

For a long time, to be a materialist and declare oneself an atheist was considered degrading, vulgar, often criminal. But times have changed indeed. Many broad people's movements, numerous honest and disinterested scientists now advocate doctrines once held scandalous or offensive to personal dignity.

What is the position of materialism in our times?

How does it justify its refusal to support religious idealism and every conceivable form of idealism? Is materialism in a position to supply satisfactory answers to the many questions of morals, origins, and faith which arise in the consciousness of the most highly developed modern men?

Here we would like to give some of the reasons for materialism in our times, and to defend its claim to guide men's minds.

As we have seen, all idealists and religious people believe that spirit is absolutely distinct from the body, that it has nothing material. One of them has defined matter as "something stupid and devoid of thought." Consciousness is of an entirely different essence. But

then their difficulty, their stumbling block, is to explain the relationship of thought to the body.

How can thought, which cannot go outside itself, acquire knowledge of the body and of material objects which are outside it, which are of quite a different nature from thought?

Plato did not hesitate to assert that the soul lived another life before its life on earth. In this previous existence, it was able to contemplate ideas. Knowledge is thus memory of another world. It is a reminiscence.

Bishop Berkeley and the metaphysician Leibnitz explained that God had once and for all determined all relations between soul and body by a pre-established harmony. Malebranche, priest of the Congregation of the Oratory, asserted that the soul and body communicated by a vision in God.

God intervenes, on the occasion of each of our acts of will, to impress this movement or that on our body. Kant rejected such divine intervention in his theory of knowledge. To him, before experience, our mind is formed of a complex of relations or categories, like those of causality, space and time, which are in the mind's make-up and which it applies to the external world. But since this mode of knowledge is only relative to the forms of our mind, we do not know anything of the world in itself. It escapes us entirely; it is unknowable to us.

Materialism rejects these constructions of the mind, these products of a subtle and fanciful imagination, these "crotchets" as they were called by Frederick Engels who did not mince his words.

Materialism declares that the world is material. Contrary to idealism to which matter is only illusion and appearance, it asserts that matter exists/It has not been created by any god. Matter and its energy are eternal; they change, one into the other, Matter is a primary fact, a reality that exists objectively outside our mind and consciousness. The law of the conservation of energy was valid in nature before there were men who discovered it.

In the words of the physicist Max Planck, even if the inhabitants of the earth were pulverized to bits, the stars would still obey the law of universal gravitation. It is not we who create the external world. It forces itself upon us with the irresistible power of elemental things.

Sensation is at the basis of all our knowledge. It is born of our organism on the occasion of our experience with the external world.

It is produced in the brain. It is a reflection of matter. Thought would not exist if it were not preceded and accompanied by certain chemical modifications in our organism and in the brain. It cannot be produced without expending chemical energy.

Thought does not proceed without work, without fatigue. According to the scientist Le Dantec, there is equivalence between thought and work: No man has ever lived without eating, or thought without eating. Thought is bound up with the brain. It is not an entity separated from our body mechanism. It forms part of the material world from which it emerges.

Then what is matter? What are the modern scientists' conceptions of matter? Do they think that it is inert, passive, stupid? Do they see in matter the power of evil, of impurity, of darkness, a blemish and a waste? Not at all! They reject such fantasies.

To modern science matter is everywhere active and in motion. Contemporary scientists have adopted the theory which the old Greek materialist, Democritus, launched with the foresight of genius: namely, that the world is a composite of atoms. They have deepened and clarified the notion of the atom. Today they tend to admit that the atom is a solar system in miniature. Everything in nature breaks up into a composite of atoms endowed with eternal motion. Matter is active, even matter which seems the most inert. Atoms are centers of force. They impress on the ether wavelike movements which our senses translate into various sensations. This wavelike motion is endlessly transformed, and there is no essential difference between matter which extends thus and mind which knows the world from the starting point of sensation. Thought which is derived from these origins is a new quality of matter, one with its own actions and reactions. Nor is it any longer inert. It plays an immense part in the life of men. And in its turn, it transforms nature – to which it owes its origin.

This is the first basic difference between materialists and idealists. Here is a second:

Idealist and religious metaphysicians dispute the possibility of the human mind arriving at a knowledge of the laws of the world. They think that there exists an Unknowable which will always escape the human mind thrown back on its own devices. Reason, they say, is too frail, too weak to pierce the mystery of things. Man is nothing but an earthworm, a slender reed. Nature is a book closed to

him with seven seals. Man must abdicate, prostrate himself before God, before explanations given once and for all in the holy books.

