AN INTRODUCTION TO CONTEMPORARY KNOWLEDGE

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INTRODUCTION

The purpose of this book is to give you, the reader—and I am assuming that your age lies somewhere between fifteen and eighteen—a picture of the world in which we live.

I have ventured to mention your age because your mind is, I think, at its springtime, when for a brief period it blossoms into flower. Up till now you have been interested only in concrete, immediate things, in games and friends and examinations, in bits of matter and how they behave and in the way machines work. Presently you will go out into the world, marry, take a job or follow a profession and, once again, the span of your mental horizon will contract, for now your interests will be concentrated upon the problems that the world will press so hardly upon you, upon getting a house and bringing up your family and making both ends meet. But now, for a few short years comes an intellectual breathing space, when the interests proper to the child are outgrown and the cares of the man are still in the future. For a short period a proportion of young men and women of about your age whose minds are keen and vigorous feel and follow the impulse of disinterested curiosity. By this I mean that they want to know about matters that do not concern them *personally*, and which can neither serve their *personal* purposes nor conduce to their *personal* advantage.

Here we are, some 2,000 odd million of us on this planet, the earth—and our numbers by the way are growing very fast; much too fast for our available sources of food supply—pitchforked into life without so much as a by your leave. We have to make the best job of living that we can; but we have had no previous experience of living and no time in which to practise, so that being alive is like giving a public performance on, let us say, the piano and having to learn the instrument as you go along.

Now, it seems to me that it is when one is about your age that one first begins to ask the sort of questions with which

this book is concerned; questions such as, "What is the physical world like" and—since it must be made of something—"of what sort of materials is it composed?" "What are the point and the purpose of being alive?" "What is the origin of life?" "How did the human adventure begin?" "What has been its past and what is likely to be its future?" One wants, in other words, to get some sort of picture—"perspective" is, perhaps, the better word—of the whole so that, looking down the perspective, one can determine one's own place within it and get some idea of one's relation to the whole and to the other people and things which go to make up the whole. It is just possible that the possession of such information might enable one to answer such questions as, what are the things in our life which are really valuable, so that it is worth sacrificing other things to get them; or, what are the things that matter and go on mattering in a sense in which most things matter only for a short time or, perhaps, mattered once—peg-tops, for instance, or marbles or toy railways—and now matter no more! One might, in short, get an idea of what one is "really after." To change the metaphor, what one wants, I suggest, is to be able to see the wood and not just a multitude of individual trees. Now, the attempt to provide just such a perspective is traditionally the job of the philosopher and this, then, is primarily a book of philosophy.

The task was never so difficult or so necessary. It is difficult because there was never so much to know; it is necessary because there was never a time when men were able or permitted to know so little of it. Let me explain. Two hundred years ago it was possible for a man to know in broad outline all that there was to know about science and philosophy and history and literature and religion. There was not too much for one man's mind to take in and in the 18th century such men as Hume, the philosopher, Gibbon, the historian, and Voltaire, the French all-rounder, knew most of what was worth knowing. But to-day there is too much for any *one* mind to take in and, more particularly, there is too much science. One mind simply cannot master it all. Now the

fact that there is so much to put in, more in fact than you ever *can* put in, and, still more, the fact that there is so much that you must leave out, makes it extremely difficult to paint the picture and construct the perspective. For all the time you have to ask yourself, "Is this that I am putting in really as important as that which I have decided to leave out?" And who is to say? Thus, to go back to my metaphor, the more trees there are, the harder it is to know which to cut down so that you can see the wood.

For three centuries human knowledge has been increasing by leaps and bounds; nor is it likely to stop. Think for a moment, as I do, of this knowledge of ours as a little lighted circle, the known, set in the midst of a vast area of surrounding darkness, the unknown. Then, the more you enlarge the area of the circle, the more you will increase its circumference. In other words, the more you enlarge the area of the known, the more you will increase its contact with the unknown; the more, in fact, will you realize how much there is yet to know.

This metaphor of the enlarging lighted circle suggests something else. Because so much has been found out in each separate department of human knowledge, it will take you much longer than it would have taken your grandfather, a hundred years ago, to learn the things belonging to that department. In fact, it will take you so long that you will have practically no time in which to learn anything else. Suppose, for example, that you are going to be a doctor; the number of subjects, anatomy, physiology, endocrinology and the rest that you will have to master, the array of facts that you will have to get up and remember, the number of examinations that you will have to pass and the years that you will have to spend in passing them—all these are so formidable that you will have very little time to do or to learn anything else, to enjoy poetry, for example, or to read history. Now, this situation has arisen simply because so much more is known about the human body than used to be known. Now what is true of medicine is true of the study of law, of economics,

of engineering and of architecture, with the consequence that by the time you are a lawyer, an economist, an engineer, an architect or a doctor, you will know very little about anything except your own special subject. Presently you will begin to forget what little you once did know.

And here I am going back to my metaphor of the circle. A form of schoolboys at the age of sixteen is, we will imagine, at the centre. Now it is precisely at about this age that people begin to specialize; that is to say, they begin to study this special subject or that, and each one a different special subject, which means that they all begin to push off in different directions like the spokes of a wheel, radiating from the centre. The bigger the wheel, the longer the spokes; the greater also the distance between the points at which the spokes touch the circumference, which means that, the more there is to know, the further you will have to travel before you get to the end of it and the further you will be from the man who followed a different spoke when you do get to the end of it—all of which, being applied, means that the doctor won't know anything about law or architecture or astronomy and that he will not be able to talk to the historian or understand what he is about. That is why I said above that the need for a perspective was never so great; and yours, if I am right, is the age at which a perspective can best be formed.

What should figure in it? The selection must be determined by the sort of questions to which when one is about sixteen or seventeen one specially wants to know the answers. What sort of universe is this in which we are living? What are the nature, position and prospects of life in general and of human life in particular? How did life originate and how develop? Is man only a special kind of animal, or is he a being set apart—perhaps specially created in furtherance of a purpose? If so, by whom and for what purpose? Is matter all that there is, and are life and mind merely by-products of or offshoots of, or emanations from matter, as coke, for example, is a by-product of coal, or are they unique, that is, fundamentally different from matter; if they are unique, they may, perhaps,

be independent of matter and our minds, then, independent of our bodies? (But if they *are* independent, how do they interact with our bodies and our bodies with them?)

If we maintain the uniqueness and perhaps the independence of life and mind, it would seem to follow that the physical world, that is to say, the sun, the moon, the stars, the earth and the bodies that move about on the earth, is not the only world. There may well be another world, a different department of the universe, as it were, which is mental and spiritual or which at least is known only by minds and spirits. If there is such another world who or what inhabits it? Beauty, perhaps, and truth and goodness and, perhaps, a God, who is the source of all three of them.

If this were so, it might help to explain the strange hold that art and music have over the human mind and the curious evidence presented by what is called our moral conscience, curious, since alone of all living creatures man can say not only, "I want to do this," but also "I ought to do that," and even sometimes go and do "that" in spite of the fact that he wants to do something quite different; it would explain, above all, the part that religion has played in human history.

I do not pretend that I know the answers to these questions; nobody knows them or, rather—and this applies more particularly to questions about morals and religion—what one man "knows" or *thinks* he "knows" is contradicted by what is "known" by somebody else. These questions, in short, are controversial; hence, the most that I can hope to do is to indicate *some* of the answers that men have actually given to them, with a view to putting you in touch not so much with what men know—though, in the sphere of science there is definite knowledge which can be communicated—as with what the best and wisest of them have thought and said. And since, whatever else may be true of it, this seems indubitably to be a physical universe, let us begin with its physical aspect.

CHAPTER I

THE PHYSICAL UNIVERSE

Nebulae and Stars

I propose to begin with a brief account of the physical universe, that is to say, the world of things which are moving about in space and growing older in time. The physical universe as revealed to our senses consists apparently of space and of material things moving about in space. Waiving for a moment the question of what is meant by the word "material,"[1] and assuming the range of the human senses to be extended by the telescope, we may say that these things are broadly of three main kinds, nebulae, stars and planets. The nebulae are the most primitive forms of matter known to us. They consist of huge spiral masses of white-hot gaseous matter which is rotating. This matter is very loosely packed, so loosely that, according to Sir James Jeans, each millionth part of an ounce of it occupies a volume which is on an average as large as that occupied by the Matterhorn. In course of time these masses grow cooler, and, as they do so, the gaseous matter of which they are composed condenses into clusters of relatively denser matter which presently become separated from one another. These clusters of relatively denser matter are the stars. The clusters appear in the first instance on the margins of these central nebular masses. In the case of the older nebulae, the star clusters are found nearer the centre, until they cover most of the area of the original nebula, which thus becomes a vast collection of stars. The nebulae, then, consist partly of stars in the making and partly of families of already-made stars.

As to the number of the nebulae, about two million are visible through the great 100-inch telescope on Mount Wilson

1 It is discussed on pp. 12, 13

in California.[1] One, which we call the Milky Way, of which our sun forms part, is visible to the naked eye. Most of the nebulae which are visible through the Mount Wilson telescope are so far away that the light rays which give information of their existence take anything up to a million light years to reach us. Now light travels at the rate of 186 thousand odd miles a second, and a light year is the distance that light would travel in a year, that is, about six million million miles.

The distance of the nebulae from the earth is not fixed. On the contrary, the nebulae appear to be receding from us so that the distance is constantly growing. What is more, the farther away they are, the more rapid their rate of recession appears to be. Thus, the nebula Virgo, which is six million light years distant, is receding at the rate of 890 kilometres a second, while the nebula Leo, which is 104 million light years distant, is receding at the rate of 19,600 kilometres a second. The fact that the nebulae are apparently travelling away from us has led many physicists to affirm that the universe is expanding.

Other considerations, however, suggest that though it may be expanding, the universe is nevertheless limited in extent. These considerations arise from the nature of space. The accepted view as to the nature of space at the present time is that space is curved, that is to say, while nothing prevents us from travelling outwards indefinitely into space, if we were to travel far enough we should come back to the point from which we had started. It is in this sense that space is limited. If space is limited, it is possible to estimate its extent. It has been estimated that the whole physical universe is about one thousand million times as big as the part of it which is visible through the Mount Wilson telescope; that is to say, there are probably millions of other nebulae which are beyond the range of our telescopic vision.

1 A two hundred inch telescope, twice the size of the one on Mount Wilson, has recently been installed on Mount Palomar, also in California, and is in trial operation. In a few years' time it should make considerable additions to our knowledge of the nebulae.

In spite of the tenuousness of the matter of which the nebulae are composed, it is calculated that each nebula contains enough matter to make about one thousand million stars. Our sun is one such star. It, too, consists of white hot matter in a radio-active condition, but cooler and, therefore, more concentrated than the matter of which the nebulae consist. The sun disseminates energy in the form of radiation,[1] and is estimated to be discharging its mass into space at the rate of 250 million tons a minute. Every day, therefore, it weighs 360 thousand million tons less than the day before. When it was younger and more massive, its rate of radiation, that is to say, the rapidity with which it burned up its substance was much greater than it is now. This greater rapidity of radiation can be calculated; we can also estimate the original size of the sun which is thought to have been about thirty-two times as great as it now is. On the basis of these various calculations, we are able to make an estimate of the age of the sun, since it first condensed out of the matter of the nebula which is the Milky Way. The estimate is that the sun is between seven and eight million million years old.[2]

The sun is very large, in fact about a million times as large as the earth and three hundred thousand times as massive. Nevertheless, the family of stars to which the sun belongs, the family which has condensed and is still condensing out of the nebula called the Milky Way, consists of a thousand million such suns. Thus the sun may be compared to a grain of sand on the sea shore which is the Milky Way.

The Planets

In spite of the enormous number of the nebulae and stars, space is mainly empty and the distance which normally separates the stars as they voyage through space is many millions of miles. Very occasionally, however, one star

1 See pp. 18, 19 for an explanation of this term.

2 This estimate may be millions of years out; another estimate based on different considerations points to an age of about seven thousand million years.

approaches close enough to another to exert upon it a gravitational pull. The effect of this gravitational pull is not unlike that of the pull of the moon upon the earth's seas, that is to say, it raises a tide. But the tides raised upon the surfaces of two approaching stars, *A* and *B*, would be of enormous dimensions, mountains of white-hot gaseous matter, hundreds, perhaps thousands, of miles high. As star *A* passes star *B* and begins to recede, it will pull some of the *B* mountains after it, so that a stream of matter will stretch out from the surface of *B* in the direction of the receding star *A*. Under the continued influence of *A's* gravitational pull, this matter or some parts of it may drop off from *B* altogether and split into fragments. These separated fragments would rotate round *B* to which they had originally belonged and, cut off from their original source of energy and heat in *B*, would gradually begin to cool. It is these fragments that we call planets. A planet, then, is a piece of a star, an ex-star as it were, separated from the main mass to which it once belonged, and gradually cooling. As it cools, a comparatively solid crust of non-radio-active matter forms on its surface, while the intensely hot gaseous matter of which it was originally composed gradually retreats from the surface to the centre. Such is *one*, perhaps the most generally accepted theory, of the formation of the planets.

Some believe that about two thousand million years ago, a second star approached our own sun and, as it receded, pulled away from the sun's surface an arm of solar material which presently split up into fragments which are the planets of the solar system. Of these the earth is one.

Calculations based on the size of space in relation to the numbers of the stars show that in spite of their enormous number and long history which has lasted through millions of millions of years, the chance of a planetary system being formed as the result of the near approach of two stars is small; so small that only one in every hundred thousand stars is likely to be surrounded by a planetary system on the model of our sun. If we suppose that in the nebula, which is the

Milky Way, there are a thousand million stars like our sun, it will follow that there are not more than ten thousand planetary systems in the Milky Way.

The planets are the only areas of the universe in which life as we know it can exist. The nebulae and stars are much too hot to maintain conditions even remotely suitable for life, the temperature at the centre of the sun being reckoned at about fifty million degrees Fahrenheit. These temperatures which are, of course, fantastically high by our standards induce in the matter of which the stars are composed a condition of radio-activity,[1] that is to say, the atoms of which the sun is composed are constantly giving out energy, energy which, in its turn, helps to maintain the temperature of the sun in spite of the constant loss of heat from the sun's surface. In an environment consisting of highly radio-active matter life, as we know it, is also impossible.

During the larger part of a planet's history the conditions prevailing upon it are also unsuitable to life. For several millions of years after it has parted company from its parent sun a planet will be too hot and too moist for life to be possible; for millions of years again, after the sun that warms it begins to cool, it will be too cold and too dry. It is only during a comparatively brief slice of the planet's history that conditions suitable to life will obtain.

In order that there may be life, it is necessary that a planet should have formed a comparatively solid crust of non-radio-active matter, which is the by-product, the burned-out clinker and ash of matter which was formerly radio-active.

A planet, then, on which life is possible must conform to the following conditions:—

(i) It must have persisted for a very considerable time after it parted company with the parent star from which it obtains its light and warmth.

(ii) This parent star must not be too old to light and warm it.

(iii) The planet must not be too distant from the source of its light and warmth.

1 See pp. 18, 19 for an account of what radio-activity means.

Such comparatively rare conditions have obtained upon our own planet for a relatively short time, perhaps for a thousand million years, perhaps for five hundred million. It follows that the number of planets on which there may be beings even remotely approximating to our own state of development is not large. Such beings may exist on Mars, possibly on Venus. But we do not know that they do, and the chance that a planet in some other system may be in the same physical condition as Venus, Mars or the Earth is, as we have seen, relatively small.

The Universe and Life

The conclusion is thrust upon us that the universe in which we live does not appear to have been designed for life. Most of it is empty space; most of the rest, radio-active nebular matter; most of the rest, stars. There is a comparatively small number of planets, but it is only upon a relatively small number of these that conditions approximating to those which we know on the earth obtain.

Life, then, seems to be an accident, the result of a chain of accidents, and the earth upon which life exists may, to use a metaphor of Sir James Jeans, be compared to "a millionth part of a grain of sand out of all the sea sand in the world." From this point of view, then, life seems in relation to the matter of the universe to be extremely unimportant.

However, there are certain considerations which point in a different direction. They point, that is to say, in the direction of supposing that the physical universe did, in fact, begin at a definite point in time, and that it will end at another point in time. Now it is difficult to conceive how it can have "begun" without a mind to "begin" it. Here, then, is another point of view from which life or mind may appear extremely important.

The Nature of Matter

In order that some account of these considerations may be given, I must first try to answer the question raised in the

first paragraph—what is meant by the word "material?", by saying something about the nature of matter.

Suppose that you were to take a piece of matter and ask the question, what is it made of? The answer, we will suppose, is that it is made of wood, or of stone, or of iron. And what are wood and stone and iron made of? Answer: of little molecules of wood, of stone, and of iron, a molecule being the least possible unit in which wood, stone or iron can exist; if the molecule were to be broken up into *its* component parts, these would no longer be bits of wood, stone or iron. To break up a molecule is to reduce it to its component atoms. Ninety-two different types of atom are found on the earth's crust. Substances which are composed exclusively of one type of atom are called elements. Hence, there are ninety-two natural[1] elements. Most substances, however, are made up of molecules which consist of a number of different elements and which are composed, therefore, of atoms of different types. What, then, are atoms?

In the fifth and fourth centuries B.C., the Greek philosophers concerned themselves with the questions which we have just been asking, and some of them came to the conclusion that the universe consists of ultimate particles of matter, ultimate in the sense that they could not be further split up. These they called atoms. They believed that these atoms were imperishable, and that they were all of the same stuff and of the same size. The atoms moved about and entered into different combinations forming different patterns. Thus, the difference between one substance and another, between iron, say, and wood, was not a difference of stuff but a difference of pattern or arrangement. Both wood and iron were made of the same stuff, were made, in fact, of atoms; but in one of them the atoms would be in a different pattern or form of arrangement and would, perhaps, be moving about faster or more slowly than in the other.

Similarly, when one substance appeared to change into another, wood, for example, into charcoal or wax into smoke,

1 Other elements can be manufactured artificially.

it was because some atoms had moved away and others had taken their place.

All this, of course, was pure guess work—the Greeks had no experimental apparatus with which to check their guesses—but it was inspired guesswork. Indeed, during most of the nineteenth century it was held that the ultimate particles of matter, the atoms, were almost exactly as the Greeks conceived them.

To-day, however, the picture of the atom is much more complicated, so complicated that it can no longer be described in ordinary language without falsification. I propose here to give the nearest thing to an account of the modern conception of the atom as can be conveyed in ordinary language.

The Contemporary View of the Atom

The atom is thought to consist of two parts. There is a heavy central part called the nucleus, which is charged with positive electricity, round which there circulates a number of particles charged with negative electricity called electrons, much as planets circulate round the sun. But whereas the force that keeps the planets rotating in their orbits round the sun and prevents them from flying off at a tangent is gravitation, the force that binds the rotating electrons to the nucleus and keeps *them* from flying off at a tangent is the force of electrical attraction that holds between charges of electricity which are of what is called opposite signs, which are, that is to say, respectively positive and negative.

Let us reckon the negative charge carried by one electron as one unit of electricity. Then there are as many positive units of electricity residing in the nucleus as there are negative ones revolving round it, the result being that the atom in its normal state is electrically neutral.

The charges of positive electricity in the nucleus are carried by particles which are called protons; in addition the nucleus also contains particles called neutrons. The neutrons differ, apparently, from the protons only in one respect, namely, that they are *not* charged with positive electricity. A proton, then, is in effect a positively charged neutron. The number

of neutrons in an atomic nucleus is usually a little larger than the number of protons. Both neutrons and protons are much heavier than electrons, the result being that the mass of the atom is almost entirely contained in its comparatively heavy nucleus. According to the number of charges of positive electricity in the nucleus and the number of rotating electrons, so will be the nature of the atom or, more precisely, of the element to which the atom belongs. Thus, the simplest element, hydrogen, consists of a positively charged nucleus, which is one proton with one negative electron rotating round it. The second element, helium, has a more complicated structure; its nucleus consists of two protons charged with positive electricity and two neutrons, and it has two negative electrons rotating round the nucleus.

There are ninety-two elements arranged on what is known as the atomic scale, each of which is differentiated from the others by reason of the complexity of its nucleus and the number of its external electrons. The most complicated element which is found on the earth's surface in a natural state is uranium. This is the highest atom on the atomic scale and has a nucleus consisting of ninety-two protons and a hundred and forty-six neutrons round which ninety-two negative electrons rotate. Other elements which can now be artificially manufactured from uranium are neptunium, plutonium, americanium and curium.

One of the most puzzling features of the atom as just described is the relation between the charges of electricity and the stuff which the charges electrify. So far as the protons and the neutrons are concerned, the position is *comparatively* intelligible, for the protons, as we have seen, can be not inaccurately described as neutrons positively electrified. Hence, when the positive charge which transforms the neutron into a proton is withdrawn there is still something left, namely, the neutron which was formerly charged with positive electricity but is now so charged no longer. This, admittedly, does not take us very much further since if we were to proceed to ask, "what is the stuff of which the neutron is composed?",

the stuff, that is to say, which can be positively electrified, the answer is that we do not know. All that we can say is that the neutron has mass in its own right, independently of its charge of positive electricity. What it is that has the mass we do not know.

When, however, we turn to the charges of negative electricity which are the electrons and which the electrons are, the position is considerably more puzzling, since the charges do not appear to be charges *in* anything. You can see how paradoxical this idea is when you consider any familiar illustration of the behaviour of electricity as, for example, when an electrical current runs down or charges a piece of wire. What the conception of the electron seems to require is the retention of the electrical current without the wire which it would be normally said to charge, since the wire, being itself material stuff, will be resolvable into atoms consisting of nuclei containing protons and neutrons plus the charges of negative electricity which are the negative electrons. To speak of the protons as being negatively charged is a contradiction in terms. Neutrons, so far as we know, can only be positively charged. When, therefore, we come to the charges of negative electricity, there is, so far as we can see, no matter left over in the wire which they can be regarded as charging.

