THE LIVING UNIVERSE

SIR FRANCIS YOUNGHUSBAND
K.C.S.I. K.C.I.E.

THE LIVING UNIVERSE

By the Same Author

THE REIGN OF GOD: A Drama

THE GLEAM

WONDERS OF THE HIMALAYA

BUT IN OUR LIVES: A Romance of the Indian Frontier

THE COMING COUNTRY: A Pre-Vision

LIFE IN THE STARS

DAWN IN INDIA

THE LIVING UNIVERSE

BY

SIR FRANCIS YOUNGHUSBAND

K.C.S.I., K.C.I.E.

O be prepared, my soul!
To read the inconceivable, to scan
The million forms of God those stars unroll
When, in our turn, we show to them a Man.

ALICE MEYNELL.

LONDON

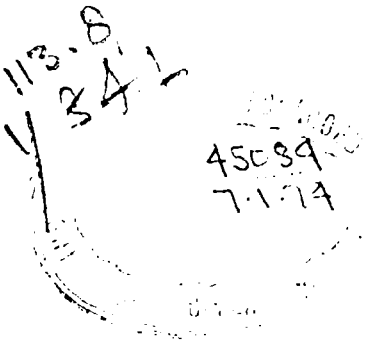
JOHN MURRAY, ALBEMARLE STREET, W.

I MUCH regret that the title of this book was chosen by me in ignorance of the fact that it had already been used by Dr. L. P. Jacks for his book "A Living Universe," and published by Messrs. Hodder and Stoughton in 1923.

I only became aware of this while the present book (of which an epitome was given as a Hibbert Lecture and published in the *Hibbert Journal*, January, 1933) was in the press; otherwise, I would have altered the title.

FRANCIS YOUNGHUSBAND.

April, 1933.



FIRST EDITION . . *May*, 1933
Reprinted . . *December*, 1933

PREFACE

In the West one has almost to apologize for speaking about the universe. In the East it is a natural topic of conversation. In the West, when we do speak of the universe, it is usually in terms of science, or of matter and mechanics. In the East it is never of matter but always of spirit.

My life since boyhood has been about evenly divided between East and West. I was educated in the West. On the other hand, I was born in the East—and born of parents who had spent the best part of their lives in the East, and who were not in the least scientifically or materially minded. My natural bias is, therefore, to think much of the universe, and to think of it on spiritual rather than on material lines.

The germ of this book formed itself in my mind forty years ago in the Himalaya. In one form that germ matured in my "Life in the Stars." In its present form it shaped itself two years ago in the Alps. The idea in this book owes much, then, to remoteness. Most of all, of course, to contact with life, to personal contact with leading Indians and cultured Chinese, and with divines, poets, philosophers and scientific men in Europe and America. And also, much to books. But, in addition to such intercourse, it does owe much to remoteness—especially remoteness in mountains.

Every mountaineer knows how when he has climbed into a clearer atmosphere and risen physically above the scenes of ordinary life, he seems to have risen spiritually, too. And, in a sense, he is right. Having risen above the turmoil, and the rough and tumble of life, he has placed himself in a position where he can see things in their due proportion. He is not unmindful of the pains and evils, the cares and worries, and sorrows and disappointments of life. But, for the time, he ceases to be obsessed by them, and can look at them as we look at them in a man when he has passed away and we can view his life as a whole. The mountaineer knows that he will have to return to the city and face hard facts. But he will face them with all the better heart for having enjoyed a whiff of fresh air from the heights.

A whiff of that whiff I trust may still exhale from these pages.

F. E. Y.

Westerham, 1933.

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INTRODUCTION

MAN wants to explore the universe, both in space and in time. He himself forms part of it, and it forms part of him. He is eager, therefore, to know about his home. As an explorer I naturally agree with these views of Sir James Jeans. And, as one who has been deeply influenced by contemplation of the stars in the stillness of desert nights and amid the mountains, I would agree with Sir James Jeans' further suggestion that astronomy may have something to say on the enthralling question of the relation of human life to the universe in which it is placed, and on the beginning, meaning, and destiny of the human race. Long commune with the stars when our own particular star, the sun, is well below the horizon, and we are, therefore, able to feel ourselves as much a part of the universe at large as of this earth, does make us anxious to know all astronomy has to say upon the relationship of human life to this great universe stretched out before us. But when we are told by this leading astronomer that our sun and all the stars will in the end burn themselves out, that inexorable dynamic laws are even now driving our earth ever farther away from the sun into the outer cold, and that, so far as we can see, it must continue to do so until life is frozen off the earth ; that other suns must die like our own, and any life there may be on other planets must meet the same in-

glorious end; that there can be but one end to the universe, a "heat death" in which the total energy of the universe is uniformly distributed, and all the substance of the universe is at the same temperature —a temperature so low as to make life impossible; that the end of the journey cannot be other than universal death; and that the human race has "to face the extinction and the eternal destruction of all its hopes, endeavours and achievements"—when we are told this by a leading astronomer we lovers of the stars feel as if we had received a blow in the eyes. We are deeply grateful to the astronomers for having shown us wonder after wonder, and for having immeasurably enlarged our conception of the starry universe. But to be told that all must end in darkness and death chills the very marrow of our souls, and takes all the beauty from the heavens.

Nor is it the slightest consolation to be told—and told as "a message of hope"!—that the human race may have a million million years yet to live on the earth. If all life, and love, and art, and religion are finally to perish this is no comfort whatever. It does not alter the main conclusion that we are living in a hostile and not a friendly universe.