But materialists and scientists are of quite a different mind. Thanks to the increasing perfection of the instruments they have created to broaden the scope of our senses, physicists, chemists, biologists, and astronomers are formulating the laws of nature in ever closer and more accurate terms. Already they have disclosed many of the ancient mysteries. Each day their progress decreases the so-called Unknowable which is only the unknown. Their confidence in the constant progress of science, their certainty that the human mind can arrive at objective knowledge of nature, is based on two arguments.

First, they now know enough about the composition of the bodies they study to be able to reconstruct them themselves. Nature produces chemical substances in vegetable and animal organisms. Today, chemists are able to produce the same synthetic substances as nature. To accomplish this, they must know the substances intimately and completely. Chemists have produced synthetic rubber, oil, sugar, fats, and numerous other substitutes. The list grows longer with each passing day. And electrolysis and catalysis have achieved real miracles.

Then too, scientists have succeeded in formulating laws that are universal in application. Their truth is verified and guaranteed by the *experience* of everyone, by the *practice* of all human life. This absence of contradiction endows them with an objectivity that is obvious to all minds which have not been distorted by a distrust of science and mystical prejudices. When Nicholas Copernicus asserted, after having proved it, that the earth is not in the center of the world; when Newton discovered the law of gravitation; when Huyghens developed his hypothesis of the wavelike nature of light; when Faraday laid the foundations of electrodynamics, they all believed that their conception of the universe conformed to reality! All the subtleties and gymnastics of Pure Thought will no longer prevent men from believing that a scientific law constantly verified in life by practice is a valid law.

But the mystics do not give up so easily!

They maintain that if human knowledge, after so many centuries of research, contradictions, and errors, has succeeded in setting up some laws that are still questionable and always subject to cor-

rection, there are some problems of origins and ends which it will never be able to answer.

Where does the world come from? How did it begin? What is the end, the aim of life? Only religion, acts of faith, or *élans* of the heart, it is said, can satisfy the demands of the mind and emotions in these questions.

Everything is simple indeed if one believes in a God who has created all things and is also an example of moral perfection. We are told: God has made the world the best it could possibly be, despite the evil which rages in it. He built it to serve man's ends; and man in turn should adore this perfect God. Similarly, justice will not be satisfied unless our soul is immortal, if it can live a future life in which the good will be rewarded and the wicked punished.

To these traditional "truths," solidly established for more than a thousand years, the waverings and uncertainties of science are counterposed. If one disputes these postulates of the appeasement of the human soul, we are told, the result is an irreparable void which science cannot fill.

Science can answer these objections with confidence.

Of course, the old religious myths offer apparently clear and simple explanations to the human mind. Once and for all to all believers in Judaism and Christianity, the Book of Genesis has formulated the whole truth about our origins. Later on, the Church councils established (forever, so it seems) certain dogmas which tradition – and also some persecution – has succeeded in instilling in religious souls. But who dares maintain today that he depends solely on these accounts of the Bible and the councils?

For two thousand years there has been an enormous accumulation of observations, experiences, and reasonings, permitting scientists to propose rational solutions for the problems of the origin and evolution of the universe. Their superiority over the naive and primitive explanations of the ancient world is explicitly admitted by religion itself, which is forced with each passing day to abandon positions formerly held in order to adopt, willy-nilly, those conquered by science.

When four hundred years ago the Polish astronomer, Nicholas Copernicus, published his book, *Revolutions of the Celestial Worlds,* he opened the doors to the modern world. Before him humanity had for 1300 years adopted the system of Ptolemy, according to which the round earth was in the center of the universe and the other celestial

bodies revolved around the earth. Copernicus disproved the theory of Ptolemy, showing that the sun, not the earth, was in the center of the universe and that the earth was only a planet like the others. What an upheaval! The biblical conception of the creation of the world was demolished. And the religions of Western Europe tried in vain to shut the mouths of scientists who proceeded to draw conclusions – anti-religious conclusions – from the discovery of Copernicus.

After Copernicus' great contribution, there arose mathematicians, astronomers, chemists, physicists, and biologists who helped formulate the present scientific conception of the origin and evolution of die universe. Another giant step forward was taken when, after the discovery of Copernicus, Newton wrote his *Principia* in which he developed his theory of universal attraction which Laplace considered the loftiest creation of the human mind. Then came the famous hypotheses of Kant and Laplace himself. Although superseded by scientists who have come after them, they have made it possible for us rationally to reconstruct the formation of our solar universe.