The question whether, if you took away the charge of negative electricity which is an electron, anything would be left is, indeed, one of the major problems now being considered by physicists, and the answer to it is not known. Until the answer is found, the negatively charged particles called electrons can only be likened to the famous grin on the Cheshire Cat, a grin with, it will be remembered, no cat to own it.

To complete the picture, it must be admitted that the answer to the question, "what is electricity?", is also not known.

In effect, then, there are at the moment two unknowns at the basis of matter, first, electricity and, secondly, the stuff of which neutrons are composed. To say that they are unknown means that they cannot at present be explained in terms of some more fundamental thing. A little reflection will show

that there must always be one or more such fundamentals, that is to say, things in terms of which other things are explained, but which are not themselves explicable in terms of anything. These fundamental things, whatever at any given moment in the development of physics they may be taken to be—and they will, no doubt, change in the future as they have changed in the past, molecules giving way to elements, elements to atoms and atoms to electricity—may, at any given time be regarded as the ultimate stuff of the physical universe, so far as physics has carried its researches up to that time.

The substances with which we are in daily life acquainted usually consist of combinations of elements; thus, water, or more precisely, a molecule of water consists of two atoms of the element hydrogen and one of the element oxygen. The answer which would, therefore, at the present time be given to the question, what are the ultimate things into which a given piece of matter can be cut up or, more precisely, what is the ultimate stuff of matter, is electricity, this being of two kinds, positive and negative, plus the components of the atomic nuclei, which are of two kinds, neutral units and positively charged units.

Some Figures for Size

I gave above some figures designed to convey some idea of the immensity of space and also of the number and size of the stars. The idea is necessarily a poor one, since the human mind is incapable of imagining such immensities. To us a million million means imaginatively no more than a million. Before we proceed to other matters it is, however, relevant to point out that the figures relating to smallness are no less striking than those relating to greatness. The diameter of the nucleus of the hydrogen atom, which is one proton, is a small fraction of a millionth of a millionth of an inch; it takes 1835 electrons to weigh as much as one proton.

The facts about the largeness of the universe and the facts about the smallness of the atom are imaginatively conveyed

in a famous meditation by the French philosopher, Pascal, upon what he calls the *Two Infinites.* In it he pictures mankind as standing, as it were, upon a bridge poised between two infinites, the infinitely large and the infinitely small. On one side of him stretch the vast immensities of space and time; on the other, the vistas no less vast of littleness. Pascal, writing in the 17th century had not, of course, at his disposal the results of modern research into the nature of the atom. He takes the smallest of known living things, a mite, dilates on the smallness of its limbs and members, and reflects that to it the body of a human being would seem a universe infinitely large. He then asks us to imagine a creature which is as much smaller than the mite as *it* is smaller than a human being, a creature, then, to whom the mite would seem a universe infinitely large. And then he conceives a creature as much smaller than this creature, the second mite, as *it* is smaller than the first mite, with *its* still smaller scale universe, and so on. Pascal's purpose is to exhibit man as a creature placed by God at the meeting place of the two infinites that he may realize the extent of his own insignificance and the relative unimportance of his human universe placed as it is between universes which are infinitely small and infinitely large.

The End and the Beginning

Let us return to the analysis of matter or, rather, to the bearing of that analysis upon the questions raised above as to the origin and end of the physical universe. Can we, given our present information, form any conception of how the physical universe may have started and of how it will end? Here we enter the realm of guesswork, nor will any suggested answer have more than a speculative value.

The following points, however, are clear. It used to be held that the atoms never changed; that they were, in fact, eternal.

This view is now known to be erroneous. Atoms can for, example, emit or absorb energy in the form of light waves, the former, when an external electron moves from an outer to an inner orbit, the latter, when it moves from an inner orbit

to an outer. More important is the occurrence of radio-activity. Radio-activity or radiation are comprehensive words covering many different forms of energy, but the forms under which we chiefly know radiation are light and heat. Radiation consists of various kinds of waves which are emitted by the nucleus of an atom and is due to activity in the nucleus. This emission of waves sometimes occurs as the result of a fundamental instability in a nucleus which is in process of breaking up, as it were, on its own initiative. Sometimes it is due to forces operating upon the nucleus from without.

As a consequence of continued radiation, the radio-active nucleus breaks down, so that the atom descends to a lower rung on the atomic ladder, and becomes an atom of a simpler element. So far as the atoms composing the stuff of the earth are concerned, radiation is a comparatively rare phenomenon.[1] The earth, that is to say, consists for the most part of stable non-radio-active atoms. Some atoms even on the earth are, however, in a state of radio-activity; their nuclei are constantly giving out particles, that is to say, they are shooting off electrons into space and, as a result, they break down into and form atoms of a different element. Thus, a piece of radium, which is composed of radio-active atoms, is constantly emitting energy. When the emission of energy has continued long enough, the radium breaks down into lead, lead being, as it were, the residue, the burnt out clinker and ash of what was once a radio-active substance. The stuff of which the earth is composed consists mainly of the burnt out clinker and ash of elements which were once radio-active.

The sun, on the other hand, is in a state of intense radio-activity. For millions and millions of years it has from every inch of its surface been discharging enough energy to keep a fifty horse-power engine constantly in action. Other younger and still more radio-active stars may radiate as much as a 30,000 horse-power engine per square inch of their surfaces, with a correspondingly greater loss of mass.

1 Thirty-three naturally occurring types of radio-active atom have been found on the earth's surface; these are all quite rare.

What is the source of this enormous discharge of energy in the form of radiation? There is a number of theories. It is agreed that the stars consist very largely of radio-active atoms belonging to elements of which no examples are found upon the earth. It is further agreed that, exposed as they are to the enormous temperatures prevailing in the centres of the stars, these atoms are continuously being stripped of their external electrons, so that it is only with the nuclei that we are concerned. According to the late Sir James Jeans and to Sir Arthur Millikan, nuclei subjected to this intense heat literally fall into and are annihilated by one another. Every time a nucleus is annihilated, energy is set free in the form of a flash of radiation. Sir James Jeans calculates that about one million radio-active nuclei are annihilated every hour in every cubic inch of the sun's mass. The radiation set free by this destruction of atoms travels outwards from the sun's surface in the form of light and heat.

Other physicists hold that both nuclei and electrons are actually being built up in the centres of the stars. More precisely, the view is that helium nuclei are built up out of the nuclei of hydrogen atoms. It takes four hydrogen nuclei to make a helium nucleus, and the weight of the resultant helium nucleus is less than that of the four hydrogen nuclei. The difference between the weight of the helium nucleus and the four hydrogen nuclei, that is to say, the weight which is lost when the helium nucleus is built up, is thought to be responsible for the diffusion of energy which occurs in radiation. A consideration which contributes to this conclusion is that, as energy has to be expended in pulling the helium nucleus apart into its four separate hydrogen nuclei components, it is thought that there must have been a corresponding equivalent release of energy when the four hydrogen components came together to build up the helium nucleus.

If, however, the building up of helium nuclei on these lines does in fact occur, the intermediate particles, which are called positrons, which are created in the building up process, have only a temporary existence, since sooner or later each such

positron will encounter an electron, the result being mutual annihilation and the diffusion in the form of X-rays of the energy which was, so to speak, bottled up in the two encountering particles. Helium nuclei are no longer radio-active and do not, therefore, diffuse energy.

These are difficult and technical matters, and I shall not here pursue them further. What concern us are the conclusions which they permit us to draw as regards the nature of the physical universe, conclusions as to which there is to-day a fair measure of general, though by no means universal, agreement.

All the physical processes which are observed to be taking place in the universe to-day (apart from the processes which, on one view, are supposed to take place in the stars, which result in the production of particles whose existence is, as we have seen, only temporary) are one way processes. They are, that is to say, the processes involved in the transformation of radio-active matter into radiation, that is, into energy and burnt out non-radio-active matter. No known example of the contrary process, that is, of the concentration of energy in matter is observed.[1]

Two conclusions seem to follow: first, that the energy now being diffused in radiation must at some time or other have been concentrated in what we call matter; secondly, that ultimately, as a result of continued radiation, a condition of even energy diffusion will be reached. When it *is* reached, no further physical happenings will take place, and the universe will then consist of broken down atoms, no longer radio-active and no longer, therefore, capable of diffusing energy, of the kind of which our own earth is largely composed plus a uniform energy distribution resulting from an even diffusion of radiation throughout the whole universe. Let me try to put the position in the form of an analogy. Let us suppose that a blob of ink from a fountain pen is shaken into a tumbler of water. At first there will be a comparatively concentrated blob of ink surrounded by water; gradually, however, the ink

1 The building up of helium out of hydrogen nuclei referred to on the previous page is not an instance of the creation of new matter, but is merely a re-arrangement of matter already existing.

will begin to diffuse itself through the water until ultimately a condition of complete diffusion—uniform ink-water distribution throughout the glass—has been reached, after which no further processes will take place in the glass. Or let us suppose that an office contains a number of elaborately done up parcels. Somebody comes and cuts the strings, undoes the paper, and scatters the contents of the parcels higgledy piggledy all over the office. If the scattering goes on long enough, there will be a more or less even distribution over the floor of the office of the contents which were initially done up in the highly concentrated bundles called parcels. Or again, let us imagine a situation in which the spring of a vast clock is gradually unwinding. Presently it will reach a condition of complete relaxation, and thereafter the spring will "stay put" and no further movement will occur.

But just as the end of the process in a condition of stationary equilibrium can be foreseen, so a beginning to the process must be postulated. At some point in time the blob must have been shaken into the water, the contents of the parcels assembled and the parcels done up, the spring wound up, and it is difficult to imagine any of these operations taking place without a shaker, a tier up, and a winder. Considerations of this kind led Sir James Jeans to conclude, that "everything points with overwhelming force to a definite event, or series of events, of creation at some time or times, not infinitely remote. The universe cannot have originated by chance out of its present ingredients, and neither can it have been always the same as now." It looks, therefore, as if the physical universe had a beginning in time. It also looks as if it will have an end in time, an end which must be envisaged, not so much in terms of annihilation, as in terms of a stationary eventlessness. The physical universe may still continue to exist as an empty theatre on whose stage no players walk and in whose stalls and circle no audience sits.[1]

1 Since the above was written, the wireless talks of Mr. Fred Hoyle have introduced the layman to a conception of the physical universe which differs in important respects from the picture here sketched. These talks are published in a book called *The Nature of the Universe.*

CHAPTER II

LIFE, ITS ORIGIN AND DEVELOPMENT

At some point of time, life appeared upon the earth; at some point very much later, human life; at a point much later still, human civilizations. Very approximately—and the figures may be millions of years out—the dates may be given as follows: appearance of life a thousand million years ago; of human life, a million; of human civilizations, giving all doubtful early examples of civilization the benefit of the doubt, about four thousand. Let us scale these figures down to make them manageable. If we reckon the past history of life at a hundred years, then the past history of man is about five weeks and the past history of human civilization about three-and-a-third hours. On the same reduced time scale, the period during which it is estimated that the sun will remain hot enough to maintain upon the earth the conditions suitable for life is a hundred thousand years or, translating back into terms of real time, a thousand thousand million years, that is to say, a thousand times as long as the whole past history of life. Barring unforeseen accidents mankind has a long history in front of it. To all intents and purposes we are still in our childhood.

I *How did Life arise?*

We do not know; about the origin of life we can only theorize. The many theories that have been advanced reduce themselves to three main types: (*a*) First, that the occurrence of life was due to the continued operation of the same factors and forces as had governed the development of the planet prior to the appearance of life.

These are the factors and forces known to science and studied as physics and chemistry, as astronomy and meteorology. On this view, the universe consists exclusively of bits

of matter moving about in space, and physics and chemistry are the sciences chiefly appropriate to its study.

Astronomy and meteorology tell us about the conditions prevailing upon the planet during the vast period which elapsed prior to the appearance of life. The earth was once much warmer and moister than it is now. It grew drier and cooler, the fires receded from its surface, a crust was formed and the land was separated from the seas. There was a succession of ice ages . . . .

It is probable that the first beginnings of life appeared on the sea shores, more particularly on the strips of sand that, covered at high tide, are laid bare at low. On the view that we are considering these beginnings were due to the action of the sun operating upon what was originally lifeless matter. The first forms of vegetable life would seem to have been of the seaweed type and of animal life of the amoeba-jellyfish type.[1] The advantage of this theory is that it ascribes the origin of life to the action of forces and influences that were already known to be in operation prior to its appearance; that is to say, no new or additional factor is postulated. Life arises, on this view, from the action of natural forces, of sun and rain and heat and cold at play upon the raw material of which the planet is composed.

(*b*) Secondly, there is the view that some force or activity of life, originally independent of matter, entered into matter when matter, developing in accordance with the laws of its own nature, had reached a state suitable for life's reception. On this view, life enters into and animates matter much as an electric current runs down a copper wire. Continuing the metaphor, we can think of different kinds of matter as being capable of taking different potentials of life. The distinctive feature of this view is that the creative force of life is thought of as being different from matter and as making use of matter to create living organisms. Thus, there are at least two dif-

1 The best account known to me of the nature and development of early forms of life is given in *The Science of Life* Books III and IV by H. G. Wells, Julian Huxley and G. P. Wells.

ferent principles in the universe, life and matter. Living organisms, ourselves, for example, are composed of both, being expressions of the principle or activity of life incarnated in the matter of which our bodies are composed.

(*c*) Thirdly, we may hold that life was the outcome of a special act of creation. Creation means bringing into being something new, something, therefore, that was not before. In effect, then, it means bringing into being something out of nothing. Those who hold this view generally combine it with the belief that there is a God, conceived as an all-powerful, all-knowing person, who not only created life but created also the physical universe which is the present home of life. This, broadly, is the conception put forward in the first book of the Bible, and it is usually held in conjunction with what is called the religious view of the universe. This view will be discussed in the last chapter of this book.

II *How Did Life Develop?*

Or, to put the question in its most familiar form, how does evolution occur? What, that is to say, is the nature and method of that process of change and development in living creatures which, beginning with the amoeba, has ended in ourselves? This is an important question because it includes the question, how did there come to be human beings? Again, there are several views.

(*a*) The first view, known as the theory of natural selection, is connected with the name of Charles Darwin. Before I describe this view, I must say a word about what are called variations. If all offspring exactly reproduced the features of their parents, then, unless there were from time to time special creations, which this view denies, the world would, it is obvious, still be populated by the species which first appeared upon it millions of years ago. These are now largely extinct, but were for the most part lowly forms of marine life, primitive shrimp-like crustaceas, amoebas, sea-worms and so on. It is only in so far as some offspring differed or varied from its parents that change in or development of the different species

would be possible. According to Darwin, such variations did, in fact, occur, apparently by chance. In point of fact Darwin averred that he did not know how or why it came about that there were variations. Granted, however, that a variation did occur, either it would confer an advantage in the struggle for existence, either, that is to say, the offspring that varied would be stronger or fleeter or more cunning than its parents, or it would not. If it did confer such an advantage, the offspring that varied would prosper and survive and perhaps choose a mate in whom a similar variation had appeared. The parents might then transmit this same variation to their offspring in whom a more exaggerated version of it would appear. After countless generations, through all of which the variation, growing perhaps more marked in each generation, had been transmitted from parents to children, it would have become sufficiently pronounced to constitute what was, in effect, a new species.

And that, according to Darwin, is very briefly how new species, including our own, originated; they originated, that is to say, as the result of what was in the first instance an accident, the occurrence of a chance variation.

I ought, perhaps, to add, in order to round off the account, that if the variation did not confer an advantage in the struggle for existence, if the offspring varied in the direction of being *weaker* or *less* cunning, it would be eliminated in the struggle for existence and no more would be heard of it.

(*b*) Secondly, there is the view, originally put forward by a French naturalist, Lamarck, that variations in species are produced by the action of the environment. Here, let us suppose, are several species of living creatures, exposed originally to a damp climate, which presently begins to grow drier, with the result that jungle tends to give way to desert conditions. Either the bodies of these creatures adapt themselves to the change from wet to dry, or they do not. If they do, the change in structure which results from the adaptation is transmitted to the offspring and grows more marked as the generations pass,

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until finally what is to all intents and purposes a *new* species evolves from the old. If they don't, that is the end of them.

We might put this view figuratively by saying that if the Sahara gradually became the wettest instead of the driest part of the earth's surface, you might expect to see camels developing the rudiments of umbrellas; if they did not, there would be no more camels.

The difference between these two views comes out clearly in the controversy which was joined nearly a hundred years ago as to how and why the giraffe grew his long neck. According to Darwin's view, long-necked giraffes were born by chance much as children with freckles are born by chance. They enjoyed a natural advantage in the struggle for food—they could nibble at the leaves on higher branches—and, therefore, were better placed in the struggle for existence than their shorter-necked contemporaries. Thus, the fittest giraffes survived but they were the fittest by chance; they had not become the fittest through causation or by design.

According to Lamarck's view, the giraffes, having at a certain stage of their history increased in numbers so that most of the leaves on the lower branches of the available trees were eaten, were under the necessity of growing longer necks in order to reach the higher leaves as an alternative to perishing of hunger. Theirs, then, is an environment in which the available food supply is found at a higher altitude. Those who successfully adapted themselves to the changed conditions by growing longer necks survived and transmitted the characteristic of long-neckedness to their offspring. Once again in the struggle for existence the fittest survived, but they were the fittest not by chance but by reason of their success in adapting themselves to a changing environment. Both views have an important feature in common. When they sought to explain how changes in and developments of species have occurred, how, in fact, all the different varieties of living things, including ourselves, came to be evolved, they did not invoke a mind to plan or a creative force to express itself in them. They set themselves to explain the process of evolution

and, therefore, the appearance of human beings without introducing mind, purpose, living force or creative intervention. They trusted to the same agencies as had operated upon the planet before life appeared; to chance, in the case of the first theory, and to the influence of the external environment in the case of the second. They are, therefore, the natural developments of the *first* view of the *origin* of life mentioned above.[1]

(*c*) If we take the *second* view of the *origin* of life[2] mentioned above, we shall say that the activity of life which enters into matter to create living organisms, being essentially creative, continues to develop in and through living organisms and produces new species as the result of its development. Let us think of living organisms as a kind of instrument that it has devised, of a weapon that it has evolved to further the process of its own development. It is, we will suppose, an experimental force working by trial and error and as it grows in practice and experience, it produces instruments which are progressively more serviceable for the accomplishment of its purpose. The variations which from time to time occur in species are the machinery of its experimentation. There are many kinds of creatures which at different times have populated the earth and are now extinct, the dinosaur, the pterodactyl and so on, whose skeletons you can see in the museums. These were the best in the way of instruments which the creative force of life was able to devise *at that time*, but they were not very efficient instruments; their brains were tiny and their bodies unwieldy. When it had developed sufficiently to be able to manage something better, the force of life scrapped them and produced mammals, among them ourselves. In due course it will scrap us too, unless we learn to behave better and are less quarrelsome and destructive, and will supersede us by some creature better fitted to carry out its purpose by raising the level of life to a higher plane of knowledge and experience than it has reached in us. Unless and until it *does* get tired of us and can contrive to supersede us, life may be expected

1 See pp. 22, 23 2 See p. 23

sooner or later to produce in us those capacities and qualities which are necessary for our further development; for example, the capacity of living longer, emphasized by Bernard Shaw who was an exponent of this view. Telepathy, that is to say, the mind's faculty of directly communicating with another mind, a faculty which appears to be on the increase at the present time may be another pointer to the next item on the programme of life's evolutionary advance. (Or if the world goes on getting noisier, life may develop ear flaps for us to shut out unwanted noise, as we have evolved eyelids to shut out unwanted light.)

(*d*) A fourth view of life's manner of development which naturally goes with the *third* view of the *origin* of life,[1] is that the different species were created very much as we now know them, by the mind of an omnipotent person, namely, God. Some of the Greek philosophers held that there were unbridgeable gulfs or gaps between the different species, so that it was impossible for one species to evolve into another. The notion that species with unbridgeable gaps between them were so created by God was added by Christianity. This is, in effect, the view contained in the first book of the Bible and it is still maintained by the Catholic Church. Until a hundred years ago it was the view of the great majority of Christian people.

What militates against its acceptance in this form to-day is the ever-accumulating evidence which shows that in point of fact many species have, *so far as their physical conformation is concerned,* gradually evolved out of other similar species. This evidence is known as the record of the rocks. The remains of the different species of living things which have inhabited the earth during different periods of its history are found in fossilized form embedded in rocks. Geologists can roughly tell us how old the rocks are in which the fossils are embedded; moreover—and this is the important point—they can tell us the chronological order of the various strata, indicating those which are older and those which are of more recent date. In these different strata of rocks are embedded the fossils of living

1 See p. 24

creatures. The most recent layer is, of course, on the top and as we penetrate down to older layers, we find embedded in successive layers animal remains which show small but increasing changes from layer to layer. Presently these gradually accumulating changes become so marked that what in a later layer is one kind of species merges gradually into what in a much earlier layer is perceptibly another, from which the later species can be seen through the evidence of intermediate forms in the intermediate layers to have developed by traceable steps. Thus travelling, as it were, upwards we see how the horse was evolved from an early creature called eo-hippus, the dog and the wolf from a creature which had some features which are common to both but others which were different from those of either. The fact that species can be seen to have developed gradually out of other species makes it unlikely that they were all created by a series of single acts as the Bible suggests. It is not, however, incompatible with the view that God caused them to evolve from a few primitive species which He did so create, using variations[1] as the machinery by means of which their evolution was effected. On this view, God did not create existing species but did originate those variations in previous species[2] from which new species including those which now exist took their rise.