Geologists have been able to reconstruct the history of our planet. They have noted its four eras (primary, secondary, tertiary, quaternary) with their essential characteristics. They have been able to give an approximate date for the advent of each of these epochs. They have been able to determine the era in which life appeared on earth. They have been able to make important advances in explaining the influences under which this decisive phenomenon occurred. They have determined the forms in which the first plants and animals probably appeared. Darwin proved that all the forms of plant and animal life have a common origin. His central thesis was that of natural selection, which acts by accumulating slight successive variations, favorable to the individual's struggle for existence. Some of these variations are transmitted to subsequent generations. Thus the development of plant and animal species is explained, not by independent creation as in the holy books, but by heredity with gradual modifications. Later biologists enriched our knowledge of the origin of species, indicating its basis in genetic changes. Hence the evolution of the different species and the emergence of man are explained without resorting to any mysticism.

In the nineteenth century, Darwin dealt scientifically with the origin of living species. The American, Morgan, studied in the light

of science the beginnings and transformations of primitive human societies.

He showed that at the outset in these social formations into which human beings were grouped, the woman-mother played the most important part. The first human tribes, the first gentes or families, were organized around the life-giving mother and, in accordance with laws, dominated by the role of the mother. A mass of historical data indicates that the matriarchate was the first social group among human beings. Morgan proved under what influences the power of the father, of the male, replaced that of the mother and the patriarchate supplanted the matriarchate. And as society evolved, the matrimonial family replaced the patriarchate, the best examples of which are to be found in Roman and Chinese society.

Morgan's discoveries confirmed Marx's and Engels' conceptions. These explained with unrivaled clarity and dialectic power how the class-state was born in primitive social groups. They showed that from its very beginnings human history has been dominated by economic necessities and by the class struggle which is still going on over most of the earth. They showed how human societies went in turn from primitive communism to slavery, then to feudalism, and then to capitalism. They proved that the transition from one type of society to another results from a change in the modes of production. And it is because in our twentieth century production has become increasingly social and collective that communism is being increasingly espoused by mankind.

Thus, communism is linked up with the entire scientific development of humanity. It is the peak of human development.

So science by its own resources has been able to explain the origins of the world and the reasons for the general evolution of men and things. Without resorting to the hypothesis of a divinity, it can answer all the questions that the theologies and idealisms pretended to solve. It is therefore not accidental that honest scientists have been led by logic and integrity of thought to profess atheism. The biologist Le Dantec is one of those thinkers with an incorruptible conscience determined to follow science as far as it leads those who believe in it.

Educated in the school of Pasteur, he pursued his scientific studies with enthusiasm and joy; and the search for scientific truth filled his life. Moreover, he could no longer tolerate those who sought to make of science "the servant of theology."

No, there is nothing above science, nothing but childish dogmas, contradicted by all the discoveries of man's genius. In a book on atheism (that is, in fact, its title), Le Dantec assailed the concept of a God creator of the universe.

Religious believers hold that God is all-powerful, that he is entirely free, but at the same time they cannot deny that nature is governed by fixed laws and determinism. Then contradicting themselves, they admit the existence of miracles. From the fact that the physical world is ordered and harmonious, they infer the existence of an intelligent being who has built it. For, they say, when one sees a clock, one is forced to think of the clockmaker. A bad comparison! For the clock- maker did not create the various parts of the clock; he only arranged them. And reason only ends in making God an architect, a demiurge, not a creator. Besides, if one could admit that God himself created the universe, that would only shift but not dispel the difficulty. He himself, whence does he come and who created him? One mystery has been substituted for another.

Furthermore, why admit that the world was created? The world need not have had a beginning. Science shows that matter and energy are conserved and transformed without end. Will it be said that order in the universe, the strict rules governing the motion of the stars, the harmony among the various parts of the body, point to final ends and a divine intelligence creating order?

But there is no finality: It is too easy to make fun of finalities in the manner of Bernardin de Saint-Pierre. There is adaptation of beings to things. Man, like the other beings, is the result of a long evolution. This evolution has been going on for millions of years; and during this period, multiple combinations have characterized this adaptation of beings to things. Some of these combinations have a relative stability for *a* time.

Man has been able to formulate the laws governing world phenomena which are bound together by universal determinism. But in nature, where everything is motion and change, no immobile body has ever been set in motion by the action of something immaterial.

In reality, the idea of divinity is solely subjective and anthropomorphic. Man has endowed God with his own attributes. He has created God in his own image. But on what has this presumptuousness been based?

Over one hundred fifty years ago, Immanuel Kant demolished the four traditional arguments ostensibly proving the existence of God. He demonstrated the absurdity of so-called rational theology. Kant's arguments are still valid today.

Marx, Engels, and their successors, Lenin and Stalin, showed clearly how religious notions originated. Religions are products of the human brain. They are only man's projection, outside himself, of his own consciousness. In primitive societies, in which man is dominated and crushed by the forces of nature, he deifies these forces, as was the case among the first pagans. These products of his brain, projected thus outside himself, seem later on to be endowed with a life of their own. Later, in societies divided into classes, the exploited class, unaware of the causes of its subjugation, attributes it to an unknown force which it calls a God.

History teaches that religions are social phenomena changing with changes in men's living conditions. Polytheism, monotheism, Catholicism, Protestantism – all correspond to various periods in the evolution of history. It has been possible to ascertain the rules and stages of these modifications in the various religions which men have adopted.

In our time, the ruling classes are interested in maintaining religions in order to safeguard their privileges. The bourgeoisie in power makes use of them in order to blind the masses. They are an opium for the sufferings of the oppressed. The bourgeoisie wants religion for the people. It tries to keep alive religious traditions, which have always been conservative, retarding forces. But religions will not be eternal safeguards of capitalism; already the latter has lowered them to the status of brakes on progress.

More and more modern scientists are adopting the conclusions of dialectical materialism. Materialism emerges strengthened from each of the new discoveries. It was born of science, of observation of nature at the very outset of human knowledge. It was an expression of science at each stage of progress. It was therefore natural for it to assume new aspects and to be modified as scientific methods and discoveries were themselves modified. Materialism today is not formulated in the same terms as in the time of Democritus, nor even in the time of Descartes or Diderot. Its content has become much richer since the prodigious development of science in the nineteenth and twentieth centuries.

In the eighteenth century, the natural sciences were still quite undeveloped. The world appeared to be a machine governed by the laws of mechanics. Buffon alone had just begun to formulate some very new and profound ideas on evolution. That is why Diderot's materialism was mechanistic. That of our own times has become dialectic. That means that the idea of evolution, of constant change, of eternal becoming, has definitely supplanted static and rigid concepts of things. Reality is not fixity but change. Everything is motion; everything is also development. Everything is action. "One never bathes twice in the same river." That is no longer a poetic expression, as it was to the ancients; it is scientific truth, completely verified and universal.

Thus dialectics teaches that at each instant in time and in each point in space something is born, and evolves, something dissolves and disappears. What appears stable has already begun to die; and from its death life is born. It is an endless process of motion.

This process of eternal change in things obeys rules which are not those of Aristotle's logic. Since Aristotle, the principle of contradiction has dominated the reasoning of philosophers: "A thing," they said, "cannot at the same time be and not be." But it can! Being contains its opposite within itself. It is itself and its opposite. The contradiction it contains is resolved in the process of becoming.

Essentially, nature is appearance and disappearance. Everything evolves. But to evolve means to disintegrate, to begin to disappear. Life contains death within itself. It comes to birth after an intense struggle with its opposite. What is prepares what will be, prepares that which will make it disappear.

Take, for example, biology. It teaches us that every human organism is a structure of cells. The cell is the unit from which, by multiplication and differentiation, all organisms are born and grow. Thus, every human being has been at a given moment the size of a cell a fraction of a millimeter small. Then he grew to become a composite of billions of cells. Every cell is active, not inert; it is in constant motion. It is the seat of the most powerful physicochemical actions. It is ceaselessly in the process of destruction and rebuilding. Life is not what the idealists thought it was: an immaterial principle quickening matter. It is a process of antagonisms in action.

If we inquire of the physicists and chemists, we get equally revealing answers. They show us that physical bodies too are not inert

but constantly evolving; that they change, one into the other; and that their qualities, diverse in appearance, are the result of previous quantitative changes. This truth was established around 1850 as a result of discoveries by the English physicist Joule and by five other scientists who, without knowing each other, formulated at almost the same time the law of the mechanical equivalent of heat. Heat is nothing but motion; sounds, color, temperature, electricity, magnetism, they are all motion and lead back to motion. Upon analysis we find that they are only vibrations, waves, oscillations, which are born of each other and which, under certain conditions, change into each other. A larger or smaller quantity or intensity of vibrations – and we obtain a change of quality.

All chemistry also proves that qualitative changes in bodies are reduced to quantitative changes – this is even indicated by the formulas for each of the bodies.

Every change in nature is therefore due to certain modifications of a quantity of motion. At one moment of progress, an object with a new quality is created. Quantity has been transformed into quality. Moreover, the ceaseless transformations in bodies do not occur in a slow, gradual, and continuous manner but brusquely, explosively. It is to the credit of the German physicist, Max Planck, that he buttressed this general truth with his famous *quantum* theory. He showed that a source of light does not give out its vibrations in the continuous fashion of a bell or tuning fork; it emits them by jolts or jerks. A bulb throws out a flow of energy, then another, so quickly and in such great quantities that one has the impression of a continuous flow of light. Planck calls these bundles of energy *quanta.*

It is the general and profound rule in nature always to proceed thus by leaps. Dialectical materialism has not failed to adopt that rule.