III *How did Man Originate?*

Here, again, the answer is controversial and differs according to which of the three views as to the origin of life outlined in (I) we accept. Until the work of geologists in the nineteenth century had revealed the existence of a number of apparently intermediate types between species of animals and more particularly between the anthropoid apes and man, man had always been regarded as a special creation. But in England, in France, in China and in Africa the rocks have

1 See pp. 24, 25

2 Now usually termed "mutations" in the "germ plasm." See any book on genetics for an explanation of these terms.

yielded fragmentary remains which seem to show that man, in common with other forms of life, has evolved from non-human ancestors. The most generally accepted view to-day is that both man and the great apes are descended from a lemur-like creature, so that, from the point of view of biology and *regarding only the human body,* we may be said to be not so much the descendants as the cousins of the apes.

Nevertheless, there are important differences between man's body, more particularly in regard to the use which he makes of it, and the bodies of the animals and the use which is made of them. These differences are largely comprised in the notion of man's adaptability to changing circumstances, an adaptability which springs from and depends upon his non-specialization. The animals survive and prosper because of their possession of some special aptitude or skill, lions because of their strength, deer and horses because of their fleetness, bees and ants because of the complexity of their corporate life. Now, in all these respects man is inferior. He is not so strong as the lion, so fleet as the deer, or so co-operative as the ants and the bees; in fact, considered from the purely physical view man is a poor specimen. His body is the prey of innumerable diseases and it is only by covering himself with the skins of other animals that he can protect himself from the climate. Owing to his upright position his belly is peculiarly vulnerable. Wherein, then, does his advantage lie? In his non-specialization. Look, for example, at the human hand. Man is the only animal who by virtue of his upright posture has freed his front limbs from the need for locomotion in order that they may be used for the purposes, whatever they may be, which he wishes them to serve. Consequently, he can put his hand to an almost infinite variety of different uses. The limbs of the animals are like tools, but many of man's limbs are less like tools than like hafts to which may be fitted any one of a number of tools. Consider, for example, the human foot; man can fit his foot with skates or skis or roller skates or gum boots or snow boots or even stilts and so adapt himself to movement over different kinds of surface. He can

adjust his foot to dancing with one kind of covering and to mountain climbing with another. Now, it is this non-specialized character of human limbs which enables men to adapt themselves to and survive in different and changing conditions. Change its environment by a hair's breadth, and an animal is helpless. Think, for example, of the idiotic spectacle presented by a bee on a window-pane, the impotence of a horse in mountainous country, or the behaviour of a moth when confronted with a candle . . . .

Man's Mind and Spirit

So far, in stressing man's non-specialization and adaptability I have spoken mainly of his physical differences from the animals.

When, however, we leave the domain of the purely physical, we cannot avoid noticing the presence in man of certain characteristics which distinguish him from all other living creatures. For example, we have foresight, that is to say, we can conceive ends and purposes in the future and plan present means to achieve them. Thus, alone among living creatures men do things which are disagreeable now for the sake of things which will be agreeable in the future, working, for example, in the fields in summer in order to store food for the winter. In general, animals pursue their ends directly; they feel impulses and straightway seek to satisfy them, while man works for ends which are at one remove away, spending time and labour not in doing what he wants done, but in making something which will do what he wants done, making, first, tools and later machines.

To many these differences have seemed to betoken the existence of a self or personality possessing a mind and, some would add, a spirit of a totally different order from that of the animals. For evidence of the uniqueness of man's mind they point to his power of abstract thought. Thus, as I have noted, man can foresee and plan for the future, which means that man alone is capable of conceiving what is usually called a long-term policy, as when a boy works at his books at

night instead of going to the cinema, in order that he may pass his examinations, go to the university and become Prime Minister. By the notion of a man's self or personality those who take this view of man have sought to throw into relief the fact that man is or has a *continuing* consciousness in contrast with the animals whose experience appears to consist only of a succession of psychological states. Thus, when experiences *A*, *B* and *C* happen to a man, he knows not only *that* they happen to him, but also that they succeed one another. He can even note the transition from *A* to *B* and from *B* to *C*. At their conclusion he can look back and say, "I have had the experiences *A*, *B* and *C*." Now this something which notes the succession of *A*, *B* and *C* and the transition from one to the other, and which looks back on them is a continuing consciousness in and to which the experiences *A*, *B* and *C* occur, and which links them together so that a man can say of *A*, of *B* and of *C* that they were all *his* experiences. In addition, then, to our experiences there is a thread, the continuing self or personality on which the experiences are strung. But for an animal there is only a succession of experiences; indeed, most animals just *are* a succession of experiences like the beads of a necklace without any thread to string them together.

Man as Free

This leads to a second point of differentiation. It is only a continuing self such as I have postulated which can be regarded as being in any sense free. To say that a creature's experience is or consists of a succession of experiences, a sequence of desires, let us say, and a battery of impulses, is to say that when the creature feels the desire or impulse he cannot but obey it, simply because at that moment he *is* the desire, unless, of course, in the process of so acting he is deflected by a stronger desire. When an impulse arises he must give way to it, unless a stronger impulse intervenes. Thus, if a hungry dog sees food, he approaches and devours it, *unless* he is deflected by the fear of being kicked and driven off, deflected, that is to say, by a stronger impulse, the impulse of fear.

Animals, then, are mere vehicles of impulse and desire, and their bodies are automata, spurred into action by whatever happens to be the strongest desire at the moment. So too, no doubt to a large extent, are men. But men are also something else, or, rather, they have something else, namely power of will, in virtue of which they can suppress their desires. "This," we say, is what we want to do, but "that" is what it is wiser or more prudent to do, prudent, that is to say, having regard to our happiness in the long run. Thus a boy may say, "What I want to do most now is to take my girl friend to the cinema, but what I obviously ought to do is to stay at home and work for my examination." What is more, we do on such occasions sometimes stay at home and work; in other words, we learn to restrain our desire for what we want now, because of our consciousness of something we may want even more in the future. In such cases our decisions are determined by what we might call long-sighted prudence, and foresight or prudence is, as I have said, peculiar to men.

But still more striking is the opposition between desire and duty. I desire to keep the money I have borrowed in order to buy a motor-bike, but I know that I ought to give it back because I promised to and one must keep one's promises. Now it is said that man alone among living creatures is capable of acting in direct opposition to his desires in the interests of what he conceives to be his duty. Indeed, the philosopher, Kant, 1724–1804, held that it was precisely in this ability, the ability to go against desire that man's freedom consisted; he was free, as the animals were not, from *absolute* dictation by impulse and desire. Now the notion of a will which is other than desire entails the existence of a continuous self or personality to be the owner and exerciser of the will.

Thirdly, the notion of a continuing human personality appears to be involved in man's religious sense. Throughout the ages he has tended to make gods and to worship them. Usually he has made them in his own image. "If oxen were to turn religious and to have a god," said one of the early Greek philosophers, "they would think of him as a great

ox." But oxen don't make gods and men do. One of the most important things about the religious sense is the intimation it conveys to man that there is an order of reality different from that which is known to him by means of his senses, an order which is in some sense the originator of the familiar world of everyday things which he knows with his senses and which gives to the familiar world its meaning and its purpose. I say conveying an "intimation" and not "showing," because whether there is, indeed, such an order, whether religion which suggests that there is, is telling the truth, or whether, as many hold, there is no such order and religion is a gigantic hoax, are controversial questions about which I shall say something in a later chapter.

Fourthly, man has a sense of beauty. He makes images in paint and stone, and he makes patterns and sequences of sound, not necessarily because they will bring him some advantage, because they will feed him or clothe him or help him to defend his family or to reproduce his species, not, in fact, for any of the *biological* reasons that influence the animals, but simply—I don't know how else to put it—for the "fun of the thing." And "the fun" has been so great, that art—I shall say something about this, too, in a later chapter[1]—has been not only one of man's greatest delights but one of the most powerful of the forces by which he has been influenced. Now the point that concerns us here is that, if you are a creature composed wholly of body and only of body, or if you are a mere succession of impulses without a continuing, remembering consciousness to hold them together, then it would be very difficult to explain the existence of morals and religion and art and the hold which they have over the species to which you belong. So far as we can see, it is only human beings who have or who are continuing conscious personalities, having minds and, as many would maintain, spirits or souls[2] as well as minds, who can be moved by things that do not contribute biologically to their survival as a species or assist their personal advancement as individuals.

1 See Chapter VII, pp. 81-99

2 See Chapter VII, p. 81

CHAPTER III

THE PAST OF MAN

Man's history upon the earth has been for the most part unremarkable, savage and obscure. From time to time, however, it has risen above its normal level to one of those peaks that we call a civilization. I will in the next chapter try to indicate what I mean by a civilization.[1]

What are the most important stages in human history, and which have been man's civilizations?

So far as the development of his practical skill as craftsman and inventor leading to man's mastery over matter are concerned, the stages usually regarded as outstanding are the invention of fire, enabling man to warm himself in winter and to cook his food, and of the wheel which, attached to carts and other conveyances, helped him to carry weights and move property and goods. Another landmark was the discovery of the principle of the arch which taught men how to build bridges and to roof their houses with stone. Some have emphasized the invention of ships with sails and steering apparatus which enabled man to leave the land and take to the sea. More important, perhaps, was the discovery of how to cultivate the land and to grow crops, a development facilitated by the invention of shoes for horses. The earliest human communities were nomadic; they lived, that is to say, by hunting or by pasturing sheep and cattle. These modes of livelihood involved continually changing their residence as their game or flocks moved in search of water or fresh pasture. Agriculture enabled men who had hitherto been continuously on the move to remain in one place. The alteration in man's habits involved in the change from the nomadic life of hunters and flock minders to the life of settlers cultivating the soil was

1 See Chapter IV, pp. 49, 50

the beginning of civilization, if only because it was the beginning of a settled way of life. Another important advance took place when men learnt to use metal to make implements instead of chipping stones to a sharp edge. It is hard, for example, to imagine an effective stone plough . . . . It is not, however, with man's achievements on the technological plane that this book is concerned. My purpose is rather to give a bird's eye view of the development of his mind and thought, and to indicate the main steps in the process whereby man's outlook upon life has been deepened and broadened, his ideas of what is right and good and valuable have been refined, his manners have been improved, his community life, involving the development of such conceptions as those of justice and of law, has been organized, and his civilizations have been formed. Four main stages in this development are, I think, of outstanding importance.

I *The Jewish-Christian*

First, come the Jews. Their importance is twofold. First, though a small and from the standpoint of power-politics an insignificant people, they effected the reduction of many gods to a single God. Mankind had hitherto almost without exception worshipped a number of gods. These were beings palpably created by human beings to serve human purposes. Primitive man was oppressed by all manner of forces that he could neither understand nor control; forces of fire and flood, of earthquake, pestilence and drought. They destroyed man's crops, swept away his dwellings and decimated his communities. And they were impersonal; he could not, as it were, get at them. And so he invented a host of fictitious semi-human beings, made images of them and called them gods—gods of thunder and of lightning, gods of fertility and of love, gods of fire and of war—to be the controllers of these natural forces and the protectors of the tribe against its enemies. The advantage of these semi-human creatures as compared with the impersonal forces of nature was their accessibility; you could pray to them and bribe them with offerings.

Let us suppose that a tribe's cattle are carried away by a flood or on a raid by a neighbouring tribe; the accepted view was that the tribe had in some way offended its god or gods. Accordingly, the tribe sacrificed to, that is to say, it bribed the offended gods. Sometimes the sacrifices were living people—in exceptional cases, in what we should now call great crises, the daughter of the chief of the tribe might be sacrificed—and if the sacrifice was acceptable, the floods subsided, or the invading tribe retired. Such, briefly, was the origin and nature of most of man's religions, as we find religion prior to the Jews. Now, it is obvious from a reading of the Old Testament that the Jewish religion contained many elements which were akin to the primitive, bribery-religions I have described. Jehovah, the Jewish god, is a person who talks, who sometimes even appears. He is vain, angry and jealous. He requires propitiating by gifts and sacrifices, burnt offerings and so on. But from the very beginning he is distinguished from other gods by three characteristics.

First, he was one and not many; secondly, he was for the most part invisible; he was not, that is to say, conceived—except on unrepresentative occasions—as a material being complete with a body who could be represented by an image. Thirdly, and this perhaps is his most important distinguishing characteristic, his function was not wholly utilitarian. Jehovah is concerned with righteousness; he is a moral God who lays down primitive codes of morality which his subjects are bidden to obey not because by doing so they will reap some advantage, but simply because it is right to do so.

In the second place, the religion of the Jews developed by a more or less continuous process of change and enrichment into the religion of Christianity. Jesus Christ is a person whose coming is foretold in Jewish literature which prepares the way for Him and bids us expect Him. He is described as "the King of the Jews." Moreover, Christ refined and elaborated the code of morals which had been laid down by the Jewish God of the Old Testament. The code of behaviour bequeathed to us by Christ is generally recognized as the best

and highest that the world has known—indeed, it is much too good and much too high for most of us. Yet the God of Christ is recognizably the same God, and the code of morals which He laid down is recognizably the same code—albeit a more developed version of it—as that which we find in the Old Testament.

Now, whether you do or do not think Jesus Christ was the Son of God and that the Christian religion is divinely inspired—and your view on this point will depend in part on your view about religion in general which we are to discuss later—you cannot but agree that Christianity has been enormously important in making human history and in the establishing of modern ways of thinking, believing and behaving, so much so that the history of the world in general and of Europe in particular is markedly different from what it would have been if Christ had not lived. Most of the things that we now believe in regard to morals as, for example, that we ought to try to be merciful and unselfish, that we ought to return evil not with a contrary evil but with good and ought not to harm our neighbours, that we ought to tell the truth, keep our tempers, forgive people, and not bear ill-will, and so on—in a word, most of our judgments about what is good and bad, right and wrong, go back to Christ, so that even if we ourselves don't know where our moral beliefs come from or believe in Christ's divinity, we most of us sometimes try, however unsuccessfully, to live after the manner which He enjoined, just as we can all enjoy a good dinner, even if we don't know from what part of the world the food which we are eating comes and how it has been cooked. The Jews and the early Christians are between them very largely responsible for the contents of the Bible which has had a greater effect upon the lives of all of us, even of those of us who have not read it, than any other single book.

II *The Greek*

Secondly, and not less important, are the thought and culture of ancient Greece. The ancient Greeks are, from most

points of view, the most remarkable human beings that have ever lived. Let me try to say why by indicating the nature and extent of their achievement. First, take space; the part of Greece that matters is a very small country, considerably smaller in size than England and Wales, while the whole of the so-called Greek world, that is to say, the area in which Greek ways of thought and life were practised, did not extend beyond the coastline of what is now Asiatic Turkey, Sicily and the extreme southern parts of Italy. Secondly, consider time. Nearly the whole of the Greek achievement was accomplished in about two hundred years, from 500–300 B.C. Thirdly, take numbers. The numbers of the Greeks were tiny. Much the most important city in ancient Greece was Athens; now it has been reckoned that the free (that is to say, non-slave) male adult population of the whole of Attica, that is to say, the country of which Athens was the capital at the time of her greatness was between 35,000 and 45,000. (This is about half the size of modern Oxford. The whole population of England and Wales is about forty-two million.) Fourthly, take ancestry. This is non-existent; by this I mean that the Greeks had no predecessors. They appear, as it were, out of the blue; barbarians everywhere before them and barbarians everywhere all round them. When we take space and time and numbers and lack of ancestry together, the Greek world appears like a little lighted patch in a great sea of surrounding darkness and the Greeks themselves as biological "sports," that is to say, as a variation in our species,[1] on the plane of the mind and the spirit. It is just as if in them the mind and spirit of man had made an abrupt leap forward.

The Greeks, then, and this is the important thing to remember about them, were doing everything for the first time; and their achievement consists not so much in the things they did as in the degree of perfection to which, without any previous preparation, they brought these things in all the spheres in which they made their mark.

In philosophy, politics, poetry, drama, history, architecture

1 See Chapter II, pp. 25, 26

and sculpture their level has rarely been reached and never exceeded. Consider, for example, the following list. First, poetry. The Greeks produced in Homer one of the greatest, perhaps—with the possible exception of Shakespeare—*the* greatest poet the world has seen. (Yet it is not quite fair to include Homer, since he comes before the brief period of two hundred years which I have mentioned.)

Secondly, drama. The great Greek tragic writers, Aeschylus, Sophocles and Euripides are—once again with the exception of Shakespeare—the equals of any of the playwrights who have succeeded them. So, too, is Aristophanes, the great Greek comic dramatist.

Thirdly, history. The Greeks may be said to have founded history and in Herodotus, the genial teller of tales and recounter of strange habits and customs, and Thucydides, who wrote the history of the great civil war between Athens and Sparta, produced two of its outstanding exponents.

Fourthly, art. The Greeks produced in Pheidias and Praxiteles, sculptors whose work has never been surpassed, and the Parthenon, the temple they built on the hill at Athens, still stands as one of the wonders of the world. Unfortunately, we have very few specimens of classical Greek painting and music.

Fifthly, politics and law. The Athenians invented trial by jury with advocates to plead and citizens to judge. They were also the authors of democratic government. Theirs, in fact, was the most extreme democracy that the world has seen, a democracy in which the whole body of adult male citizens was entitled to go to the Assembly and vote on matters of public policy. It was exactly as if every English citizen were a member of the House of Commons. Pericles, the head of the Athenian democracy during Athens's period of greatness, is one of the most famous statesmen in history.

But, sixthly, it was in the field of philosophy, which also to all intents and purposes originated in the Greek world, that the Greek spirit reached its highest level and made its most original contribution to the advancement of the mind and the widening of the outlook of mankind. Socrates,

Plato and Aristotle are still the greatest names in the list of the world's philosophers and Plato's *Dialogues* rank only below the Bible in the list of books that have influenced mankind. It was not so much what these men taught—although they did suggest certain quite definite ideas as to the origin and purpose of the universe, the nature of human excellence and the rules which should be followed if human life is to be lived at its best—as the subjects which they raised for the first time and discussed with no less originality than profundity that constituted a new chapter in the history of mankind. All the issues that men have subsequently canvassed, God versus no God, Freewill versus Determinism, Idealism, that is to say, the view that things exist only in the mind, versus Materialism, according to which everything is fundamentally made of matter, Democracy versus Aristocracy and Monarchy as the best or most efficient form of government; whether the best life is to be found in the highest total amount of pleasure, as the Epicureans asserted, or whether man should seek to control and discipline his desires, so that he might learn to be content with the least possible, as the Stoics maintained—all these topics were first brought up, discussed and worked up into philosophies in ancient Greece. The thought of Greece influenced the Romans, who in the sphere of the intellect did little more than echo and imitate the Greeks. When the Romans conquered the ancient world, they caused the learning and culture of Greece to be diffused through Europe. Thus in a very real sense, the Greeks formed the mind of European mankind precisely because they determined the subjects which the educated peoples of Europe have thought it worth while to discuss ever since.

III *The Renaissance*

The importance of the Renaissance, which took place in Italy roughly between A.D. 1350 and 1550, consisted in a liberation of the mind and an enlargement of the outlook of man. What the Renaissance freed men's minds from was domination by the Catholic church and the Greek

philosophers. A habit had grown up of settling everything by reference to Christian doctrine and Greek philosophy. What doctrine, it was asked, did the Church teach? What were the views of Plato and Aristotle? Between them the Catholic Church and the Greek philosophers provided the answer to every question that could legitimately interest the mind of a civilized man, from the origin of man to the position of the soul in the body, and from the elixir of life to the size and shape of the earth. The Church interpreted the will of God and Plato and Aristotle had crystallized once and for all the thought of man.

This attitude was, of course, extremely discouraging to free and original thinking—if all the answers were to be found in the authorities, that is to say, in the Church and the Greek philosophers, why bother?—and led men to suppose that truth had been discovered and established for all time many centuries ago. Thus, for most of the periods which we call respectively the Dark and the Middle Ages, lasting roughly from about A.D. 500 to 1300, the mind of man was comparatively stagnant. What the Renaissance did, as I stated before, was to free men from their enslavement to the authority of the Church and the Greek philosophers.

Upon what was the interest of the newly awakened mind of the Renaissance man directed? Mainly upon the physical world. The main positive achievement we chiefly owe to the Renaissance is the invention of science, or rather, of the scientific method. For the important thing about science is its method. If a scientist wants to find out something, he does not refer to Plato and Aristotle and see what they said; still less does he go to the Church and ask it to make a pronouncement; he goes and looks for himself. You want to know how the universe works? Right, make the appropriate experiment and you will find out. All that is necessary is to put the right question to nature and nature will give the answer. You want to know how the human body is constituted? You have only to open it up and look. Now this method involved a radical departure from the procedure of the past. Hitherto,

if men wanted the answer to a question about the nature of the world, they either relied upon sheer reasoning to give it them, as we would do to-day if we were working out a problem in arithmetic or mathematics, or else they appealed to authority. Thus, men's reasons told them—and there was good Greek authority for this—that heavier objects fell faster than lighter ones. Galileo dropped weights attached to cords from the leaning tower of Pisa and proved by experiment that all bodies, whatever their shape or weight, accelerate when they fall with an equal velocity (in point of fact, thirty-two feet per second). The authority of the Church had laid it down that the earth was fixed, that it was the centre of the heavens, and that the sun revolved round it. Copernicus and Galileo made the appropriate experiments for determining the relations between the earth and the sun, and discovered that the sun was relatively fixed and that the earth went round *it*. The Greek philosophers announced that the soul inhabited a certain part of the body. The men of the Renaissance cut bodies up, and found nothing that related even approximately to a soul.

Generalizing from these examples, we may say that whereas hitherto men had pronounced by the light of reason what things must be like and how they must behave, the men of the Renaissance followed the new method of science and made it their business to find out by observation and experiment what they were in fact like and how they did behave.

Nor were their researches of merely theoretical importance. By putting the right questions to nature and finding out nature's answer, they enabled man to gain power over nature, since in finding out how nature did, in fact, behave, the scientists made it possible to modify and to control nature's behaviour in order to produce the sort of results that men desired. Among such results was the important one of saving men from dull and drudging work by inventing machines to do their work for them.

The Renaissance was a time of great outpouring of energy in every direction. It was exactly as if the mind of man had

woken up from a long sleep. In addition to laying the foundations of science, the Renaissance coincided with the world's great age of painting and architecture. The men of the Renaissance were renowned for their versatility; they prided themselves on being able to do anything; to ride, to shoot, to swim, to fight, to drink deeply and to make love, as well as to paint pictures, make experiments, solve problems and wrest its secrets from nature. "Men," said one of them, "can do all things, if they will."

IV *The Industrial Revolution and Its Consequences*

The fourth great advance in man's life, which may be comprehensively termed the industrial revolution, derives in large part from that setting free of man's mind to enquire into and presently to control the workings of nature which began at the Renaissance. Continuously since then, that is to say for the last four or five hundred years, man has continued to explore the workings of nature and to acquire power over the physical world.

About a hundred and fifty years ago this knowledge of the workings of nature and the power which it brought in its train, which had been slowly increasing ever since the Renaissance, suddenly spurted and began to grow very rapidly. Applying the discoveries of the men of science with the object of satisfying human needs, men learned to tap the hidden forces of the earth and to harness them to serve their purposes and, as a result, in a hundred ways improved the condition of our human lot.

Thus nineteenth century man enormously accelerated his speed of movement and his output of commodities; he saved himself from doing dull and drudging work; he extended the span of human life and relieved the pain of human illness; he lighted and paved his streets and lighted and warmed his houses; he constructed a sanitary system and a hospital system. Indeed, applied science has so changed and improved human life that an era of plenty and prosperity such as man has never known seems at times to open up before him.

What have been the main steps in this process? First, the use of coal to make steam to pull trains, to melt iron and to manufacture steel and to make gas to light and warm people's houses. The nineteenth century was pre-eminently the age of coal and iron and steel and gas.

Secondly, the discovery of electricity and its use as a force, first to augment and then largely to replace coal and gas, providing cheaper power to drive machines, better and cheaper light for people's houses, quicker and cheaper transport to move their goods and their bodies.

Thirdly, the invention of the internal combustion engine which has done more to change the surface of the earth and the habits of the men and women who live on it than any other single discovery. Fourthly, the discovery of how to make machines which, heavier than air, would yet remain in the air, the discovery, in other words, of how to fly.

As the result of these advances and extensions of human power, men can now travel in cars everywhere over the surface of the earth; they can fly in the air like birds, and in submarines dive below the surface of the sea like fishes.

The discovery of how to release the forces locked up in the atom opens up for mankind the possibility of a still greater advance. I said something in the first chapter of the structure of the atom which may roughly be represented as a nucleus consisting of charges of positive electricity surrounded by a number of external electrons which rotate round the nucleus. It has long been known that if it were possible to split the nucleus, power derived from radio-active energy would be artificially set free which could, by the contrivance of suitable technical devices, be harnessed to the fulfilment of man's purposes. Within the last ten years "the splitting of the atom," as it is called, has been achieved, and men have set about the task of harnessing the resultant radio-active energy. It is unfortunate that the main purpose to which this discovery has so far been put is that of the destruction of other human beings and their cities. (Two atomic bombs dropped on the Japanese cities of Nagasaki and Hiroshima at the close of the

last war caused over three hundred thousand casualties, and were a major factor in inducing the Japanese to sue for peace.) It is, however, already clear that, harnessed to peaceful ends, atomic energy could lead to an increase of beneficial human power, power for construction, power for production and power for transport, no less great than that which succeeded the use of coal and subsequently of electricity to transform human life during the nineteenth century. It is, indeed, reasonably certain that if, as present indications suggest, atomic energy is successfully used on a large scale for industrial purposes, our present powers will be as much exceeded as the new-won powers of the industrial revolution exceeded those of the pre-machine age.

V *Summary and Prospect*

As the result of the long series of discoveries to which I have so briefly referred, man's life has been altered more radically and more rapidly during the last one hundred and fifty years than during the whole of the preceding two thousand years. In what ways does this alteration chiefly show itself? In the first place, most of the external enemies to which our species in the past has been exposed are either overcome or are in a fair way to being overcome. Look back over man's life in the past and you cannot but realize what a sordid, meagre, frightened affair it must have been. His crops and, therefore, his livelihood, have been at the mercy of forces which he could neither understand nor control, forces of fire and flood, of earthquake and drought; his communities were swept by pestilence and famine and with the sweat of his brow he wrung a meagre sustenance from nature. To-day, thanks to science, all these enemies to man's well-being have either disappeared or have been reduced to comparative impotence. Machines have taken over a large part of man's dull and arduous work, and have so increased his output of commodities that a future of unprecedented leisure and prosperity opens up before him. Medical science has tracked down the causes of many diseases and has learned how to make men's

bodies immune from them. One enemy to man's happiness and one only remains, and that is the enemy within, which is man's comparatively unchanged nature. To this I will return in the next chapter.

In the second place, the effect of rapid transport—of the train, the steamship, the car, above all the aeroplane, has been so markedly to reduce distance that the world shrinks like a shrivelled walnut, with the result that all the nations of the world have, as it were, closed in. The world to-day is to all intents and purposes a single whole, a world, then, in which what happens anywhere affects people everywhere. Such a world requires a single world government. As to the possibility of this, I shall also have something to say in the next chapter.

Meanwhile, there are one or two questions which the development I have just sketched suggests.

First, there is the question how it has come about; secondly, there are the questions how long it will continue and how it will end.

What is the Cause of Social and Industrial Development?

There is one answer to this question which is very popular at the present time, an answer which is universally given in all the countries under Russian influence, the answer of the German philosopher, Karl Marx, who lived in the nineteenth century. It is to the effect that changes in man's history, changes in his communities, changes in his ideas of right and wrong and of politics, changes in his conceptions of law and justice, changes in the things he holds to be good and true and valuable, in a word, all those changes that make up what we call the progress and development of our species, are fundamentally due to the way in which he satisfies his basic human needs. These needs, the needs for food and warmth and shelter, can be satisfied by hunting, by agriculture, by the employment of slaves, by the work of free and independent craftsmen, by merchants trading across the seas, or through the mass production of commodities by men operating

machines in factories. According to which of these methods is adopted, so, on Marx's view, will be the resultant kind of society. Hence, the motive force behind the development which I have briefly sketched in this chapter, is, on this view, generated by the different methods which at different times men have adopted to satisfy their fundamental wants.

This answer may at first sight seem unexpected, but it can be worked out in great detail to apply not only to great political events like the French and the Russian revolutions, but to changes and developments which happen in comparatively peaceful times, as, for example, when a system under which small peasant proprietors worked small, unenclosed strips of land was succeeded by a society of big landlords owning large, enclosed estates upon which work was done by agricultural labourers who owned no land.[1]

The Marxist account also explains how and why men make the discoveries and inventions which have changed their lives just when they do. In fact, the more you study it, the more convincing this answer can be made to seem.

It is not, however, the answer of most people in this country and it is not my answer. The reasons why it is not depend upon matters which will be discussed in Chapters V and VI. Meanwhile let me turn to my second two questions. Will the process of development continue and how will it end? The answer to these questions demands a chapter to itself.

1 A change which occurred in England in the late seventeenth and eighteenth centuries.

CHAPTER IV

THE FUTURE OF MAN

What is a Civilization?

Many people have held that the development whereby man has risen from barbarism to civilization is cyclical; they have thought, that is to say, that it recurs in cycles, like the phases of the moon.

But, first, what is a civilization? All men have certain physical needs, needs for warmth, food, sex and shelter; these needs man shares with the animals. Savages spend most, if not all, their time in the endeavour to satisfy them. A civilization, then, cannot be a condition of affairs in which human beings merely satisfy ever more easily and elaborately their fundamental physical needs and do *nothing else;* it must be a condition in which they satisfy their needs so easily and feel themselves so secure from danger that they have the time and energy to attend to other things and, in particular, to the developments and demands of the mind and the spirit.[1]

Those who seek to live the life of the mind and the spirit do some things not because the doing of them will be to their advantage in a biological sense, not, that is to say, because it will help them to survive, or because it will advance them in a material or social sense, by making them richer or more powerful or more famous, but simply for the pleasure or interest that they take in doing them or because they think it is *right* to do them.

In a civilization, then, some men are released from the pressure of purely biological ends and also from the domination of immediate cares and personal ambitions, and being so released use their energies to build beautiful houses, make

1 See Ch. VII, pp. 81, 82 for some accounts of the sense in which these words are used.

beautiful pictures or music, think elevated or profound thoughts, try to do what is right because they conceive it to be their duty, seek in science and philosophy to explore and understand this puzzling universe in which our lives are set, and endeavour, if their minds are turned towards religion, to know God better, to love Him and to worship Him. In order, then, that there may be a civilization, it is not enough that men should be rich and powerful and leisured and should be able to satisfy their material wants easily and abundantly—for this, after all, is only what a glorified savage would do given the advantages of leisure and abundance; nor is it enough that men should be able to move rapidly about the surface of the earth or should be desirous of hitting and skilled in hitting little round bits of matter (balls) with long thin ones in the shape of bats, mallets, racquets, cues, clubs or sticks; they must also devote at least some part of their energies to living the life of the mind and of the spirit by pursuing those things which are good, true and beautiful; further, they must not only pursue them in their own lives but seek to increase the knowledge of and desire for them in others. Putting this shortly, we may say that a civilized community is one in which men pursue what are called values.[1]

If this is the correct definition of a civilization, we must admit that there have been very few civilizations since most people when they have achieved a sufficient command over material things to enable them to satisfy their material wants easily and abundantly and to become, therefore, rich, leisured and powerful, have been content to go on increasing the amount of their riches, the extent of their leisure or the degree of their power over other men. In other words, they have used the leisure and the energy which their freedom from material needs has made available to pursue what are fundamentally the same kind of goals as appeal to savages, namely, the gratification of their senses, freedom from toil

1 See *Ch. VII, pp. 82, 83 for an account of the sense in which the word "values" is used.*

and the ability to order other men about. Broadly speaking, men in Europe have achieved civilizations in the sense defined only in ancient Greece, 500–300 B.C., in Renaissance Italy, A.D. 1350–1550, and in 18th century France and England. But even in these communities only a comparatively few people have been civilized in the sense defined.

The Cyclical Theory

Now what the cyclical theory of civilization points out is that several times in the past history of mankind civilizations of some kind have emerged—not perhaps civilizations in the strict sense defined above, but communities of whose members a certain number possessed power, ease and wealth which they devoted to satisfying their desires and enjoying a leisure which they filled with ever more complicated and luxurious amusements—but that these civilizations have never lasted. Sooner or later they have either fallen to pieces by themselves or have been overrun and destroyed by more vigorous and simpler peoples. It goes on to imply that it is not just an accident that this should have happened so often, but that there is something necessary about its happening; that it happens, in fact, in pursuance of some kind of rhythm or in obedience to some kind of law.

The theory bids us look back over man's past. Again and again, it says, you will see great civilizations arising, in Assyria, Babylon and Ancient Egypt, in Greece and Rome and Renaissance Italy and 18th century France, only to fall away and finally to disappear. Perhaps, then, its supporters have urged, the lives of peoples and communities may be like those of individuals in that, just as individuals go through certain well-defined phases of growth and decay, are born into the world, are first children and then adolescents, grow to maturity, become middle aged and then pass through old age to decay and death, so, too, is it with the communities that human beings compose; they, too, pass through a number of well-defined familiar phases which follow one another as inevitably as the phases in the life of man. Noticing

1 1612

that in the past human beings have again and again raised their lives to a certain level of prosperity, comfort and even civilization, they have argued that there is something which *prevents them from maintaining their lives at that level* for more than a certain period. When the period comes to an end, the level falls back and the whole process begins all over again.

Now, is this, in fact, true? The answer is controversial. For my part, I do not think that it is and for two reasons; first, I think that the coming of Christianity into the world was an entirely new factor in the world's history, so that everything that has happened since Christ happens differently from everything that went before. The notion that history goes on reproducing itself indefinitely cannot, therefore, if I am right, be accepted. But this answer has nothing to do with history but depends rather upon what is called the religious view of the universe which will be considered in the last chapter.[1]

My second reason is that the achievement by modern man of power over nature, which is the fourth great stage of human development and advance described in the last chapter, means that the destruction of our present civilization, if it were to occur, would be so much more complete and devastating than any previous destruction that it is quite possible that mankind might never survive it, so that this civilization of ours—or it may be, its successor—may well be the last human civilization.

How Our Civilization Might Destroy Itself

There are three ways in which the powers that science has won for mankind might bring about this result.

First, there is the new danger from war. I say "new" because whereas previously war was an activity in which men could indulge without the complete destruction of their communities, the powers that science has given us, notably those arising from the splitting of the atom and the setting free of the incalculable forces of atomic energy, and the potentialities of what is known as biological warfare—the dropping of bombs filled with bacteria which would spread

1 See Ch. VIII.

disease, poison the soil and the crops, make women sterile and so on—have so increased man's destructiveness that another war might well lay waste the countries involved in it beyond power of recovery. Here, for example, is a forecast by Bertrand Russell of the possible results of atomic war given in a radio lecture in the winter of 1948: —

"If atom bombs are used in large numbers—as is to be expected if great wars continue—it is thought by some nuclear physicists whose opinion commands respect that they are likely to generate radio-active clouds, which will drift with the wind, and destroy every form of life as they pass, leaving our planet, at the end of a few years, completely destitute of both animals and plants."

But the possibilities of biological warfare, as it is called, may turn out to be even more destructive than those of atomic warfare. A body called the World Health Organization has been set up by the United Nations Organization. It is concerned, as its name suggests, with the health and diseases of mankind. Its director, Dr. Chisholm, who, presumably, is in a position to know as much of such matters as anybody else—perhaps more than anybody else—told us in the autumn of 1949 of "a substance which can be spread extensively," and which will kill within six hours, if it gets into food, is breathed in or gets into the eyes. Within twelve hours it will have disappeared without trace. "Thus," he added "an enemy could wipe out a whole community and the ground would be safe to occupy next day." His conclusion was, "that any country which has expert bacteriologists and a few fanatical distributors is as powerful militarily as any other country in the world." He went on to point out that in the face of such a threat, the assets traditionally supposed to make a country strong in war, heavy industries and large armies, navies and air forces, would be valueless. Even those who possessed and were in a position to make use of atomic energy would, he suggested, be comparatively helpless if attacked by an enemy who had the resources of bacteriological warfare at his disposal.

And the inference? That men to-day have to meet a threat of destruction and extinction of a kind that the human race has never had to face before. As Dr. Chisholm himself put it, "Biological warfare has changed the conditions of survival. Never before has the human race found itself in this position. It can only be compared with the situation of primeval animals before the Ice Age."

Now, men have never succeeded in keeping free from war in the past nor, indeed, are they likely to do so in the future so long as they are organized in separate national states each of which is in control of its own army, navy and air force and each of which is, therefore, able to plunge the world into war, whenever the government or the dictator who happens to have got control of the government believes, however wrongly, that he can obtain an advantage for himself or his country by so doing. Only some form of world government which controls all the world's armed forces and against which, therefore, no single nation or group of nations could wage war, since they would not have the wherewithal to do so, can finally save the world from war.

Secondly, there is the fact that since science, by accelerating man's speed of movement, has to all intents and purposes succeeded in abolishing distance, the world to-day is geographically speaking a single whole. Our civilization, then, is or is likely soon to become world-wide. Hence, any war which broke out anywhere is liable, as never before, to spread over the whole world and, therefore, to destroy the *whole* of civilization and not merely some part of it, the part affected by the war, as has been the case in the past. That is why I said in the last chapter that the new powers conferred upon man by science increasingly demand a world government, if they are not to result in man's destruction.

Thirdly, there is the factor of population. More than a hundred years ago the economist, Malthus, pointed out that human beings tend to increase more rapidly than the means of sustaining them, that is to say, than the food supply. Hence, if the world's population continued to grow, mankind, he

averred, would starve. In the past, war, pestilence and famine have kept the population of the world in check; but given peace and the continued development of medical science, these checks would he realized, be removed and the human population of the world would grow too large for its food resources. For various reasons into which we need not here enter, Malthus's prophecy did not in the nineteenth century come true, but now, some 120 years later, it begins to show signs of doing so.

Here are a few facts which show what the problem is. During most of recorded history, the human population of the world has stood at 400 million. At the beginning of this century it had reached 2000 million. It is now 2300 million and is increasing at the rate of nearly twenty million a year. Thus, there are fifty-six thousand more people alive in the world every morning than there were on the preceding morning; every minute forty more mouths have to be fed than was the case in the preceding minute. By the end of the century the world's population will have reached 3000 million, that is to say, human beings will be very much more numerous than they have ever been before.

For this great growth of population science is largely responsible. Hitherto, over most parts of the world, and particularly in India and China, a large proportion of the babies that have been born have died during the first year of life. As the result of the improvements in medicine and hygiene brought about by science, most babies now live. Science, again, has enormously diminished the mortality among mothers which in such countries as India has always been very great. In the past the close-packed communities of Asia have been swept again and again by plagues such as cholera which science has done much to eliminate.

Partly because of the reduction in infant and maternal mortality, partly because of the growth of hygiene and the diminution of plagues, the population of India alone has increased by thirty-five million persons since the beginning of the last war. Yet in India, thirty-five persons in every

thousand still die every year compared with between eleven and twelve in England. When the death rate in India drops to the English level, the population will grow very much more quickly still, unless the birth rate can be drastically reduced.

While facilitating this growth of population, science has at the same time enabled human beings to plunder the natural resources of the earth so ruthlessly that the area available for food growing rapidly diminishes. This is partly owing to our rapacious methods of farming which tend to exhaust the soil, and to the wholesale cutting down of trees. As a result, the fertile topsoil from which plants and vegetables grow is blown away by the winds or washed away by the rain—the process is called "soil-erosion"—the effect of which is to produce the so-called dust bowls of America. In the United States, out of 460 million acres of good arable land, some 330 million are estimated to have suffered from some soil erosion and in Australia about half the wheat-growing lands.

The reduction of land available for food growing is also due to the growth of industry and to man's habit of living in towns. Thus, in America 700 thousand acres are withdrawn every year from food production by roads, factories, cities, suburbs and aerodromes; in our own country the figure is about fifty-six thousand.

The Potential Benefits from Science

There is, of course, another side to all this. Science, which increases the number of mouths to feed and whose main effect hitherto has been to diminish the area of food-growing land, could have and, in some cases, does have the opposite effect. By the use of birth-control it enables people to limit the number of their children. Thus in England the present[1] birth rate is about seventeen babies per thousand persons, which is just over half what it was in the Victorian age. Birth control is at present practised only by what we call civilized societies, and more particularly by the best educated and the wealthiest members of those societies; but ultimately, if our civilization continues, it may be expected to spread to

1 1949–50

all communities and to all members of those communities.

Moreover, scientific knowledge *could* be used enormously to increase the world's food supplies. This could be done in two ways; first, by increasing the food-growing areas. Thus, to take a particular example, by the use of bull-dozers to scrape out water holes large areas of Africa and Australia now uncultivatable because of lack of water could be brought into cultivation. Again, by destroying the tsetse fly medical science could make vast areas of Central and Eastern Africa available for cattle grazing. In general, it is estimated that whereas some 11,000 million acres of the earth's surface are from the point of view of climate suitable for crop growing, it is only on some 3–4000 million acres that crops are actually being grown.

Secondly, it is possible gradually to increase the amount of food which those areas already in cultivation do in fact produce. For example, in Britain the yield of wheat used to be from 8 to 10 cwt. an acre; it now averages about 20 cwt. an acre, and the best farmers can get up to 40 cwt. The use of fertilizers in India and China, together with the breeding of new types of rice plant, would give an enormously greater output of rice, the staple food of the majority of Asiatics, and so on. But all these increases and improvements presuppose that science will be used, as it ought to be, for the benefit of mankind, to make human beings happier and more prosperous, and not wastefully or perniciously to destroy natural resources. It cannot be said that the ways in which science has in fact been used over the last hundred years gives ground for hope that it will be used beneficially in the future. Meanwhile, the situation is disturbing.

The number of mouths to feed is constantly increasing, but the resources from which they may be fed are correspondingly diminishing. If present tendencies continue, if, that is to say, science continues to be mainly used for man's harm instead of for his welfare, the world may well be faced in one or two hundred years' time with famine, involving wars between famine stricken nations competing for larger shares of a dwindling food supply.

The best way of preventing such a disaster would be to fix each nation's population with reference to the food resources likely to be available. This could be done by the wise use of birth control. But at the present time each nation tries to become as large and as numerous as possible in order that it may be strong in war, and only a world government would have the power to compel the nations to take the necessary steps to limit their populations. Thus, from many points of view it seems that man's increasing powers point unmistakably to the need of world government, if they are to be used not for man's detriment and possible destruction, but for his welfare.

The Prospects of World Government

What, then, are the prospects of a single government for the whole world? Unfortunately they are not very promising. Two attempts have been made within the last forty years to bring the nations together, first in the League of Nations which was created after the 1914–1918 war; secondly, in the United Nations Organization which was the product of the last war. Neither of these associations has, however, been very successful. The League of Nations was helpless to prevent the second world war and its successor, the United Nations Organization, seems to have no authority over the great powers. How, indeed, could it have such authority, when it is without armed forces to impose it? Many people think that the only way in which the nations of the world can be brought together under the control of a single world government is through the domination of the rest by a single power, as the European world was dominated by Rome in the centuries immediately succeeding the birth of Christ. America is the most likely candidate for world domination, but it is difficult to see how such domination could be achieved without at least one more war, since it is inconceivable that Russia as at present governed and motivated, would submit to it. In such a war it is all too likely that some of the methods of destruction mentioned above would be used with terrible results.

These are some of the reasons for thinking that the advances which have resulted from the application of science to the control and exploitation of the forces of nature have brought about a new situation in the history of mankind. Man has it in his power to-day to destroy himself or to bring about a reversion of the human species to a condition of savagery or barbarism, which might last for hundreds or even thousands of years. Is this latter development likely? The answer depends upon human nature, the one thing that science has hitherto been unable to improve. Why has it not? The reason may be that human nature is unimprovable by science, precisely because there is something in human beings which is outside the scope of science. Is this the case?