It goes without saying that this tested method of dialectical materialism applies not only to the study of the physical sciences. Societies are also in nature, and are part of it. They are born, live, and evolve according to the laws revealed by the dialectic method.

Idealists believe that abstract ideas guide the world. According to them, every people is born with a spirit of its own. This spirit of the people, these so-called innate ideas, are the source of all its institutions and culture. Man bears within himself, before he undergoes any experiences, concepts of morals, of the good and the just.

Here too idealism does not take into account life itself, the material conditions of human and social activity.

Materialism, on the contrary, looks for the reasons for the evolution and progress of societies, not in concepts of the imagination but in the concrete history of humanity. History is its teacher, the true science of society. It is the science of sciences; and it is not a trifling "guessing" science, as the dealers in metaphysical abstractions contemptuously say.

History shows that social phenomena, like other phenomena, are eternally changing; that they are constantly being transformed. That which appears stable is destined to die under the influence of contrary forces. The present is explained by the past, in which it was already contained. One cannot understand it unless one knows whence it comes.

In each human group, the mode of production of material goods conditions social changes. Marx proved that with masterly force. For one must first live and produce in order to live. But in order to produce, one needs more or less rudimentary or more or less perfected instruments. The progress of instruments of production has a determining influence on the march of historic events. It is also the mode of their possession which fundamentally modifies relations between human beings.

In the course of the history of human societies, what was the history of the means of production? Who were the possessors of these instruments of human labor? When one is able to reply concretely to these questions, one understands the meaning of human evolution and the laws of progress, the meaning of the social process.

The invention of the watermill, the windmill, the rudder, the plow with an iron plowshare, the bellows-forge, the collar resting not on the neck but on the shoulders of the horse, gunpowder, the steam engine, the spinning jenny, the locomotive, the dynamo, the internal combustion engine, the automobile, the airplane, and the radio exerted a decisive influence on the history of societies. History proves with a wealth of examples that men's conceptions and the forms of their societies have been modified as a result of this material progress, and not as a result of certain abstract ideas or religious and metaphysical systems. These systems of beliefs have been altered at the same time as the material conditions of life created by the new machines have altered.

Men think differently when they work solely with their hands in a small workshop and when they are together with thousands of other workers in a large factory equipped with the latest and most complicated machines which make labor a social act common to many men. Productive forces are changeable: They were of one type in the epoch of slavery, of another type in the epoch of feudalism, and quite different in the period of trusts and highly concentrated capitalism. And history is not merely the action of conquerors and kings, but, in the last analysis, of producers of goods which men can use.

It is easy to note in the long history of societies "the application of the rules of the dialectic method." It is from the death of a regime that is born the social force which refutes it and which it nevertheless bore within itself. Capitalism was born and developed within feudal society. Then it did away with feudalism and the bourgeoisie replaced the feudal nobility in power. In the same way, after a century and a half of domination, capitalism has created the powerful class of the proletariat, strengthened each day by the progress of machines, by the concentration of capital, the multiplication of expropriated members of the middle class, and the flight from the countryside. This proletarian class will replace capitalism, which carries within itself the germs of its death.

Finally, the history of human societies also teaches that the passage of one social form to another does not occur by slow and continuous transitions but as a result of struggles and revolutions. History is full of attempts at revolution which one day allow the new organization to replace the declining one doomed to destruction because of its inner contradictions.

What is the inner contradiction of capitalism? It is the following: Under capitalism, the mode of production of material goods is social, collective; while the ownership of the instruments of production has remained private. Hence repeated and chronic crises, hence world wars; and wars hasten the end of capitalism which bears war within itself "as the cloud bears the storm."

Since the time of the Greeks and Romans, through the Middle Ages and the ensuing centuries, history is marked by these constant class struggles and profound social shocks.

Here as elsewhere, nature acts by leaps, jerks, revolutions.

Before finishing this incomplete sketch, we must reply to the unjustified reproaches leveled against materialism.

Remember that for a long time materialists and atheists were excommunicated by society and even treated as criminals. We have seen that in the ancient world, the Middle Ages, and the eighteenth century, they aroused indignation and had to forego, under penalty of death, an open expression of their opinions. Even during the French Revolution the disciples of Rousseau's deism condemned the atheists and sent them to the guillotine. Today logical materialists are freer to talk, write, and spread their ideas. But what accusations are made against the supposed consequences of their doctrines!