The question cannot, I think, be answered by reference to the kind of considerations that we have hitherto taken into account, that is to say, by reference to historical considerations relative to man's past and to political considerations touching his present of which we have taken account in this chapter. We must turn to the kind of question which we raised at the beginning of the second chapter, when we considered whether the life and mind of man are things unique in the universe—these were our second and third possibilities—or whether they are merely accidental by-products of the working of material forces, this being the first of the three possibilities mentioned.[1]

If the latter, if man and the mind of man are unplanned accidents in a purposeless universe, then there is no necessary reason why he should not completely destroy himself, but also there is no necessary reason why he should not be able to improve himself by an extension of the methods of science to deal with human nature. The relevant science in this connection is that of eugenics or scientific breeding. If the second view is true, if life and mind are the expressions of some vital creative force which, originally unconscious, expresses itself in man in order that it may achieve consciousness in and through living organisms, then the destruction of

1 See Ch. II, pp. 22-24

man does not presumably involve the destruction or disappearance of the creative force of life, which may once again express itself in human beings, or in creatures like human beings but, it may be, superior to them. If the third view is correct, if man's life and mind are a witness to the presence at the heart of things of a mind which is akin to ours, a mind which belongs to a Person and created mankind in pursuance of a purpose, then it is unlikely that man will be allowed to perish from the face of the earth, until the purpose is fulfilled. Also, it is not by the methods of science that his nature can be improved, since some part at least of his nature lies outside the scope of science. To a consideration of these possibilities we shall turn in the remaining chapters.

CHAPTER V

MIND AND MATTER

The Body-Mind Connection

Let us, first, ask what it is that we mean when we speak of a mind. We normally suppose that we are not all body; we have minds, we say, as well as bodies and it is our minds which are conscious and which think, will and feel. If our minds are not parts of our bodies, they are not material; therefore, they are not in space because only material things can occupy space; therefore, though they may be intimately connected with our bodies, our minds are not *in* our bodies. Open a man's head, and you will see a structure of nervous tissue, consisting of millions of nerves arranged in tiers and layers of immense complexity; this structure is his brain. Now, the brain is the instrument through or by means of which the mind affects the body and the body affects the mind. When, for example, I *will* to raise my hand, the *first* of the series of events that takes place in my body occurs in my brain, just as, when some occurrence happens in my body which produces an effect in my consciousness, for example, a disturbance of the nerve cells at the end of my finger when I touch something hot, it is only after the requisite events have taken place in my brain that I feel the pain in my finger.

The connection between body and mind is close and constant; in fact, they are always influencing one another. If I have a shock I turn pale, if I am angry or shy, red; if I am in great pain or distress, a noise occurs in my throat called a groan and my eyes may begin to water. If I decide to eat, a small hole opens in the bottom of my face and my lifted hand pops solid substances into it and so on. These are instances of the effects of the mind upon the body; my mind, that is to say, feels something or decides on something and my

body registers the feeling and acts in accordance with the decision. Contrariwise, if somebody sticks a pin into me, I feel pain; if I get drunk, I see double; if I have jaundice, I see yellow; if I am constipated, I have a headache; if I go out for a walk in an east wind, I feel irritable or melancholy; if my temperature rises above normal, my sensations of touch become sharper and finer, so that I become conscious of, for example, the texture of the sheets. These are examples of the effects of the body upon the mind.

So continuous is this two-way process of interaction, as it is called, between body and mind, that some people maintain that every event in the body is accompanied by a corresponding event in the mind and vice versa, though, for my part, I find this hard to believe.

Yet how difficult, how almost impossible, it is to understand how this process of interaction takes place. The body is a piece of matter; it has mass, length, breadth, and thickness and occupies space, and its contents are blood, bones, flesh and nerves. All these are resolvable, as any other material thing is resolvable, into molecules, elements, and atoms.

The mind is not material, has, therefore, no mass, length, breadth, or thickness, and does not occupy space. Its contents are the stream of hopes, wishes, fears, thoughts and emotions which make up what we call our consciousness.

Body and mind, it would seem, have no single factor or feature in common. How, then, can they "get at" one another so as to produce effects upon each other? For things, after all, can influence one another, only in so far as they possess common qualities. Thus, a paving stone can crush a butterfly because both are material and occupy space, but how can it crush a wish or be affected by a thought? We can measure a board and weigh a stone, but who can measure the inspiration that went to the making of Beethoven's Symphonies or weigh a poem by Shakespeare? There is a legend about the whale and the elephant who went to war, but neither could harm the other, since the elephant could not get at the whale in the water, nor could the whale come

at the elephant on the land. It is precisely this sort of difficulty raised to the *n*th degree which is presented by the apparent interaction between mind and body.

Materialism. What it Maintains

Now, this difficulty, a difficulty which arises only on the assumption that mind and body are really different, has seemed to many to be so insuperable that they have been driven to deny that mind and body *are* really different. Since many of the things that happen in the mind are, *on any view*, due to prior happenings in the body as, for example, when a pin is stuck into my hand, I *feel* pain, they have been led to conclude that *everything* that happens in the mind is in the last resort caused by something which has first happened in the body. The mind, then, is, on this view, determined by the body and what we call free will, which involves the occurrence of uncaused mental happenings, is an illusion.

Again, since the body is obviously material and since, if the mind is not material we cannot understand how it affects or is affected by the body, they have insisted that the mind must be material too. And so they have conceived of mind or consciousness as a kind of emanation from or off-shoot of the brain, or as a sort of glow round the brain, like the halo round the head of a saint. Its function, they have maintained, is to light up the events that happen in the brain. Thus, when a pin pricks my finger, a series of nervous impulses passes along my wrist, up my arm and neck and so into my brain. When they reach the brain, these impulses cause a disturbance in the matter of the brain; this disturbance is illuminated, as it were—and it must be remembered that I am speaking here only in metaphorical terms—by the glow of consciousness, with the result that we are said to be "conscious" of the prick. Mind events, then, are the end results or by-products of a series of bodily happenings. This view links up with the first of the three views as to the origin and nature of life which I mentioned in Chapter II,[1] the view which regards the appear-

1 See Ch. II, pp. 22, 23

ance of life upon our planet as due to the operation of the same forces as governed the development of the earth prior to life's appearance and which, therefore, accounts for life as a by-product of or development from matter. It is, indeed, the natural development of that view in its application to psychology.

According to this, which is usually termed the materialist view of life, all living things originated out of dead things and all vital events, that is to say, events in living creatures, are determined by preceding physical events to which the creatures react and which, therefore, cause the events which are the creatures' reactions. According to the materialist view of mind, minds originate in bodies and are produced by bodies, and all mental events are caused by or are reflections of prior events in the body which the mind animates.

The Materialist View of the Universe

Now, let us take a look at the materialist scheme of the universe to which this view of the relation of matter to life and of body to mind points, and which it has helped to build.

The universe consists of matter and only of matter; it consists, that is to say, of little bits of material stuff, conceived at the moment as positively charged neutrons and charges of negative electricity,[1] moving about in space. The bits come together and as a result produce what we call "things." It may be that the bits are all ultimately of the same kind and that the differences between things are, therefore, differences only of arrangement and of speed of movement, as bricks out of a box can be so arranged as to constitute a pyramid or a bridge and yet remain the same bricks.[2] Some of the little bits or, rather, some of the arrangements of them have developed the property of "livingness"; they have, that is to say, come alive, but they have done this only under certain rather rare conditions. Let the temperature of the earth, for example, be a few score degrees higher or lower; let there be rather more or rather less water on its surface; let it be a little nearer to

1 See Ch. I, pp. 13-15 2 See Ch. I, pp. 12, 13

or further from the sun, and life, as we now know it, would be impossible. Even as things are, life is possible only in a very thin slice, as it were, of space. It is tied to all intents and purposes to the surface of the earth; it cannot rise more than a few miles above it or penetrate to more than a mile or so below it.

So long as life persists, whatever is living is dominated and determined by what is not living. Thus, living bodies are determined by the stimuli which are brought to bear upon them by the environment in which they are placed. As we saw in Chapter II,[1] the manner in which they evolve and develop and the characteristics which they ultimately come to exhibit on any view depend largely upon this environment. Change the environment and you change the nature of living things.

Within the living body the mind is determined by the brain; that is to say, what we call our mental life is in the last resort no more than the reflection or by-product in consciousness of events which have occurred in the body and the brain independently of the mind. For if consciousness is, as suggested above, a kind of glow which lights up events in the brain, it cannot, it is obvious, light up what is not there. Hence causation proceeds always from the less living to the more. There is, first, the event in the external environment, and then the events in the body of the living creature which are its responses to the external event. Within the living creature there is, first, the event in the sense organ, the eye, the ear or the skin, which originates the chain of responses by the body to the event in the external environment. There is, secondly, the transmission of the event on the surface of the skin or in the sense organs along the telegraph wires of the nervous system which carry the news of it to the brain. There is, thirdly, the consequential disturbance in the nerve cells of the brain and there is, fourthly, the event in the mind or consciousness which we call our *knowledge* of the event in the external world which originated the whole train of bodily and mental happenings.

1 See Ch. II, pp. 25, 26

Life, then, is conceived as something which has occurred by accident in a universe which was not designed for it. It is like a chance passenger travelling for a time across a fundamentally hostile and alien environment. Some pieces of matter, the kind we call bodies and brains, have happened to become conscious, but this consciousness is in essence material, being likened to a sort of glow which surrounds the brain; or, to change the metaphor, it is like the bright colours you will see upon an oil film when the sun strikes it.

Many of the discoveries made by scientists in the last hundred years have seemed to support this view. Geology has enormously extended the age of the earth, which did not come into existence four thousand years ago, as our great grandfathers were inclined to think, but is hundreds perhaps thousands of millions of years old. During the greater part of that period, the earth was without life. Astronomy has enormously extended the size and spread of space. Nowhere else in all those billions of stars and planets is life known to exist; on the contrary, there is, as we saw in the first chapter, good reason for thinking that the area of the universe in which conditions suitable for the maintenance of life obtain is exceedingly small. Thus, in the vast immensities of geological time and astronomical space, life seems like a tiny little glow, flickering uncertainly for a brief period. When the conditions suitable for life cease to exist, the glow will be snuffed out in the one corner of this universe that has known it and the bits of matter of which the physical universe consists will continue to move to and fro in space, meaninglessly, pointlessly and nearly endlessly.

The Prospects of Life in General and of Human Life in a Materialist World

Nearly, but not quite; for, as we saw in the first chapter, the second law of thermo-dynamics,[1] as it is called, looks forward to a period when all the physical energy in the universe will have achieved equal distribution. When that

1 See Ch. I, pp. 29, 31

condition is reached, there will be no more events of any kind in the universe which will, so far as we can see, persist indefinitely without change and without, therefore, the kind of change which the movements of pieces of matter involve.

These considerations have an important bearing on the question of the future of the human race. We know with tolerable certainty what will be the end of life upon the earth. Just as it was once too hot to maintain life, so when the heat of the sun begins to fail, the earth will in due course become too cold and too dry. We may not unplausibly suppose that the condition of the last survivors of mankind will be as miserable and as brutish as that of the first, since they will have to devote all their attention and energy to keeping themselves alive in conditions which are increasingly unfavourable to life. One day the last human survivor will breathe the last human breath and the lifeless earth will continue to spin through space, bearing the record of man's achievement, his buildings, his pictures, his statues and his books, frozen to its icy surface. But, it may be said, man will have learnt how to transfer himself to another planet long before such a condition of affairs is reached. When the earth begins to grow cold, there will be a mass migration of the human race to a planet nearer to the sun, to Venus or even to Mercury. Nor does the solar system necessarily set limits to man's migration. As the heat of the sun continues to fail, he may travel outside the solar system to a planet rotating round some younger star in the Milky Way.

Such is man's power of invention that we cannot deny that such developments are well within the bounds of future possibilities. But even if such possibilities should be realized, they do not enable man to escape from what, if the materialist view is true, is his inevitable fate; they only postpone it.

Let us consider once again the implications of what is known as the second law of thermo-dynamics, according to which the universe is unwinding itself like the spring of a

watch, and running down like an engine.[1] Ultimately, so far as we can see, the spring will be completely unwound, the engine completely run down. If all physical changes cease, there will be no more changes in those pieces of matter which are called human bodies. Hence, if human beings consist exclusively of their bodies, the human race will come to a stop and what we call man and consciousness will disappear from the planet. In a famous essay entitled *The Free Man's Worship* Bertrand Russell, one of our greatest living philosophers, has put this position in eloquent and celebrated words. "All the labours of all the ages, all the devotion, all the inspiration, all the noonday brightness of human genius are doomed to extinction in the vast death of the solar system and the whole temple of Man's achievement must inevitably be buried beneath the débris of a universe in ruins."

In view of these possibilities, or rather of what if Materialism is true, we must regard as near certainties, it is high time that we considered whether Materialism is in fact true.

1 See Ch. I. pp. 20, 21. Since the above was written the wireless talks of Mr. Fred Hoyle have introduced the layman to another view of the ultimate destiny of man on the earth which is—it now appears—to be roasted instead of frozen. See *The Nature of the Universe* by Fred Hoyle. In this book the concept of the universe running down like a clock has been superseded.

CHAPTER VI

IS MATERIALISM TRUE?

A Glance at Idealism

But is it true? That is a large question which cannot be adequately discussed, let alone answered, in this book. The great advantage of Materialism lies in the difficulty which it avoids. This is the difficulty to which I drew attention in the last chapter, the difficulty, namely, of understanding how mind and matter, if they are *really* different one from another, could produce effects upon one another, as they so obviously do. It is because of the enormity of this difficulty that many thinkers have been driven to take the line that mind and matter cannot be *really* different. Therefore, they maintain, since matter obviously exists and is real, mind cannot *really* be different from matter.

But we could, it is obvious, take a different way out of the difficulty and affirm that matter cannot *really* be different from mind. Matter, we might say, is an illusion of mind or is a creation of mind or is an emanation from mind. This is the way known as Idealism which affirms that only minds and their contents, ideas, thoughts, images, desires, emotions and so on, exist and it is the way taken by the majority of philosophers.

When it is persuasively urged, it is extremely difficult to refute the view that what I am *actually* aware of when I appear to myself to make contact with the world outside me are my own feelings and sensations. Thus, when I look at a table, I have the *sensation* of seeing something square; when I touch it, I have a *feeling* of something cold and hard and when I hit it with my knuckles, I have the experience of hearing a sharp, rapping sound. Now, these sensations, feelings and experiences are mental; they are, that is to say, parts of my consciousness.

Moreover, it can be shown that most of the qualities which we normally attribute to things existing outside us don't really belong to them but are sensations and feelings belonging to us. Thus, as Bishop Berkeley, who sets out this position very persuasively in his book, *The Principles of Human Knowledge,* and again in his *Three Dialogues between Hylas and Philonous* pointed out, when we are near a fire we have a sensation of heat and the heat, we say, belongs to or is in the fire. But if we gradually approach the fire the sensation of heat will deepen, until it gradually changes into a sensation of pain. Now nobody supposes that the pain is in the fire; the pain, we say, is in us; yet the pain is only a more intense degree of the heat. The implication is that the heat, too, was in us and not in the fire.

Or take, says Berkeley, the case of a cheese mite's foot. This is so small that it is not visible to the naked eye. Are we, then, Berkeley asks, to suppose that the cheese mite cannot see its own foot? This seems unlikely for biological reasons, since it is difficult to see how the cheese mite could survive, if it could not see itself. The inference is that the cheese mite's foot appears to be of one size to the cheese mite and appears to be of another size to us; or, rather, it does not appear to us to be of any size, from which the conclusion is that size like heat since it varies with the perceiver does not belong to things but does belong to the perceiver's consciousness, being, as Berkeley puts it, "an idea in the mind."

It is not my intention here to develop what is called the philosophy of Idealism and I cannot, therefore, pursue these arguments further. I mention them only to illustrate my contention that there is another way out of the difficulty presented by the impossibility of conceiving how two substances as different as are mind and body could interact. It is not *necessary* to take the materialist way and affirm that mind is part of matter; we can take the idealist way and insist that mind and mind alone is real, and that it is mind which is the unknown cause of the sensations and ideas which people feel. Moreover, if it is unknown we cannot know anything

about it. We cannot, therefore, know that it is material.

In this chapter, however, I propose to ignore the difficulty and to affirm roundly that the relation between body and mind is a mystery which we cannot solve or hope to solve. If there is any truth in the religious view of the universe (see Chapter VIII), the fact that we cannot should not occasion surprise. According to the account given in the Bible God caused life to enter into matter by breathing His breath into dust. Now, granted the truth of the religious view of the universe, granted, therefore, the existence of God, we cannot expect to understand the manner of God's working.

I now propose to consider whether the difficulties involved in the acceptance of Materialism are not as great as the interaction difficulty which admittedly Materialism does not have to face.

I *How Did the Universe Start?*

Perhaps the most difficult question for Materialism to answer is, how did the universe start? The universe with its stars, planets, the earth, air, sky and sea is a going concern. On the materialist view—and, indeed, so far as physical things are concerned it is extremely difficult to take any other view—whatever exists must have a cause. All the material things that we know must, then, have been caused by other material things.

Let us go back in thought to the first material things first, that is to say, in time of which we have any knowledge. These are presumably the gaseous radio-active matter of which the nebulae were formed before they condensed into the denser aggregations of matter that we call stars, and the stars in their turn threw off the planets.[1] Now this primal stuff, the stuff of the nebulae from which everything else has taken its rise, must also have been caused, and so, too, with any matter that there may have been before it. However far we went back in time, we should always be able to ask of any matter which might be in existence at that time, what caused

1 See Ch. I, pp. 6-9

it? Now the view that the chain of material causes and effects stretches back *for ever* in time would entail, presumably, that the universe never got started at all.

Moreover, it is very difficult for us to think of matter having been, as it were, eternally there. All material things and happenings that we know of have beginnings and have causes, and, so far as our thought can take us, the same must, we must suppose, be true of all material things and happenings at all times and places, including, therefore, the material things that existed and the material happenings that took place before man appeared. If this is, indeed, the case there cannot once have been material things which were without beginnings or have once occurred material happenings which were without causes. Matter, that is to say, cannot have existed eternally.

Further, as we saw in the first chapter,[1] the particular arrangement of matter, namely, the initial concentration of energy in the nebulae, which the facts of astronomy appear to require, certainly *seems* to suggest a beginning, that is to say, a concentrating in time.

Nor can we conceive of matter creating itself; we cannot, in other words, conceive of a time when matter was not, and that then suddenly there was matter—we cannot, that is, conceive of this, *provided that matter is all there is.* For matter cannot bring new matter into existence; it can only change its form, as when the wax of a lit candle is dissipated into the surrounding atmosphere in the form of molecules. In sum, the notion of a world originally without life and intelligence producing (i) itself, (ii) intelligent beings, and (iii) the understanding of (i) by (ii), does not satisfy our reasons.

The only other possibility is that there is something prior to matter, something of which matter is the expression or the instrument, or, more simply, something that created matter. Now, it is difficult to see what that something can be if it is not mind. That minds can create matter we know. For example, if I *will* to create a roll of muscle on my arm, I can

1 See Ch. I, p. 21

cause it to appear by doing the appropriate exercises. If two parents *will* to have a child, a child is born. It seems, then, that the notion of mind bringing matter into existence presents no particular difficulty, *provided that some matter was there* to begin with. And as to the matter that was there to begin with, what can we say of it except that a mind must have caused *it* to be, not a human mind like our own which can apparently only work on pre-existing matter, but a mind infinitely more powerful than ours which could bring matter out of nothing, causing matter to be where there was none before. To revert again to the argument of Chapter I, we have already seen that the science of astronomy gives some countenance to the view that mind originally created matter, or at any rate concentrated energy in space at a particular point of time.[1]

But does not this demand for a mind to create matter raise in a new form the difficulty which has already caused us to reject the view that matter was produced eternally by other matter, the difficulty, namely, that the series of material happenings would, on that view, have gone back for ever and the universe would, therefore, never have had a beginning at all?

I agree that the difficulty is still there, but if we assume a *mind* to effect the initial act of creation, I do not think that it is any longer fatal. We have already seen that mind can create new matter in cases where matter is already in existence for it to work on. We have also conceded the possibility that an omnipotent mind could create matter where there was none before. Now, all the material things of which we have any knowledge have both a beginning—the body of the child begins in the bodies of its parents, the tree grows from a germ, a machine is assembled in a workshop, a house is put together brick by brick and the bricks themselves are made from baked clay and so on—and also an end—all material things sooner or later break up, wear out and fade away. But though all the material things that we know have both a beginning and an end, we do not see either the beginning or the end of any

1 See Ch. I, pp. 20, 21

mental existent, and we do not know, therefore, that mental things either end or begin. Thus, we do not know that our minds were created at the same time as our bodies; they may have pre-existed them, as those who believe in reincarnation maintain, and they may well outlive them, as the spiritualists assert and Christianity believes. Certainly, nobody has ever witnessed the beginning or the dying out of a mind. Therefore, for all we know to the contrary, minds *may* be immortal, that is to say, they *may* exist without beginning or end. If so, the notion of a non-created mind existing eternally to be the creator of matter, though difficult for us to conceive, is not impossible.

II *What is Implied by Knowing*

Let us consider what is the distinctive characteristic of a mind, the characteristic in respect of which it is differentiated from everything else. It can *know;* know, that is to say, things which are other than itself. Broadly speaking, its knowing is of two kinds. It can know physical things which are present with it in time and present to it in space and which stimulate the sense organs of the body which it animates. This kind of knowing is called "sensing" or "perceiving," as when I now perceive the pen and the book which are lying on the table. Secondly, it can know facts which are not physical, not present with it in time or to it in space and which do not stimulate the sense organs, as when I know that the Battle of Waterloo was fought in 1815 or that $a^2-b^2=(a+b)\,(a-b)$.

Now, can we conceive of a piece of matter possessing this characteristic of being able to know? Possibly, we might do so in regard to the first kind of knowing. We might say, for example, that the ice "knows" the sun that melts it, or that the meat "knows" the fire that cooks it, or the steel filings the magnet that attracts them, although such a statement if it were to be made, would seem at best to be only metaphorical. For though the ice may "know" the sun and the meat the fire and the filings the magnet in the sense of taking note of them and behaving appropriately, they do not know what it

is they are taking note of, nor are they conscious of the fact that they are behaving and reacting, as I do and am when I not only experience heat but know that it is the sun or the fire that is the cause of what I am experiencing, and am also aware of my reaction to it.

But is it possible to conceive of matter knowing, even in the sense of taking note of, what is not present with it in time or present to it in space? For my part, I cannot conceive how it can do so. Mind, then, I would say, is the only thing which can know facts which are non-physical and other than itself and in respect of this capacity it is not only different from matter, but is unique.

There are several important points to note in regard to this characteristic which minds possess of knowing things other than themselves.

(i) First, the physical universe is, as we have seen, very large and for the most part empty of life, while the space that living things occupy is tiny and their time span short. Mind, from this point of view, seems unimportant; matter important. Yet mind has one great advantage over matter—it knows matter and matter does not know it; that is to say, we know that we are small and insignificant and that the universe is vast and empty and the universe does not know these things. As the great French philosopher, Pascal, put it, "Man is only a reed, the weakest thing in nature; but he is a thinking reed."

Mind's Advantage over the Universe

(ii) This suggests a further and more far-reaching reflection. If Materialism is true, the fact that mind exists in the world is in the nature of an unplanned accident, unplanned since, prior to mind's actual appearance, there was no mind to plan it.

But planning and even non-planning are mental conceptions. Nothing in a world which is mindless could be either planned or not planned; for to say either that it was planned or that it was not planned would be meaningless, if there were no mind to give meaning to the conceptions of planning and its contrary.

Similarly with regard to such notions as those of vastness, emptiness and loneliness. Are these not mental notions, having meaning only to and for minds and having meaning, therefore, only where there are minds? Materialists emphasize the immensity and the loneliness of the universe, dwelling upon the enormous areas where it is certain that life does not exist and the almost interminable prologue in time before life began to exist. But the universe *in itself* is neither immense, empty nor lonely—how, indeed, could a piece of matter be lonely? Time in itself is not long and space in itself is not vast. Such words as "lonely," "empty," "long," "vast" and so on stand for mental conceptions and ideas; it is mind that has contributed them to a world which, apart from mind, is without them. Thus, to say that the universe is big and that mind is insignificant is to make use of conceptions which, apart from mind, mean nothing. In order that such expressions may have meaning, it must be pre-supposed that mind is somehow *there* to make them meaningful by virtue of its ability to class things as big or as insignificant.

Spiritual Qualities

If the physical universe is not vast or empty or lonely without mind to find it so, presumably it is not in *itself* beautiful or great or sublime. Now men do find the universe to be beautiful and sublime; they admire sunsets and rivers and mountains and wonder at the stars at night; they make poems to the spring and deck their rooms with flowers. It is customary to call beauty and sublimity spiritual qualities; they are, that is to say, qualities which possess what we call "value," and it is spirit[1] which perceives value.

Now matter in itself has no spiritual qualities. In *itself* it is neither beautiful nor ugly. It is beautiful or ugly only in relation to minds which find it so. Hence, in a universe that consists of matter and only of matter, a universe in which mind, in so far as its existence is conceded at all, is thought of

1 See Ch. VII, p. 81 for an account of the sense in which the word "spirit" is used.

only as a rarefied kind of matter, it would not be possible to account either for the beauty and sublimity that minds perceive in things, or for the fact that minds find them to be beautiful and sublime, and, we may add, awe-inspiring and worthy of reverence.

Truth and Falsehood

(iii) The knowledge which minds have can be either correct or incorrect. A mind, for example, can know that there are fifty people in a room when there are, in fact, fifty (knowing correctly) and it can think that there are fifty when there are fifty-one (knowing incorrectly). It can know that the train leaves at 10 a.m. when it does, and think (incorrectly) that it leaves at 10.5 a.m. When we know correctly what is, in fact, the case, our knowledge is true; when we think incorrectly that something is the case which, in fact, is not, our knowledge is false. Here, then, are two more notions, the notion of truth and the notion of falsehood which are attributes of minds or, rather, of the knowing which is an attribute of mind. Now it does not seem possible to conceive how a piece of matter or, indeed, how any activity in which matter can engage could be either true or false.

The Rules of Logic

(iv) Not only can our knowledge be correct, our reasoning can also be valid. There are certain rules which guide our thinking, known as the rules of logic. When we reason correctly we reason in accordance with these rules. Some of them are pretty obvious as, for example, the law of excluded middle, an example of which is that everything must either be or not be a beech tree; or the law of identity—example, it is impossible for a thing both to be and not to be a beech tree. Others are more complicated, such as the principle of implication—if P implies Q and Q implies R, then P implies R.

One of the most famous of these laws or principles of reasoning is the principle of the Syllogism which goes back

to the Greek philosopher, Aristotle. It is obvious that whenever we reason, we do so in order that we may obtain some knowledge which we did not have before and which is also true. If we knew it before or if it were false, there would be no point in reaching it. In order that we may obtain such knowledge we must, said Aristotle, know two things to begin with which he called the premises. First, we must know a general truth, known as the major premise, for example, that all men are mortal, and, secondly, we must know a particular truth, known as the minor premise, for example, that Socrates is a man. When we know these two premises, we are in a position to draw the conclusion, *therefore* Socrates is mortal.

The principle of the Syllogism has in recent years been seriously criticized and few logicians now hold that reasoning proceeds in this way. But, as I said above, *some* rules there must be to guide our reasoning.

In this connection it is important to realize that whenever we reason, the mind makes a jump; it jumps, that is to say, from something that is known to something that is not—or, at least, was not, before the reasoning began—and we naturally want to know what are the conditions under which the jump is justified. These jumpings by the mind have been roughly classified under two heads, jumps from general truths to particular cases, and jumps from particular cases to general truths. The first kind of jump is known as deduction; the second as induction. Thus, I know the general truth that $7 \times 2 = 14$; I know, further, that here are seven pairs of socks; then I know without counting that the number of individual socks is 14, that is to say, I deduce this particular conclusion from the general proposition which I already know, plus my particular information to the effect that here are seven pairs of socks. Similarly, if I consult the time-table and discover that a train leaves King's Cross for Edinburgh at 10 a.m., I deduce that on going to the station at that time I shall find the train.

On what is my expectation based? On my knowledge of the general principle that information given in time-tables is

on the whole trustworthy. Therefore, I conclude, the information given by this particular time-table in regard to this particular train will be trustworthy and act accordingly. These are examples of deduction. Induction is pre-eminently the method of science. I have seen the sun rise in the east on a number of particular occasions and know of no single example of its rising in the west. I, accordingly, reach by induction the general law that the sun always rises in the east. Similarly, it is by induction that I reach the law that water boils at sea level at 212 degrees Fahrenheit, because water has been observed to do so on a large number of separate occasions and there has never been an occasion, given the same conditions, when it has been observed to boil at sea level at a higher or a lower temperature.

Now, when the mind proceeds from particular examples to formulate general rules or principles as in induction, or draws conclusions in regard to particular cases from a prior knowledge of general principles as in deduction, it makes a jump. The laws of deduction and induction specify the conditions under which the jump is justified.

In general, the occurrence in a sentence of such words and phrases as "therefore," "since," "because," "it follows that," "the conclusion seems to be" indicates a jump on the part of the mind from one step of reasoning to another. When all the jumps are justified, we have a valid chain of reasoning.

We are now in a position to return to the general question raised in this chapter, the question, namely, whether Materialism can account for the facts of experience as we know them, and we do so by proceeding to ask, how can a piece of matter, or, how can the relations between pieces of matter, be valid? The question, it is obvious, is a nonsensical one. It is like asking how a colour can be square or a quadratic equation purple. What is more, if mind is only a by-product of matter and its thoughts are wholly caused by what is going on in the body, how could its thinking be also and at the same time caused and regulated, as it clearly is, by the kind of logical considerations of which I have been giving examples?

The movements of matter obey the laws of physics, yet in the cases I have been citing the activities of reasoning certainly *seem* to be determined by something else, namely, the laws of logic. I conclude that the conceptions of "true" as applied to the conclusions of thinking, and of "valid" as applied to the method of thinking can have no meaning in a universe which consists only of matter.

Conclusion

These are some of the reasons which have led men to conclude that there must be mind in the universe as well as matter, and that though what goes on in a mind is intimately bound up with what goes on in the body it animates, in respect of some, at least, of its activities as, for example, when it does equations in algebra or follows logical trains of reasoning, the mind is free from determination by the body.

CHAPTER VII

ART AND ITS IMPORTANCE

Use of the terms "Mind" and "Spirit"

Assuming that man's mind is, at least in some respects, free from determination by his body, let us try to give some account of the main forms which its free activity has assumed. At the outset we are met with a confusion about words. Readers may have noticed that in the preceding chapters I have sometimes made use of the word "mind," sometimes of the word "spirit." What, then, is the distinction between them? It is difficult to say. Once the presence of an immaterial element in our total make-up is admitted, it follows that some part of us is not body. Now this part of us which is not body may be most conveniently classified according to what it does. Thus, when it thinks, when, for example, it is engaged in doing mathematics or logic or inventing something or looking up trains in a time-table or writing such a book as this, we call it mind—it is the *mind* which thinks; when it enjoys such an experience as listening to music, watching a sunset, feeling friendship or love for another human being, making sacrifices for others—though the verb "enjoy" is not, perhaps, the most suitable word to use in connection with the making of sacrifices—above all, perhaps, in what religion terms the knowledge and love of God, it is most properly called "spirit"; it is the spirit which *feels*, I do not mean feels emotionally, but feels aesthetically—that is, perceives, responds to and is moved by beauty—and feels religiously. Yet the two, mind and spirit, are not separate but overlap; some thinking, such as that which is involved in the sudden perception of some new truth, for example, in Einstein's perception and formulation of the theory of relativity, is akin to spiritual experience. Again, the word "feeling" is hopelessly inadequate

to describe some spiritual experiences, for example, those involved in creating and appreciating works of art, or in the enjoyment of beautiful scenery, or in entering into communion with God, since these are also ways of knowing something.

Ultimate Values

I pointed out in an earlier chapter[1] that the distinguishing feature of a civilization is the liberation of man's mind and spirit for the pursuit of things which are valuable in themselves. On reflection, it is, I think, obvious that there must be certain things which are desired, not as means to other things, but in and for themselves. Most of the things that we desire, we desire as means. Suppose, for example, that you have a cold; then, it may be said, you desire or rather need quinine. Why? Because you want to cure the cold. Why cure the cold? Because you do not want to be diseased. Why not want to be diseased? Because health is better than disease. But why desire to be healthy? Because, it may be said, health is a means to happiness or, perhaps, to efficiency. But why desire to be happy? Most people would answer that happiness is an end in itself, something, that is to say, that is valued for its own sake. As to efficiency, this again is presumably a means, a means, that is to say, to something else, since there is no point in being efficient unless one is efficient in relation to some end or for some purpose. What end? What purpose? A variety of answers can be given to this question, but it seems to be obvious that whatever it is that efficiency is desired *for*, will itself be desired either as a means to some end beyond itself, or, like happiness, as an end in itself. It is a surprising fact that the things which are desired as ends in themselves, which are desired, that is to say, for their own sakes and not for the sake of anything else, instead of being clear and obvious, as one would have thought, are matters of controversy and disagreement. On the whole, however, the experience of mankind has broadly decided that there are

1 See Chapter IV pp. 49, 50

three things which are certainly desired as ends in themselves, namely, truth, goodness, and beauty; many would add happiness. Truth, goodness, beauty, and perhaps happiness are, then, called ultimate values.

In the course of the discussion in the last chapter of the rules that guide valid reasoning, and of the meaning of the word "true," when we speak of a "true" conclusion, I had occasion to say something of the value, "truth," and of its hold over the human mind. It remains to speak of beauty and goodness, in both of which connections it is the word "spirit" rather than the word "mind" which seems appropriate to describe the activity of human consciousness which is involved. In this chapter I shall be concerned with man's awareness of beauty and, in particular, with that expression of beauty which we call art, and with the effect of this consciousness in refining man's spirit, elevating his consciousness and enlarging his outlook.

The Different Forms of Art

Art has had an effect upon the lives of human beings second in importance only to religion. Unfortunately, the power of art is not often felt until maturity is reached.. What follows may, therefore, seem exaggerated to readers who are still young, and they will have to take much of what I am saying largely on trust.

First, I will consider the forms which art has assumed. These are chiefly music, painting, sculpture, literature, more particularly that kind of literature which is poetry. There are also what are known as the minor arts exhibited in furnishing, textiles, porcelain and china. There are, then, certain physical things, combinations of sounds, paints which are arranged in a certain way on canvas, stone carved into shapes, black marks on a white background (written) or noises in human larynxes (spoken) words, pieces of wood and cloth and metal and china, which have exerted a mysterious power over the human spirit and are the occasion of some of its greatest and most enduring delights.

What, then, is it that these varied kinds of physical things possess in common, so that they are all brought together under the general heading of art, or objects of art? The answer to this question is highly controversial, nor can any one answer command universal agreement. I will give my own answer first and then an example of a very different kind of answer.

Plato's View of Art

I should say that what all these different things have in common is the quality of being beautiful. This quality of being beautiful is unique; that is to say, there is nothing else in the least like it, and when a human spirit which has been properly trained and educated—for we cannot all appreciate beauty when we first meet it; we are, indeed, very far from doing so—is brought into contact with the quality it experiences a peculiar kind of delight. What is the source or cause of the quality? The answer takes us some way into philosophy where I do not wish to pursue it; but very briefly—and this is Plato's answer and in part the Christian answer—there is another world or order of reality in addition to the world of things that move in space and time. In this world there dwell a number of ideas or principles—"forms" is perhaps the best word by which to refer to them—goodness is one, justice is another, truth a third, beauty a fourth, which are the origin and source of all those things which in the ordinary world of daily life we find to be good, just, true and beautiful. For this immaterial world of principles or "forms" is not wholly divorced from the familiar world, but enters into it and bestows upon trees and flowers and the shapes of hills and a spring morning those qualities in them which delight us. But the principle or "form" of Beauty can be divined and pursued by the human spirit; and, if the pursuit is successful, it may be caught and trapped and embodied in some material like paint or stone or sound. It is the artist who pursues and catches and traps and embodies beauty. Hence the artist may be defined as a person whose spirit is gifted with a peculiar

faculty of vision, in virtue of which he is enabled to perceive the presence of the principle or "form" of Beauty and then give it visible or audible shape in material things which are what we call works of art, so that ordinary people, being subsequently brought into contact with the work, are enabled to see for themselves the beauty which the artist has first perceived, since he has, as it were, thrown it up into high relief for them by embodying it in his work.

Can we say anything about this principle of Beauty? Very little since it is, if Plato is right, unique and not, therefore, like anything else. One thing, however, seems clear. It is not a physical or sensible[1] quality like hot or cold, hard or soft, wet or dry, or coloured. It is not, that is to say, with the eye or with the ear or with any of our senses that we come to know it, but with the spirit. An example will make this clear.

Beauty not a Sensible Quality

Suppose you put down with your finger a dozen notes, one after the other at random on the piano. Hammers hit wires, and as a result waves travel outward through the atmosphere. After a calculable time some of these waves reach the place where a man's ear-drums are. They impinge upon the ear-drums, there creating a disturbance which acts as a stimulus to the nerve endings which run into the membrane of the ear-drum, and which is by them conveyed first to the middle and then to the inner ear. The inner ear contains or rather consists of an oyster-like shell, the cochlea, which contains a fluid and is fringed with long wavy hairs or threads called cilia which are arranged along its inner edge. When the stimulus from the middle ear reaches the inner ear, it causes ripples in the fluid in the cochlea. These ripples impart a swaying motion to the cilia, which swaying motion originates a continuous series of nervous impulses which run along the nerves leading from the inner ear to the brain. Here a complicated series of disturbances takes place among the tiers and layers of nerve cells of which the brain is composed. (I

1 One that we perceive by our senses.

have here mentioned only a few of the bodily occurrences involved in the machinery of hearing. Physics and physiology between them could give a fairly full account of these occurrences.) When and only when all these bodily occurrences have taken place, I shall have the sensation of hearing the sounds which the notes struck produce from the piano.

Now let us suppose I strike the same notes, but strike them in such an order that they form the statement of the theme of a fugue by Bach. Exactly the same physical and physiological events, that is to say, exactly the same happenings in the physical world, occur as before. But this time something is added; there is pleasure, an enormous pleasure, in the hearing of the theme. In the case of great music we say that the combination of sounds which gives us this pleasure is beautiful. Yet the only difference between the first case, the case in which the notes were struck at random, and the second, the case in which the same notes formed the theme of the Bach fugue, is a difference of order and arrangement. It is on this difference that the beauty of the second and the non-beauty of the first depend, and from it that they derive. Now order and arrangement are not physical things; it is not, that is to say, with any of our *senses* that we know them. Thus, it would seem that the quality of being beautiful, which in this case is a quality dependent upon and bound up with a certain *order* or *arrangement* of sounds, would not appear to be a physical quality.

Similarly with pictures; the materials which go to make a picture are canvas and paint. Let the paints be spread at random upon the canvas, and there is a coloured surface and that is all; let the same paints be spread on the same canvas in a particular way by, let us say, Rembrandt, and beauty is achieved which produces a profound effect upon the human spirit. Since the materials involved in the two cases are the same, wherein does the difference between them lie? In the order and arrangement of the paints on the canvas. Yet order and arrangement are not physical things. Hence the beauty, which arises out of the order and arrangement of

pieces of matter, since it turns out to be a quality *of* the order and arrangement, is a quality of something which is not itself physical.

Beauty, then, on this view, is like a pane of glass through which man's spirit can catch a glimpse of a different order of reality, which is a non-material order, and since it is a quality of things, or rather of the relation between things, it is there, so to say, waiting to be perceived whether anybody actually perceives and acknowledges it or not. This is called an "objective" view, because its essence is to maintain that beauty belongs to or is a quality of objects, or, more precisely, of the arrangement of objects.

Tolstoy's View

As an example of a different answer to the question, "what is it that the class of things which we call works of art possess in common?", I will take the view of the great Russian novelist, Tolstoy. According to him, art is communicated emotion. Let us suppose that the artist, be he musician, painter or poet, feels an intense emotion about something; let us suppose further that he creates a work in paint or sound or stone or words which somehow expresses this emotion, and that the emotion is communicated to those who are brought into contact with the work; then, said Tolstoy, there will be art. Hence what all works of art have in common is this power of communicating strongly felt emotion.

There seem to be many objections to this view. First, it does not tell us what *kind* of emotion must be communicated if there is to be art. Perhaps the most direct expression of intense emotion that we can think of is the screams of a man being tortured on the rack. Moreover, the emotion is communicated, for we know, or we think we do, precisely what he is feeling; but nobody supposes that such screams, emotionally expressive as they are, constitute art, and the reason why they do not is presumably that the emotion expressed and communicated is not of the right kind.

There is another objection, no less grave. All are agreed

that works of art vary in merit. Some are of supreme importance and endure through the ages; others live no longer than the year, sometimes than the month, which gave them birth. In general, it is often possible to say with an assurance of wide agreement that of two works of art one is greater than the other, the operas of Mozart than those of Sullivan, the pictures of Leonardo da Vinci than those of Sir Alfred Munnings, the recent President of the Royal Academy.

Now there is little doubt that at any given moment what most human beings, and among human beings we must presumably include children, admire are not great works of art. Most people are bewildered by or indifferent to art, and prefer "musicals," jazz, swing, crooning, or whatever the latest fashion in light music may be, to the works of the great composers, and the bathing beauties on the covers of illustrated magazines to all the pictures in the National Gallery.

Hence, if we are to judge the value of a work of art by the degree and quality of the emotion which it succeeds in communicating, very few of the world's great works would survive the test; fewer still at the time of their first appearance, since the accounts of the first reception of great works of art make it reasonably certain that *at that time* they succeeded in arousing emotions in numerically fewer breasts than the contemporary equivalents of light music and bathing beauties. For it is not easy, except for those who are specially gifted, to appreciate great works of art on their first appearance or hearing. In order that we may do so, we need training, practice and fairly constant intercourse with great pictures and great music, until gradually our eyes are opened and our ears unsealed. Hence if we apply the only test which Tolstoy's theory permits, the test of success in communicating emotion, most of the world's acknowledged works of art would fail. Tolstoy, incidentally, accepted this conclusion, and asserted that because Russian folk songs had given pleasure to numerically more people than had *Hamlet*, they constituted greater works of art. Apart from the fact that this conclusion runs counter to the general judgment of mankind, it seems

reasonably certain that whatever it is that we mean when we say that this picture is more beautiful than that, what we do *not* mean is that, on counting heads, we found that fifty-one out of every hundred people who saw the two works preferred "this" to "that"; we do not, in other words, think that questions of artistic worth can be solved by statistical methods.

For these reasons, when the question is asked, "what distinguishes the class of things that we call art or works of art from other things?", I prefer an answer of the first type, an answer which says, "it is the fact of their being beautiful," to an answer of the second type which says, "it is the fact of their being able to express and communicate emotion."

The Power of Art

I ought to justify the inclusion of this chapter in the present book by saying something about the power of art over the human spirit, but to do the theme justice would take me too far afield, since it would require some discussion of particular works of art.