They are accused of reducing man to the level of a brute, of denying morals, of denying spirit, of checking the *élan* of souls, of destroying imagination and poetry. It is said that they undermine the foundations of social order; that they give free rein to all passions and the most evil instincts; that they take away from man his individualism, his nobility, his grandeur; that they plunge humanity into despair.

Materialism is called a "base and dull" idea and described as "coarse," "sordid," and "barbarous."

The time has come to put an end to these warped opinions, the fruit of stubborn old prejudices of idealism and mysticism.

There is one category of materialists which it seems absurd to accuse of immorality. These are the scientists. We have already mentioned the example of the physiologist Le Dantec. We could summon up the names of many scientists past and present whose lives are models of the highest human virtues. How many heroes and martyrs of science there are among them! Their lives offer the finest testimonial of disinterestedness and spiritual nobility. How many scientists we could quote who did not wish to profit by their discoveries and get rich from them! How many have preferred the intimate joy of their researches to the mad rush for profits which is the general rule in the capitalist system!

On a higher level, it may be affirmed that the practice of science teaches of itself the most rigorous honesty and absolute intellectual integrity. It demands careful observation, respect for facts, truthfulness, surrender of any accepted hypothesis once the facts have contradicted it. Is not that an aspect of the highest morality?

On the other hand, there are very many materialists in the socially disinherited classes, among workers and artisans who love their craft to a fault, among revolutionary workers always ready to

sacrifice for the ideal they have espoused. Those who have come close to these workers have always paid tribute to their courage, their energy, their personal disinterestedness, as well as to their thirst for knowledge and their constant efforts toward progress.

They furnish so many examples throughout history! Just think of the *sans-culottes* of 1793, the republican workers of June 1848, the Communards who knew how to die defiantly! Recall the fighters in the recent war in Spain and the men of the International Brigades who went to their defense! Remember all those who but recently, in all the countries of Europe invaded by the Nazis, fought to the death against the crimes of the Gestapo! And what shall we say of the spirit of sublime sacrifice of the peoples of the Soviet Union who suffered such a long and terrible blood-letting in order to safeguard the freedom of all the peoples of the world! No, all of these had no need of a religion to live and die in honesty, duty, and honor. They raised morality to its peak. Those capable of dying for a great human cause in order to assure future progress cannot be compared with the vulgar person who acts under the pressure of momentary interests or in the fear of hell or some heavenly policeman.

We must also refute another accusation made against materialism. It is charged not only with lowering morality until it is destroyed, but also with denying spirit by asserting that it is linked with matter and subsidiary to it.

The materialist should not find it difficult to reply to the idealists and religious-minded on this point. For they are the ones who limit spirit, they diminish it by trampling on human reason and declaring it incapable of meeting the demands of knowledge. Religions keep on telling men that only a divine revelation will allow them to clear up the essential problems posed to their consciousness. All idealists down to Bergson have never stopped criticizing reason and science. They humiliate reason and science, scorn them, fight against them in favor of mysticism and instinct. Materialists, on the other hand, have confidence in the progress of science, product of oft-decried reason. We are therefore justified in asserting that it is idealism, not materialism, that injures spirit. Materialism recognizes that science and reason are the only sources of human knowledge and that there are no problems which they will not some day be able to solve!

The objection is raised that human science, limited by its very nature, is incapable of giving man certain *consolations* and certain

hopes for the other world, which sentiment requires. In this connection, the words of the great Pasteur himself are quoted:

> "I want to raise myself above the doctrines of materialism. I do not want to die like a bacillus. Immortality of the soul is a consolation, a risk to be run."

No doubt certain scientists, including even some of the greatest, are free to show how inconsistent and illogical they are. They may declare themselves mystics in their extra-scientific life, while all the consequences of their science lead them to materialism. But then they obey influences in their social environment, prejudices in their circle, vulgar bourgeois desires for tranquility, and sometimes (this is true of some scientists) demands of their own class interests.

As one well-known scientist said: "If I held truth in my hand, I would see to it that I did not open it, so as not to disturb the existing order!"

Then there are others who used to make no bones about their disbelief in religion – until influenced by class interest, they adopted militant Catholicism on the pretext of saving society. There are quite a few thinkers of this ilk.

But there are also numerous scientists, logical and of genuine integrity, who guide their pure and worthy lives according to their scientific convictions. These men seem to me higher guarantors of true morality. They find in their intellectual courage, in the accomplishment of their task as seekers, the "consolations" which others look for in fables or myths that violate reason and science. How many of them, in the sixteenth century for example, preferred to be burned alive rather than renounce their ideas and accept prevailing falsehoods.