One of the most important things to notice about the power of art is the way in which great works continue to exert their influence through the ages. Scientific discoveries which are of major importance at the time when they are made are superseded. Thus Newton's theory of gravitation has been superseded by Einstein's theory of relativity, and the nineteenth century view that atoms were all of the same kind and were solid and indestructible, by the twentieth century concept of the atom as a sort of miniature solar system composed of electricity. Hence the works of great scientists have value only as stages on the way to a goal which supersedes them. Broadly speaking, the achievements of generals, politicians, and statesmen have an importance only in their own time. These men win battles and elections, head governments and make laws, but two hundred years later their battles are of interest only to the students of strategy, while the elections are forgotten and the laws superseded. Hence these people and their acts, great as they may have been, are like milestones which mankind passes on its way to something

else. But with works of art it is not so. The place which they occupy in the estimation of succeeding ages and the power which they exercise over men's spirits are as great as they were in the age which produced them; indeed, their power tends to increase with time, as they come to be better understood. The poems of Homer, for example, are as much loved to-day as when they were written some two thousand five hundred years ago, and the number of people who are thrilled by the music of Bach or who delight in the plays of Shakespeare, does not grow less as the span of years which separates us from their creators—two hundred and fifty years and three hundred years respectively—continually widens. This truth has been put by the saying that a great work of art is "a possession for all time," by which is meant that people in all times will respond to it.

The philosopher, Plato, thought art so important that he decided to exclude artists from his ideal State on the ground that they aroused emotions which are better left dormant; as when, for example, a hero in some tragedy makes a great lamentation continuing through many eloquent speeches over misfortunes which in real life the brave man endures in silence and takes credit for enduring in silence, maintaining a stiff upper lip. Plato also thought that most artists only make copies or imitations of things, painters of people and places, poets and tragic writers of the scenes and events they describe. Hence, Plato thought, artists and poets turn the attention of man's spirit away from what is real and concentrate it upon what is make-believe, nourishing it, therefore, on illusion.

I mention this view of Plato's, not because I am here concerned to enquire into its truth or falsity, but because of the testimony it offers to his recognition of the power of art over man's spirit.

The Effects of Art. Music

Can we say anything about the nature of art's effects? Very little, for the effects are too various to permit of any

manageable classification. This is particularly true of great music. Music can be listened to in many different ways. You can float away in a day-dream on a sea of sound, and your day-dream may be glorious, thrilling, wistful or sentimental—though usually delightful; you see yourself in a hundred ennobling situations, leading lost causes, capturing single-handed the enemies' guns, rescuing the maiden, magnanimously forgiving on your death-bed those who have wronged you, and so on. But all these emotions that you feel in your day-dream are of the same kind as those that are aroused in you by life, although you enjoy a magnified and glorified version of them. In experiencing these visions and emotions you are being introduced only to yourself, though to a glorified version of yourself. But in addition to these emotions, music also produces an emotion which is unique and peculiar to itself, the emotion we feel for certain patterns and combinations of sound. And because it *is* unique and peculiar to music, we can really say nothing about it, because to say something about it would be to describe it in terms of some other emotion, and this, if it *is* unique, could not be done without falsifying it. But we do know that it is thrilling and, when once we have experienced music in this way, we know that this emotion, the emotion which is peculiar to music, is the only thing about music that really matters. The best description of music heard in this way that I know is that of the English diarist, Samuel Pepys, who was the founder of the English Civil Service. "It ravished me," he wrote, "and, indeed, in a word, did wrap up my soul so that it made me really sick, just as I have formerly been when in love with my wife."

A curious thing about great music is that it is limited both in space and time. Bach, Scarlatti and Handel were all born in 1685; Beethoven died in 1827, Schubert in 1828; in between came Haydn and Mozart. Thus a very large proportion of the world's greatest music was composed in about a hundred and fifty years in a comparatively small area of Central Europe lying between the Rhine and the Danube.

Painting

Unlike music, painting by its nature requires to be *of* something. It must, that is to say, be in the form of a representation of some subject—of a person say, an event, a landscape or of geometrical shapes. Moreover, although this element of representation may not be the *most* important element in the picture, it has usually been regarded as having considerable importance; the subject of the picture must, it has been held, be recognizable. In our own age, however, many painters have reduced this element of representation of a subject almost to zero, and present in their pictures collections of coloured shapes and geometrical designs; or they paint recognizable objects in fantastic juxtapositions—hands growing out of sardine tins or bus tops, or pianos whose keys are eyes. In general it may be said—this is, of course, a personal though fairly widely held view—that no paintings of this type have up to the present reached the highest level of artistic worth. They may, of course, do so.

But though the painting must be a painting *of* a subject, it is not in the subject's accurate portrayal that the excellence of the painting lies. If it did lie in this, a coloured photograph might well be considered the highest kind of pictorial art, precisely because it would be the most faithful of representations. Nor, indeed, is it easy to say in what respects the paintings of some of the great Dutch artists, of Vermeer for example, who had a wonderful power of so portraying the interiors of rooms that his pictures seem to the average eye precise realistic reproductions in two dimensions of a room, differ from coloured photographs. Yet they do differ, since they have the power of moving us intensely, and giving great and continuous delight, while coloured photographs have not. There must, therefore, obviously be other elements which enter into the picture besides the purely representational. There are, for example, the artist's temperamental or emotional attitude towards what he is portraying; the emphasis which he places upon some particular *aspect* of the scene represented, as he may decide to throw one part of it

into high relief and soft-pedal another; his endeavour to present the contents of his picture in such a way as will bring their intrinsic beauty into prominence even, it may be, at the expense of accurate representation of all the details, and so on. The questions here raised are difficult, and I cannot pursue them further. I must content myself with drawing attention to the fact that though the picture must be representative *of* something, the pleasure we obtain from it lies less in its accuracy as a representation than in the combination of *structure, design, light and colour that it presents.* This fact is at first sight very puzzling. It is only when we have seen a considerable number of pictures that we realize that it is, indeed, a fact. When we first look at pictures, we look to see what they are *of,* and we enjoy them, in so far as we do enjoy them, because we are interested in the scene portrayed, a battle for example or a hunted stag, and admire the artist's skill in portraying it. It is only when we have grown used to pictures that we realize that though they must in some degree be like life, their value, that is to say, that in them which excites emotion in us, does not lie in or depend upon the degree of their likeness.

Many of the world's great pictures were painted in Italy and Holland between the years 1400 and 1600, and in France from the middle of the eighteenth century onwards.

Literature

The power of literature is more various than that of painting and music. In fact, its variety is infinite, since literature reflects every aspect of human experience and appeals to every side of human nature. It can charm us with its beauty, as in lyric poetry, ennoble us with its grandeur as in great drama, especially tragedy, move us to delighted laughter as in comedy, rouse us to a frenzy of indignation at the follies or the wickedness of mankind as in satire, and in works of imaginative idealism imbue us with the determination to mould the world as it is nearer to the world as it might be, or inspire us with the ambition to achieve our heart's desire.

Shakespeare and Keats are names which might stand as representatives of the literature of the first kind; Sophocles, Racine and again Shakespeare of the second; Molière, Aristophanes and again Shakespeare of the third; Voltaire, Swift and Shaw of the fourth; Shelley, Blake and again Shaw of the fifth.

There are many theories as to the nature of the effects produced by and of the delight that we take in great literature. Why, for example, do kindly, everyday people who when they meet it in their daily lives deplore suffering, and will put themselves to much trouble and inconvenience to stop it, delight in tragedies, in *Macbeth* or *Hamlet* for example, which are full of suffering, and in which the characters betray, poison, stab, and in general behave abominably to one another. Moreover, to return to Plato's point,[1] how the characters in a tragedy dilate on their misfortunes and infirmities! In ordinary life, if something goes wrong with you—you have had a blow, we will say, it may be physical, a hockey ball has hit you on the knee, or psychological, your girl has just turned you down—you try to make as light of it as possible. Indeed, you have been trained to make light of it, to keep a stiff upper lip and not, as we say, to cry over spilt milk. But in a tragedy people who have had a blow make speeches of, it may be, a hundred lines in length which are full of self-pity, explaining to everybody who is prepared to listen to them how everybody and everything is against them.—Hamlet, for example, scarcely ever seems to stop scolding and complaining—and not only are we expected to admire them, but we *do* admire them and hold *Hamlet* and *Macbeth* to be among the world's greatest plays.

Why? A well-known answer to the question suggested by the Greek philosopher, Aristotle, is that we enjoy seeing tragedies on the stage because they draw off, as it were, our surplus supplies of emotion, more particularly, of the emotions of pity and fear which are continually welling up within us, and which, if no outlet is found for them, will make us nervy

1 See p. 90 above

attractive way of spending the afternoon. There is a book by Mrs. Gaskell called *Cranford.* It is chiefly about two maiden ladies of uncertain age and restricted means, living in a small country town over a hundred years ago. Read it before you yourself go to call, if ever you do, on your old ladies, and you will feel more interested in and sympathetic towards them than before, precisely because you will find them so much more interesting and realize so much more of their hopes and troubles. You will see more in them and get more out of them than you would have done, if you had not read Mrs. Gaskell's book.

You are, we will suppose, in love for the first time, exciting enough in itself, no doubt, but if you read one of the great stories of first love, *Lorna Doone* by Blackmore, for example, or *Richard Feverel* by Meredith, you will find your own experiences even richer and more wonderful than they were before, precisely because a great novelist can make you realize what perhaps you could not have wholly realized for yourself, the beauty and romance of first love. *Lorna Doone,* by the way, can also give you an insight into English history in the seventeenth century, help you to realize the wildness of Exmoor before the motor age, and to feel what it is like to be out in a great snow storm. I am not saying that you cannot appreciate these things for yourself; merely that when Blackmore has shown them to you, your appreciation of them will be keener and richer than it was before.

The feelings of a woman who has run away from her husband, gone to live with the man she loves and been persecuted by society for doing so, may not seem to you of very great interest. But when they are portrayed by the master hand of a great novelist, by Tolstoy in *Anna Karenina,* they become so real that I defy anybody not to be moved in his very soul by the drama of the story. In *War and Peace,* again, Tolstoy will convey to you with such unforgettable vividness what it is like to be a soldier that you will think you have undergone at second hand the whole range of experiences that fall to the lot of a fighting man before, during and after

the battle. You will be swayed by his hopes, share his moments of triumph, feel to the full his agonizing terrors.

Or let me take an example that comes home to me personally. I am fond of the country, fond particularly of walking in it, not on roads, but across country. But I am comparatively ignorant of country things, of the names of different kinds of trees and flowers and of the appearances of the different birds. There are only a few birds that I can recognize by their song.

And so, when I am going to spend any length of time in the country, or even before going for a country walk, I fall to reading the works of one of the great English writers on the country, of W. H. Hudson, for example, or Thomas Hardy. Thomas Hardy does not just tell you that natural processes are going on. He describes them with a loving particularity of detail, telling you how, for example, you can at night deduce what kind of grass covers the side of a down from the noise which the wind makes as it blows through it. You or I might be content to say that Tess in *Tess of the D'Urbervilles* walked through the bottom of a rank garden in July to meet her lover, but in Hardy we read, "She went stealthily as a cat through this profusion of growth, gathering cuckoo-spittle on her skirts, cracking snails that were underfoot, staining her hands with thistle milk and slug slime, and rubbing off upon her naked arms the sticky blights which, though snow-white on the apple tree trunks, made blood-red stains on her skin."

Such writing opens your eyes to nature, and enables you to see far more in it and to find more scope for your interest and even love, than you could have found for yourself.

And now I see that I have fallen into the mistake against which I warned myself. I have said that the effects produced by literature are infinite in their variety, yet now, by choosing two or three of these effects because they happened to be easy to describe, and dwelling on some of them in detail because they appeal to me personally, I am suggesting by implication that these are the *only* valuable effects of literature. If there are six reasons for a course of action, and you dwell on two

of them and two only, you suggest by implication that the other four are not important. Mention one and you ought, it is obvious, to mention all; but to mention all, I have neither the skill nor the space.

I know well, however, that among the most notable of the effects I have *not* mentioned is the strangeness of literature and the power that it has of appealing to your curiosity and wonder—"Once upon a time . . . . ." the fairy stories used to begin, or "One winter's evening about five o'clock, just as dusk was falling . . . . ." the adventure story starts, and if it is a good story, you can't take your nose out of the book but go on reading to the end, simply because you must know what happened. And here we touch upon the importance of the plot upon whose excellence the appeal of story telling in the last resort depends.

And then there are the people, the characters. The novelist creates a little world of people whose feelings for and reactions upon one another he chronicles. In everyday life the relations between people are blurred by numberless unimportant details or cut across by irrelevant happenings, so that you are repelled by the woman you love because she has a cold and a red nose, or feel quite affectionately disposed to the man you dislike because you have just beaten him at chess. But in a novel, you can observe the relations between people in all their purity with little irrelevances like the red nose and the victory at chess stripped away.

Finally, there is the touch of magic with which great literature can work upon us, magic whose appeal to us is no more explicable than is our feeling for beauty. Perhaps at bottom it *is* our feeling for beauty in another guise. When the poet writes:—

> "The curfew tolls the knell of parting day,
> The lowing herd wind slowly o'er the lea,
> The ploughman homeward plods his weary way,
> And leaves the world to darkness and to me,"

there is more than the evocation of a pleasant country scene,

more than the desire to know what the poet is going to do with the empty world which has been left to him. Some magic has been let loose which in my case sends a little thrill of pleasure down the spine.

This, then, is an inadequate, a most inadequate, account of some of the many and various pleasures that people derive from literature, so that a good book is for them one of the best and most repaying companions that they can take with them through life.

CHAPTER VIII

THE RELIGIOUS VIEW OF THE UNIVERSE

From time to time during the expositions of the preceding chapters we have come within sight of the problem of religion. On a number of occasions questions have been raised to which no answer could be given, points reached from which no progress could be made, unless we came to some provisional conclusion as to whether the religious view of the universe is true.

Thus, at the end of Chapter IV[1] I suggested that the answers to questions relative to the future of our civilization, perhaps even to the future of the human race, depended in the last resort on whether the universe is mindless and haphazard, or whether it has been created by a mind in pursuance of a purpose, of which purpose man is a part. I also hinted that what is called the cyclical theory of civilization could not be true, if Christianity were true. In Chapter VI one of the most important arguments adduced against Materialism was that, while the notions of self-created and eternally existing matter were almost, if not quite inconceivable, that of self-created or eternally existing mind, though difficult, was not inconceivable. Thus the answer which we give to the question, is religion true in respect of most of what it asserts, determines in the long run the answers we give to a large number of other questions with some of which we have been confronted in this book. To the question, is religion true, we must, then, now turn.

The Religious View of the Universe

What, in essence, does the religious view of the universe assert? The question is not easy to answer because the world's great religions, Mohammedanism, Buddhism, Brahminism,

1 See Ch. IV, pp. 59, 60

Confucianism, Taoism, and Christianity, are far from being unanimous on essential points. Thus Brahminism, or Hinduism as it is sometimes called, believes in reincarnation—the introduction of the same soul or spirit into a succession of different bodies—while Christianity does not. Christianity believes that the individual person or, more precisely, the soul of the individual person is immortal; Buddhism does not, since it looks forward to the absorption of the individual consciousness into an all-embracing universal consciousness, as the waters of a river are ultimately absorbed into the sea.

In general, however, the great religions agree in holding that the familiar world of earth and sea and sky and things and people, that is to say, the world of things moving about in space and living and growing older in time, is not the only world, that this order of reality is not the only order of reality, but that there is another order not in space and not in time, which is in some sense the cause of and responsible for the familiar world, which will outlast it and which has greater worth than the familiar world.

The World of Things in Space and Time

Let me develop the point about space and time. All material things are in space; that is to say, they have weight, length, breadth, and height and any one of them is nearer to or further away from, to the left or to the right of, any and all the others. We cannot imagine a material thing which is not in space. And equally, if there *are* any non-material things—wishes for example, thoughts, the obligation to do our duty, the beauty of a picture or a piece of music—these are not in space. Hence a spaceless order of reality would be a non-material order.

Similarly, everything we know in our everyday familiar order of reality is in time; it is, that is to say, growing older all the time. A pen, for example, or a piece of paper, is at any given moment of time further from the time when it was first made and nearer to the time when it will disintegrate and fall to pieces. And *all* of it is getting older all the time. Also everything that happens to it is either after or before every

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other happening or simultaneous with it. We cannot, then, imagine a physical or mental happening which is not in time.

When we try to conceive of things which are not in time, we can picture them most easily in terms of mathematics. Thus we might say that the fact that $a^2 - b^2 = (a + b)(a - b)$ will at all times and to the end of time be a fact, precisely because the fact which the equation asserts is not in time at all; similarly with the fact that the angles at the base of an isosceles triangle are equal. When we speak of a timeless order of reality, we do not mean an order which will endure for a very long time indeed, as the nebulae will endure or the stars, and then come to an end or transform itself into something else; we mean an order which is not in time at all, such an order as that to which the algebraical and geometrical truths I have just cited belong. Hence, the order of the universe whose existence religion affirms, though it may manifest itself in and even create things in space, as God is supposed to have created this world, or enter into time as God is supposed to have sent Christ into this world at a moment of time, is not itself either in space or time.

It may be the case, as the philosopher Kant held, that space and time belong no more truly to the familiar world which certainly *appears* to contain them, than they do to the immaterial order of reality, the spaceless and timeless order, whose existence religion asserts. Space and time may, Kant thought, be just the ways in which we look at things, and we look at them like that because we cannot help but so do. Let us imagine that I am wearing a pair of blue spectacles. Then everything that I see will appear blue, not because it is blue, but because owing to the nature of my seeing apparatus, seeing it blue is a condition of my seeing it at all. Now let us suppose that all people came into the world with pairs of blue spectacles permanently affixed to the bridges of all noses. Then everybody would maintain that everything was blue, that being blue in fact was a condition of a thing's existing at all, simply because nobody had ever seen or could ever see anything that was not blue. And yet the blueness

would not belong to things, but would be a quality which we had imposed upon them in the act of looking at them. Kant's view, briefly, was that space and time were like pairs of mental spectacles in the sense that they were characteristics which the *mind* of man imposes upon everything which it knows in the familiar world as a condition of the mind's knowing it. They do not, if he is right, belong to things; they are a kind of framework which we impose upon them.

However this may be with regard to the familiar world, it is not the case in regard to the order of reality whose existence religion asserts. This is outside space and time. Most religions, including Christianity whose teaching I shall mainly follow in this chapter, hold that this order is, or at any rate includes or contains a person, God, who is both all powerful and all knowing. (The words "includes" and "contains" suggesting, as they do, the way in which a programme includes its items or a box contains its contents, are misleading because they suggest a relation in space; but it is almost impossible for us to think and write and speak without making use of words which suggest spatial metaphors.) Christianity further holds that at a particular moment in time God created the familiar world of things in space and time, including our bodies, but that while our bodies belong to the space-time world and their movements are determined by the laws that govern it,[1] and while parts of our mind may also so belong and be determined, we are or we include in our total make-up an element, the so-called spirit or soul,[2] in respect of which we are members of the other order of reality, and are, therefore, eternal. This element in or part of the mind, the spirit or soul, is also created by God; some have held that the soul is to be regarded as the expression in us, of God Himself being the part of us in respect of which we are divine; however this may be, most religions are agreed that it is the part of us in respect of which we are most akin to God. It is, therefore, the most important part of us.

1 See Ch. V, pp. 61, 62

2 See Ch. VII, pp. 81, 82 for the use of these words.

God being wholly good, cannot be considered to wish, to intend or to make anything but what is good. He is not, therefore, responsible for the evil in the world. Owing, however, to the evil which is in us, we are constantly frustrating His intentions and so bring evil into the world.

The Mystery of Evil

Whence did the principle of evil which is in us arise? This is an exceedingly difficult question; indeed, it is more, it is a mystery to which no satisfactory answer has ever been given. I will return to it in a moment. To continue with the teaching of Christianity, God made man wholly good—how, indeed, could He have done otherwise, since He is wholly good Himself?—but man, nevertheless, departed or fell from this state of goodness and did evil. (All this is described in the Bible in the language of mythology.) God, however, did not leave man alone in his evil doing, to stew, as it were, in his own juice. He caused an expression or embodiment of Himself which the New Testament calls God's Son, Jesus Christ, to come into the world as a man some two thousand years ago.

The significance of Christ's coming is broadly two-fold. First—and this is clear—to give man an example of what a good life is and how it should be lived, so that we should not have the excuse of saying that we did not know. Secondly—and this is a more difficult conception and not fully understood by the present writer—to take the sins of all mankind upon His own shoulders, and to expiate them by His voluntary suffering and sacrifice, so that, however bad we may have been, however bad we may yet be, God's forgiveness will be extended to us, if we sincerely ask for it, because of Christ's suffering and sacrifice on our behalf.

This doctrine, which is known as the doctrine of the Atonement, is one of the most mysterious doctrines of Christianity. Some of its implications are, however, plain enough. First, because of the evil inherent in man we must not in this world expect to be very happy, nor can we suppose that man's communities, though they may increase in material power

and comfort, will become noticeably morally or spiritually better than they have been in the past or are in the present. This disposes of the notion of progress, the notion, namely, that the life of man on the earth will tend gradually to get better and happier through, for example, the wise use of the powers which have been conferred upon us by science; it also disposes of what is called Utopianism, that is, the view that in some one or more human communities at some time in the future something like perfection will be achieved, perfection in this connection meaning the disappearance of poverty, ignorance, strife and injustice and the reign of universal happiness, peace, intelligence and goodwill.

Secondly, if the soul of man is immortal and if God wishes us ultimately to achieve complete virtue and happiness, as having regard to His own goodness He must necessarily do, some of us at any rate will presumably in the end achieve this condition, but not in this world and not on this plane of reality. Christianity puts this mythologically by the doctrine of Heaven and of man's salvation in Heaven. But since most of us are unable to conceive of perpetual happiness and unflawed virtue, or indeed of any tolerable way of getting through life which does not involve our bodies, their desires and the satisfaction of their desires, we have never been able to form any satisfactory conception of Heaven.

The case of Hell, however, is different. The doctrine of Hell is one of the most unsatisfactory parts of Christianity. There is no doubt that many Christians have believed that if men continued in their wickedness, and did not even try to be better, they would be punished eternally in hell. Christian writers, for example, Dante, who have found themselves unable to give any satisfactory account of Heaven, have painted the physical tortures of Hell with great particularity, feeling, apparently, a delight in the thought of the everlasting torments of the wicked.

Few people now believe in the existence of Hell as a place where the wicked are physically tortured, but the belief is still strong among Christians that it is possible for a man to

live in such a way that he can be "damned," that is to say, condemned to live in a state of misery eternally without any possibility of reprieve.

How much is Credible?

How much of all this can a young man growing up in the middle of the twentieth century find it possible to believe? Most will answer "very little." We live in an irreligious age, and we are not prepared to accept the existence of things that we cannot see and touch, or to believe in propositions that we cannot verify and prove. These habits of mind are largely due to science which has had the effect of making people think that only the things that they can see and touch are real and that whatever is true is in theory demonstrable by observation and experiments of the kind that take place in a laboratory.

Now Christianity, it is obvious, is not true in this sense; it is also obvious that it maintains the existence of a great deal that we cannot see and touch. Some parts of Christianity, moreover, for example the doctrines of the Fall and of the Atonement, are mysterious, and cannot be completely understood by reason. Hence Christianity, in common with other forms of religion, must be accepted, if it is accepted at all, at least in part by faith. Now to accept a doctrine by faith means, I take it, that if on general grounds we think that the parts we understand provide a fairly plausible account of our experience as a whole and a fairly plausible explanation of the universe, then we shall be prepared to take on trust those parts of it which pass our understanding, to give it the benefit of the doubt where it is doubtful and to believe that those things which it leaves unexplained are, nevertheless, in theory explainable in terms of the doctrine.

One thing seems reasonably certain, and that is that the truth about the universe is bound to be mysterious to us and to pass the bounds of our present understanding. It is salutary in this connection to bear in mind the figures which indicate the comparative shortness of man's past and the enormous

length of his future, given in a previous chapter.[1] If we were really to understand very much of the universe, what, one wonders, would be left to our descendants to employ their understandings upon during all those millions of years in which man, it may be supposed, will continue to live and to think?

However, there are very real difficulties in Christianity as, indeed, there are in all forms of religion. Perhaps the greatest is that attaching to the notion of evil. If God is good and created the world, how did evil creep into it?

The Christian View of Evil

The explanation usually given by Christianity is briefly as follows:—

There is no merit in doing good and acting rightly, if you cannot help yourself. A race of automata, even if they were wholly virtuous automata, who never felt or acted otherwise than in the best possible way, would have no moral worth. They would be like stones which roll down hill because they cannot help it, or like tigers who devour their prey because that is their nature. We should no more think of praising them than of praising the stones or blaming the tigers. Hence, in order that human beings can achieve virtue, they must be in some sense free. Now freedom means freedom to choose, to choose wrong as well as to choose right; but if there were no such thing as wrong, there would be no possibility of choosing it. Or perhaps wrong consists in the mere fact of not choosing to do what is right, when we could have done so. All this is involved in the saying that freewill is a condition of morality.

Why Did God Create the World?

One of the advantages of this kind of explanation is that it enables us to give some sort of answer to the question, why did God create the world. There is a famous argument in Plato's philosophy which runs something like this:—

1 See Ch. II, p. 22

a perfect being would have no motive to create; for all creation implies the bringing into existence of what *was not* before, implies, therefore, change. Now change is either for the better or for the worse. If it were for the better, then the fact that somebody willed the change would mean that there was some degree of good, namely, that in which the betterment resulting from the change consisted that was lacking before, before, that is to say, the occurrence of the change which the creation of the world brought about. Therefore, God was not perfect to begin with. If for the worse, then to will that something should be caused to be which is worse than what exists already is the act of an evil and not of a good being. If God could not voluntarily change either for the better or for the worse, He could not will that alteration of affairs which creation entails and He could not, therefore, create. Therefore, Plato argued, God did not create this world.

To this the Christian has an answer. It is to the effect that virtue and love are goods. Therefore the increase of virtue and of love is a good. Hence, the more morally virtuous and loving creatures there are, the better. Therefore, in creating free moral beings, God is creating the conditions in which the amount of virtue and love in the universe are capable of being increased, and God creates these conditions, even if, in doing so, He must take a risk, the risk being that the free moral beings may choose evil and not good, in which case, presumably, the amount of virtue and love in the universe would be diminished. God, according to the Christian view, is prepared to take this risk and sent his Son into the world in order to diminish the chance that what is in effect an experiment might fail.

Hence, God's object in creating the world is to increase the total amount of good as expressed in the virtue of free, moral beings who had the chance to go wrong and did not take it, and in the love of freely loving beings whose love is given to God, their Creator. Such beings also provide objects for God's own love, so that the amount of love in the universe is, as it were, increased from both sides.

This gives an answer which is at least comprehensible to the question, why did God create the universe.

Difficulties in the Christian View

Nevertheless, the view just described is open to serious difficulties. Let us again consider the problems of evil. Suppose that we take the line indicated above that evil must exist in order that beings who have free will may be able freely to choose it, or, alternatively, that evil consists simply in the fact of their willing to choose something other than the best possible. Does not the difficulty nevertheless remain? For how could evil exist to be chosen, unless there were evil already present in the universe prior to the choice? Or how could men choose wrongly unless the seeds of evil, the evil that is expressed in their choices, were already implanted in them? In the first event, assuming that the world was created by a good God, where, we must ask, did the evil in the world come from? In the second, assuming that man was created by a good God, we must still ask, where did the evil in *man* come from.

The Two Principles

Many have found these difficulties to be so overwhelming that they have postulated not one but two principles in the universe, one good and the other evil. The universe, on this view, is the stage on which the two principles struggle for mastery and the struggle goes on continuously. Both principles are present in the heart of man. Such, broadly, is the contention of the religion of Zoroastrianism; such, the view of Manichaeism, an heretical offshoot of Christianity. This view has the advantage of enabling us to understand how evil can be present both in the universe and also in our own hearts, by insisting that evil was, as it were, there to begin with. It has, however, always been frowned upon by Christianity, partly because of its pessimism, since it gives no assurance of the ultimate victory of good; on the contrary, the struggle between good and evil will, if this view is correct, continue indefinitely.

Moreover, many minds find it difficult to conceive of the universe as being an embodiment or expression of *two* fundamental principles. Why, they ask, just two? Why not three or four or twenty-three?

I do not myself find much difficulty in this view; on the contrary, it seems to fit in with the notion of creation, as we experience creation on the every day level of the familiar world in the work of artists. The creations of artists are always creations *in* something, something, that is to say, which is other than the creator and his intentions. The musician creates in sound, the artist in paint, the sculptor in stone; even the poet and dramatist must use words as their medium, words which are other than the ideas which they express in them. Hence God, if His creating is in any degree like the creating with which we are acquainted, needs the brute physical stuff, whatever it is, of which the universe consists and has eternally consisted, to work with in order that his creative ideas may take shape. If we proceed to think of this stuff as artists think of their material, as being intractable and frustrating the full realization of the creator's intentions, we shall be within sight of a possible explanation of the existence of evil. God, on this view, does the best He can with the material in which He has to work.

However, this, I repeat, is not the Christian view which insists that in the beginning there was only God, and offers as its ultimate explanation of the existence of evil, in so far as it does offer an explanation, the myth of a fallen angel, Satan or Lucifer, as he is sometimes called. Among the angels who existed initially together with God was one, Satan, who rebelled against God and was cast down from Heaven. God, according to the myth, endows him, at any rate temporarily, with the power to tempt men and to lead them astray, so that in struggling against temptation their moral characters may be strengthened and developed.

But this explanation, in so far as it is an explanation, only puts the difficulty back in time. How, we asked originally, if the universe is the creation of God who is wholly good, could

evil appear in it? How, we now ask in relation to the myth of Satan, if the angels were created wholly good, could one of them conceive the intention of rebelling against God, an intention which, if God is wholly good, must *itself* be evil? The notion that God made Satan evil in order to set the whole moral system of the universe in motion is untenable, because it presupposes, once again, that God is Himself not perfect; for to introduce evil into a world that knew it not is not the act of a perfect being.

In the last resort we must, I am afraid, give up the attempt to find any completely satisfactory explanation of evil within the framework of the Christian view of the universe. This is one of the great difficulties, perhaps the greatest, of Christianity.

And there is another. According to the account at which we have glanced, evil arises from men's misuse of the gift of freewill. It is because, having the freedom to choose, we choose wrongly that evil occurs. Now consider pain. Pain, more particularly physical pain, is an undoubted evil; some, for example those who have been tortured, regard it as the greatest evil that there is. The explanation we are considering covers the fact of human pain reasonably well by asserting that pain results from the evil that man has brought into the universe by his wrong choices and his wrong actions. Even the pains of illness, it might be argued, would never occur if men had always lived rightly and had never abused and misused their bodies.

So far, so good. But as we now know[1] there was life upon the earth for hundreds of millions of years before man appeared. Throughout all that period the animals were preying upon one another, eating one another, tearing one another and perishing of wounds and hunger. During all that time, then, there was pain and pain, we are agreed, is an evil. Now this evil cannot be ascribed to the fact of human wickedness; for mankind did not yet exist. I do not know of any satisfactory answer to this difficulty.

1 See Ch. II, p. 22

The Need for an Explanation

So much having been said about the difficulties—and there are many upon which I have not touched—what is to be said on the other side? First, the human mind craves for an explanation. There must, we cannot help but think, be *some* reason (*a*) why there is a world at all and (*b*) why the world is such as it is. Now religion's trump card is that it does provide us with some sort of explanation.

Let me, first, make two points in regard to the nature of explanation with particular reference to its relation to science. (i) Science does not explain. It puts back in time the thing to be explained.
(ii) Science does not tell us *why;* it tells us *how.* I will take each point in turn.

(i) Let me take as an instance some particular fact—the weather, for example, as it is at the present moment. It is, we will suppose, raining. Why? The science of meteorology will tell us that this is because at a certain density and temperature clouds turn into rain. Why, then, this density and this temperature and why the presence of these clouds at these particular points of time and space? Answer, because a depression is deepening somewhere in the middle of the Atlantic and moving eastwards. Why is it doing so? Because an isobar or an isotherm—I know nothing of meteorology and am, of course, inventing these answers, my interest being in the *form* and not the *details* of the account—is or was present in mid-Atlantic some days ago. Why was it? Answer, because the ice cap round about the North Pole was unusually early (or perhaps unusually late) in breaking up this year. Why was it? I do not even know the *form* of the answer to this question, but it would presumably specify some condition prior in time to the breaking up of the ice cap which caused it to take place unusually early (or late).

And the cause of that condition? It is obvious, is it not, that we can go back and back in time, accounting for each phenomenon by specifying some previous condition which produced it, until we come to the condition or set of conditions

prevailing on or near the earth's surface when the earth was first separated, a white-hot mass of flaming gaseous matter, from the sun. And the cause of that separation? We do not know, except that it was probably due to the approach of another star. And the cause of the approach of the other star? This we certainly do not know.

We can now see what is meant by saying that a scientific explanation does not really explain. It substitutes for the thing initially to be explained some other thing; it puts that other thing which *now* requires to be explained back in point of time, and it goes on doing this indefinitely.

(ii) Secondly science tells us only what we observe or can in theory observe. It tells us, for example, that water at sea level boils at 212 degrees Fahrenheit. Why does it boil at this temperature? The answer presumably is that at a high temperature the molecules composing the water fly further apart and move faster. Why do they behave like this? We do not know. Neither do we know why the effect of their doing so should be to produce steam. We can only say that that is the way the world is made and that is the way things happen.

Science again—to revert to some of the matters discussed on earlier pages—can, given variations, explain the causes of evolution reasonably well;[1] but why are there variations? We cannot say. We can ascribe them to mutations of the germ plasm[2], but that, surely, is only another way of putting back in time the thing to be explained. Why are there mutations in the germ plasm? We do not know.

Science again can describe to us the machinery of sensation. Here are the sense organs, the receptor nervous system which runs from the sense organs to the brain and the brain cells—all of them describable in physical terms. Now, we have, it is obvious, feelings and sensations—the feeling of pain, for example, from a prick, the sensation of seeing a colour. Science can tell us how this machinery works. A series of nervous impulses analysable in the last resort in terms of the movement of electrical charges, passes along the telegraph

1 and 2 See Ch. II, pp. 24, 25 and 29 (footnote).

wires of the receptor nervous system, which run to the brain from the sense organ affected—from the surface of the skin which the pin pricks, from the retinas of the eyes when the light from the coloured object strikes them. Science, again, can tell us something of the disturbances which take place in the incredibly elaborate mass of cells which constitute the brain. These, too, are analysable in terms of the movements of pieces of matter, the sort of movements, therefore, of which physics and chemistry can between them give a full account. But no kind of physical movement or chemical process is in the least like feeling a pain, seeing a colour or hearing a sound, and why the occurrence of such movements and processes should be followed by these psychological or mental effects we do not know, nor can science tell us. Thus science is only organized explanation. We notice that first one thing happens and then that a second follows it; we notice further that provided that the circumstances and conditions are the same, whenever a thing similar to the first thing occurs, then a thing similar to the second follows it. Hence a scientific law as, for example, the law that water boils at 212 degrees Fahrenheit, is simply a statement to the effect that on an immense number of occasions such observations have in fact been made.

On the basis of the law, and assuming that the same causes will have in the future the same effects as they had in the past, we can predict what *will* occur. Moreover, by altering the conditions and causes, we can modify what will occur so that it will be conformable with our desires. But in telling us what happens, science does not tell us *why* it happens as it does. It does not, then, really provide us with an explanation.[1]

Yet, as I have said, the human mind craves for an explanation. There must, it insists, be *some* reason why things happen as they do. Now religion does provide an explanation in this sense. The Christian religion, for example, says that the world is as it is because God created it. Man is as he is because God created him and man behaves as he does because, desiring in His goodness and love that man should achieve

1 These points were made by Socrates in the fifth century before Christ.

virtue by his own efforts and that the amount of goodness and love in the universe should, therefore, be increased, God gave man freewill. There are evil and suffering in the world because man has misused this gift. Nevertheless, by dint of struggling against and trying to overcome this evil, by virtue of undergoing the suffering, our characters may be improved—it does not, of course, follow that they will be improved—and as a result we may become fit to take our places in a different and better order of existence which awaits us after death; or it may be that this order may be most appropriately conceived as a timeless order existing neither in the present, past nor future. This world, then, is most properly to be regarded as a kind of spiritual training ground which is designed to try and so to strengthen our moral natures as a gymnasium is designed to try and strengthen our physical bodies. It is not, therefore, designed to make us happy and we must not, then, expect to be very happy here or happy, when we are happy, for very long.

Now this explanation may be wholly mistaken or you may not like it; but it *is* at least an explanation in the sense that, *if* it is true, it does answer the question, "Why are things as they are?" To put it shortly, it does make sense of the universe.

The Demand for a Purpose

Just as the human mind craves for an explanation, so it demands a purpose. It seems intolerable to us that the universe in general and human life in particular should be without any point or purpose, a mere hurrying to and fro of bits of matter endlessly and meaninglessly. Now the universe affirmed by science, the universe which consists of the things that we can see and touch and of things like unto them, is and must be without purpose. For it is meaningless to say that a piece of matter has a purpose. On this point, too, the religious view of the universe does provide us with satisfaction. For the purpose of the universe is, it says in effect, the increase of goodness in free moral persons or, as Christianity puts it, the preparation of souls for salvation.

Now you may not like this purpose or you may think it is an impracticable one, but you must agree that it really is a purpose.

Religion and the Values

It has, moreover, the advantage of enabling us to take up some of the loose threads that we have left lying about in previous chapters. For example, I had occasion in Chapter IV[1] to speak of the pursuit of values as the distinguishing mark of a civilized community. In Chapter VII[2] I used the term "ultimate values" and tried to say what I meant by it. I pointed out that the process of desiring something not for itself but for the sake of some other thing, of desiring it, in other words, as a means, must stop somewhere. We cannot, that is to say, want *A* for the sake of *B*, *B* for the sake of *C*, *C* for that of *D* and so on indefinitely. The point at which this process stops, whatever that point may be, is the point at which we desire something for its own sake and this something is an ultimate value. I mentioned that most philosophers have taken the view that the number of such values is three, namely, goodness, truth and beauty, and that many philosophers, but not all, include happiness.

Now let us suppose that this account is approximately correct. Then the universe contains certain factors or elements which are valuable in themselves and are recognized to be such by human minds. Now this, on reflection, strikes one as extremely odd. Why three such factors or four? Why not, as I asked above, twenty or thirty? Is it really likely that the universe just happens to contain three or four things which happen to be of ultimate value, and which are just lying about, as it were, in it, as though they were pieces of cosmic furniture? Is there not, one wonders, some more simple and satisfying explanation as when in a detective story three or four different and apparently unrelated clues are brought into relation with one another and shown to make sense by a single completely satisfying explanation of the crime? The religious view suggests that there is such an

1 See pp. 49, 50 2 See pp. 82, 83

explanation. It suggests that in so far as we can conceive the nature of a spiritual world at all, we can do so most easily after the likeness of a person who is all powerful, all knowing and wholly good. This person is creative, and created among other things the familiar world of things and people in time and space. If this is the true explanation, the universe is at bottom a unity; it is not, that is to say, many things, three or four or twenty-three, but one thing and one thing only, and that one thing whatever else it, or rather He may be, is a Person owning a mind. This Person reveals Himself to human beings in various ways, and in particular three, namely, as beauty, as goodness and as truth.

Hence, when we have an experience of beauty in art or in nature, when we admire an act of courage or unselfishness, when we pursue and appreciate truth for its own sake as scientists or philosophers do, we are knowing and making contact, however remotely, with that which is divine. For these are the ways in which God makes Himself manifest on earth and shows Himself to men.

Now this, once again, *is* an explanation—it may, of course, let me repeat, be a totally false explanation, but if it is true, it shows us *why* it is that we value certain things for their own sakes, regarding them as ends in themselves and not merely as means to something beyond themselves; it explains, in short, the compelling power which the values have over the human spirit.

In a previous chapter[1] I had occasion to refer to disinterested goodness, pointing out that man alone among creatures sometimes did what he considered to be his duty without expectation of benefit or hope of reward. We are so used to this trait in human nature that we are liable to forget how odd it is, and how insistently it demands explanation. That people should do what gives them pleasure or is likely to bring them benefit either now or in the future, or which satisfies some emotional craving, for sex, for instance, or for revenge—all this is understandable. But what surely *does* require explanation is that a man should go to the stake for

1 See Ch. II, p. 33

his opinion, or a woman sacrifice herself for her child, or a boy tell the truth or keep his promise when it is quite clear that he has a great deal to lose by doing so and he is equally convinced that, if he lies, nobody will find him out.

Now this, too, is explicable if we adopt the religious view of the universe; for on the religious view man, as I explained above, is a member of two different orders of being, and it is in respect of his membership of the second, in respect, that is to say, of the spiritual element within him that he responds to the appeal of disinterested goodness and does his duty in the face of every temptation to do something else.

In all these ways the religious view does make sense of our experience of the universe. If the religious view were true, these, we should be entitled to say, are the kinds of happenings we might expect to see in the world, and these are the kinds of ways in which we might expect men to behave.

Summing Up

Three further points must be made in order that the case, as it stands to-day, may be fairly put. First, the religious view, as we have seen, is exposed to great and serious difficulties which to many, probably to most thinking people to-day, seem insuperable, so that whatever else may be true, this, they feel, cannot be.

Secondly, it is very far from explaining everything.

Thirdly, it is in no sense proved. For most of us, it is at best an hypothesis for which the most that we can say is that it covers more of the facts than any other hypothesis. Only those who really *believe,* who, that is to say, possess what is called faith, are in a position to affirm that it is certainly true, and in the light of their conviction of its truth go about the business of living their lives, lives which, they maintain, are different from and, as they would hope, better than what they would have been, had they not possessed the conviction. As they would put it, if you believe sufficiently in God and pray to Him, He will in some way make himself known to you and so strengthen your belief until it becomes a certainty. In

other words, you must take Him on trust to begin with, if you are to end up by taking Him on conviction.

For my part, I think that whatever view we take, the universe is and must remain mysterious to us. We can think of no explanation that covers all the ground, and in the nature of the case no hypothesis that goes beyond our actual experience—and this the religious hypothesis certainly does—is capable of what science calls proof.

But who, as I have already asked, are we that we should expect to be able to understand the universe? As we saw in Chapter II,[1] humanity has only just begun its earthly career. What is more, the further we advance in knowledge, the more thoroughly we become aware of the extent of our ignorance. Hence I would like to end where I began[2] with my simile of knowledge as a little lighted circle set in the midst of an area of environing darkness, the darkness of the unknown. As I pointed out, the more we enlarge the area of the circle, the known, the more also we enlarge the area of its contact with the unknown.

Moreover, while I do not find mystery surprising, I also do not fear it as forbidding. What strikes me as terrible is the thought that the physical universe which was described in Chapter I is the only universe. That there should be something besides the world of matter, even if we can understand very little about it, seems to me to be a comforting and not a frightening thought. The great scientist Einstein has put it better than I can hope to do. "The most beautiful thing we can experience is the mysterious. It is the source of all true art and science. He to whom this emotion is a stranger, who can no longer pause to wonder and stand rapt in awe, is as good as dead—his eyes are closed. This insight into the mystery of life, coupled though it be with fear, has also given rise to religion.

"To know that what is impenetrable to us really exists, manifesting itself as the highest wisdom and the most radiant beauty which our dull faculties can comprehend only in their most primitive forms—this knowledge, this feeling, is at the centre of true religiousness."

1 See Ch. II, p. 22 2 See Introduction, p. 3.

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