All these men could quote the words of the ancient sage:

> "The impious one is not he who turns away from the gods of the crowd. It is he who clings to the idea which the crowd has of its gods."

Finally, certain slanderers now repeat: "Materialism and science do not allow for imagination, beauty, or poetry."

This accusation is just as futile as all the others!

Is there a poet, including even Homer, who opens vaster, more attractive, and more inspiring perspectives to the imagination than contemporary astronomers, physicists, chemists, and biologists? For

our weak and infirm senses they have substituted instruments whose scope and accuracy are almost infinite. In so doing, they have revealed to us mysteries and beauties of the invisible which even the most gifted artists of the past did not suspect.

As our eye sees it, the universe is a black vault dotted with several thousand brilliant points that shine by night. To the ancients, the earth floated flat as a pancake on the waters of Okeanos. Above it was a crystal sphere strewn with golden nails that were the stars. That was their little universe as it appeared to their senses. Moreover, they believed that the world had been created by a caprice of the gods in order to serve man's needs. Animals, plants, everything in the world had been taken out of the void solely for our use. Down through the ages how many childish pages have been written about this feeble theory of finalism!

But from Copernicus to our own day, astronomers have come with their powerful telescopes, and they have done away with such puny visions! The reality with which they have replaced ancient fables is supremely inspiring to the imagination of poets and artists. It evokes the infinitely great. The universe is no longer the tiny planet, earth, with its ceiling beyond which trial balloons of the scientists have already reached. The universe is an infinite space which can only be measured in millions of light-years. It is a mass of incandescent stars, a hundred million suns held together by the power of attraction. It is the nebulae formed of millions of stars, each one of which is nothing but a tiny island in the infinite universe. Their light travels at 186,000 miles a second and it takes hundreds and hundreds of years for this light to reach the earth. And the radiations of these suns have awakened life on our planet, a grain of dust suspended in this abyss! This grandiose structure will one day find a Lucretius. But who dares assert that it limits or cripples contemporary imaginations?

The astronomers acquaint us with the infinitely great. Biologists bring us in contact with the infinitely small. Armed with their electron microscopes, they prove to us the existence of living beings tinier than the boldest flights of the imagination can conceive. Their instruments, enlarging objects more than forty thousand times, acquaint us with beings endowed with an intense life measuring only six-millionths of a millimeter and possessing differentiated parts. In the depths of such a microscopic world life was born. Perpetual struggles between billions of these tiny animals led to the most

highly developed human beings, of geniuses creating the most striking masterpieces! Does this scientific view of things destroy all the work of the imagination and clip the wings of all poetry? Does not the theory of evolution inspire emotions? Some pages of Darwin are worthy of the greatest poets.

Geologists furnish us with the proof that there is no hard and fast boundary between the living and the non-living, between minerals, animals, and plants.

Rocks are in part the result of the constructive power of animals and plants, many of them of delicate and subtle structure, who have been working at them for hundreds of millions of years. Sponges and corals have built enormous constructions in the tropical seas. Certain of these rock-building animals, such as the radiolaria which form colorfully striped jaspers, are very beautiful microscopic jewels. No artist has ever sculptured more splendid forms.

Then come the physicists and chemists who take us through marvelous adventures. They too confirm for us that matter is everywhere active, however passive and motionless certain of its forms may seem. Since Dalton, the atomic theory has been unanimously accepted by all scientists: Matter is not infinitely divisible. But what is the make-up of the atom?

Before Crookes and the Curies, it was thought that the atom was a fixed, rigid, indestructible ball. After them, and especially after Rutherford, it is acknowledged that the atom comes close to being a solar system in miniature. Myriads of tiny grains electrified with negative charges, the electrons, are the planets which turn as if around the sun, around a nucleus with a positive electric charge. Nuclear physics is born.

For centuries, the radium discovered by the Curies has been ceaselessly giving off energy by radiation, without any outside source. It is luminous in darkness. It gives out a heat that burns severely. And – here is the miracle! – one gram of radium has the energy of three thousand tons of coal. One gram of radium gives forth every second 36 billion atoms of helium traveling at over twelve thousand miles a second. At present, physicists have succeeded in splitting atoms, thanks to bombardment by millions of volts of electricity. They hope to tap the prodigious reserves of energy locked up within the atom. Thus, one atom is a mine of wealth so abundant that one grows dizzy at the thought. If humanity succeeds in capturing this wealth, it will have energy for nothing. We will be able to

close the coal mines and oil wells. What a dream! Courageous scientists have undertaken to realize it. After the destructive atomic bomb, let us hope that mankind will use the splitting of atoms for more constructive human ends.

Already we have gone beyond the conceptions of the alchemists who sought to transmute base metals. In 1934, Joliot-Curie disintegrated a nucleus of aluminum and changed it into phosphorus. Centuries ago, he might have been burned at the stake. Today he is made a member of the Academy of Sciences!

What poet will sing the epic story of radioactivity?

Who will glorify the genius of Faraday who discovered induction; or Hertz who achieved the synthesis of light and showed his immediate successors the road which led to one of the most marvelous inventions of our time, the radio?

Reality as revealed by the twentieth century physicist is a thousand times more suggestive than all the systems and constructions of the most fertile imagination.

The scientists of our day have a bolder imagination than those ancients who were thought to be inspired by the gods of Olympus. And think what it will be in the future! Hundreds of years hence Prometheus unchained will have infinitely enriched the treasure-house of human knowledge!

No! It is wrong to assert that poetry disappears as science gains the upper hand over the myths and legends of religions.

Materialism is the philosophy of the Communists who believe in science and its application. Science alone can explain the world; it answers all the needs of the heart as well as of the mind. Every day it clarifies men's minds more completely. No one can set a limit to its progress.

A number of religions still vie with each other to guide the human race. There are said to be 530,000,000 Christians (Catholics, Protestants, Orthodox); 500,000,000 Buddhists; 230,000,000 Moslems; 210,000,000 Hindus; 10,000,000 Jews; 100,000,000 pagans. Therein, according to Onésime Reclus, lies the strength (more apparent than real) of the various religions.

Communism does not choose among them. We know that their role was and still is immense. Communism teaches neither scorn nor hate for these ancient forms of men's thought before science. It recommends that we study their origins and history in order to understand them. It will then be found that our present is bound up

with the past, that many old ideas have survived in men's minds, and also that, despite appearances, there is a continuity of one culture to another.

Communism bases itself on man: real, concrete, living, thinking, suffering man. Man and his destiny – that is the sole aim of the efforts of communism. There are some two billion human beings scattered over the earth. The historic role of communism is to guarantee to each and every one of them freedom, joy, and the complete development of his physical and moral well-being. This is for all men whatever they may be, wherever they come from. "If the city is not open to all," said Michelet, "I shall not enter it!" We want to wipe the tears from every face. Science gives man the means to do that.

To usher in a social order in which this final goal will be attained is humanity's higher moral law. It is the "categorical imperative" of our era. For after seventy centuries of religious discipline, including twenty centuries of Christian teaching, man is still a wolf to his fellow man! Nothing can conceal such a demonstration of impotence. Where religions have failed, science comes forward to achieve a human civilization worthy of the name.

Our philosophical doctrines are rooted in French traditions. We are the sons of the Encyclopedists. We remain faithful to their materialist conceptions, to their desire for man's material and moral progress. But since the appearance of the Encyclopedia around 1760, almost two hundred years have elapsed. Three outstanding facts dominate these two centuries:

Physical and natural sciences have made great advances.

The applications of science have changed the face of the world.

The history and evolution of human societies have been studied scientifically.

The guides of modern man have appeared on the scene under the influence of these three important events. They pursue the same aims as the Encyclopedists but with new means adapted to the further development of knowledge and techniques.

These leaders of men are: Marx, Engels, Lenin, Stalin.

They devoted themselves to a thorough-going study of modern capitalist economy. They have marked out its origins, disclosed and laid bare its inner mechanism. They have followed it in its growth, in its successes and magnificent achievements. They have also revealed the causes of the periodic crises which shake capitalism.

They have perceived the contradictions which condemn it to die as the societies which preceded capitalism have died.

Marx and his successors have thus created the science of socialism based on the strict observation of contemporary reality. They have clearly shown by reasoning and accumulated facts that everything impels the present system toward socialist and communist solutions.

Already the appeal of these innovators has been listened to by millions. Their realistic words have echoed in the farthest corners of the earth. The oppressed and disinherited have rallied around them in increasing numbers; so have all modern men of good will and clear intelligence. Each day facts confirm the correctness of their teachings.

Without bothering about the slanders and attacks leveled against them by those who are interested in perpetuating the past, ever greater and more militant masses of human beings recognize the truths of materialism and communism.

Having understood these truths, they fight with all their might to bring about a new society solidly based on science. They fight with enthusiasm to unite all human beings and all nations in a system based on liberated labor and peace.

As for us, we have resolutely set out on the road traced by the founders of communism. There is no turning back. The experience of an entire lifetime confirms me in the belief that there is no other way out for suffering humanity weighed down by the nameless afflictions of dying capitalism.

Communism is not only essential for the progress of human civilization. It is also a demand of reason enlightened by modern science.