And this is a serious matter. For a man likes to have something to hold on to through all the trials and vicissitudes of life. He wants to be able to feel that at rock-bottom the universe is to be trusted. And if he finds that he can have no such confidence in the universe, that at rock-bottom it is merely energy, and that all he most prizes, his loves, and hopes, and ambitions count for, literally, nothing in the long run beside the cold grinding of purely

physical laws, then he will have nothing he can safely hold on to and will have to buffet his way as best he can against a hostile universe knowing all the time that whatever of the good, or the beautiful, or the true he may achieve will all be washed out and lost for ever. Men cannot always have what they want; *and what they would like to be true may not in the event prove to be true. Still, they will not be baulked of what they want, when it is something which affects* their whole lives, unless they are convinced past all possibility of doubt that it cannot be had.

Of vast—of literally vital—importance, for it affects our whole lives, is it, therefore, that we should examine this conclusion and rigorously test it by what we can gather from the conclusions of other sciences, and by our own good sense. For upon the decision we eventually come to will depend our root attitude to life. If we are convinced that life, and love, and beauty count for nothing in the end, and that the laws of physics finally determine events, these things of the spirit will lose interest for us, and our minds will naturally settle on momentary and material enjoyments. We will live to eat rather than eat to live. We will insensibly lay the emphasis on the material rather than on the spiritual. Our bodily health will be more to us than our spiritual welfare. A higher standard of living will mean to us better material conditions and more mechanical appliances rather than a loftier spiritual outlook and finer appreciation of art and religion. And we will expect the material conditions to improve the standard of living rather than the higher conception of life to improve the material conditions. But if we

find that it is early yet for astronomy and physics to make any final pronouncement on the destiny of the universe, if we find further that philosophy supports the view that not the laws of physics but spiritual values determine the destiny of the universe, then in striving after a knowledge of the truth, after a finer appreciation of beauty, and after making the world just a little better than we found it, we shall be cheered by feeling that we are not working against some inexorable laws which will finally defeat all our efforts, but that we have the universal impulse with us so that nothing in the end will be lost. And knowing this our minds will be at peace.

Let us then see how matters stand. Let us gather together the latest results of science—nowadays made so freely and intelligibly available to us. Then let us call in the aid of philosophy, whose function it is to deal with the ultimate nature of things and with the universe as a whole. And, finally, let us consult also those men who from their peculiar susceptibility of nature may directly apprehend the inner workings of the world in a way not easily followed by ordinary men.

When we have thus examined the universe in the light not only of science but also of philosophy, we should be able to reach some conclusion as to whether darkness and extinction is the final end of things, or whether the spirit is master of the physical world, so that goodness, beauty, and truth must ultimately prevail.

PART I

MAINLY FACTS

CHAPTER I

THE MATERIAL UNIVERSE

THE immensity of the material universe—the unimaginable number and distance and ages of the stars—is what most strikes those who listen to the latest message of astronomy; and, in contradistinction to the immensity of the whole, the infinitesimal minuteness of its constituent parts. Yet hardly less remarkable is the literally unceasing, though orderly, activity of each minutest part, the delicate intricacy of their adjustment with one another so that they form a systematic whole, and the beauty instinctive to parts and whole alike.

The material universe may be of unimaginable magnitude, and its tiny ultimate constituents may be in unceasing activity. But everywhere and always there is evidence of an ordering activity keeping things together in a whole.

Take first the number of the stars. Take a statement like this of Jeans: "The total number of stars in the universe is probably something like the total number of grains of sand on all the sea-shores of the world." Take another statement of his: "At a moderate computation, the total number of stars in the universe must be something like the total number of specks of dust in London." Or look at the photographs taken with the largest telescope in the world of a minute piece of the sky and reflect that the

majority—between thirty and forty— of the objects are nebulæ each containing some thousands of millions of stars, or the material for their formation, that besides these there are about two million more of such nebulæ which can be photographed in all, and, probably, millions of millions of others beyond the range of any telescope. Here we have one means of realizing something of the immensity of the universe even though the numbers are so huge as in truth to be quite beyond our power to grasp. We cannot really conceive in our minds the number of grains of sand on all the sea-shores of the world, or the number of specks of dust in London. And when we hear that the number of stars we can see with the naked eye on a clear night is only three thousand, we find it hard to visualize even one million stars. Our imagination is stunned and numbed before such figures. All we can do is to accept the fact that the number of the stars is so tremendous as to be beyond all powers of imagination.

But, if we are to appreciate, however feebly, the immensity of the universe, we must further reflect that each one of these stars is no mere speck like a grain of sand, but of huge dimensions. A few stars, says Jeans, are hardly bigger than the earth, but the majority are so large that hundreds of thousands of earths could be packed inside each and leave room to spare; while here and there we come upon a giant star large enough to contain millions of millions of earths. And one star, Antares, has a diameter of 390 million miles, or 450 times the diameter of the sun. The sun, which is only a very ordinary star—just one in some thousands of millions derived from

one of many millions of nebulæ—is a hundred times the diameter of the earth and a million times its volume and has 330,000 times its weight. Probably, very few stars weigh as little as a tenth of the sun's weight; the vast majority have weights intermediate between this and ten times the sun's weight. As a general rule the weights of the stars lie within the range of from a tenth to ten times the sun's weight.

Such are the gigantic dimensions to which we would have to enlarge our grains of sand upon all the sea-shores of the world if we are to get an idea of the immensity of the universe. And now we have to make yet another effort of our imagination if we want to have a conception of the scale upon which the universe is built. Grains of sand are packed close together, but the stars are at enormous distances apart. The very nearest star is so far away from us that light travelling at the fearful speed of 186,000 miles in every *second* takes four and a quarter *years* to reach us. It is 25 million million miles away. And the furthest object in the sky observed through the great telescope at Mount Wilson is so distant that light from it travelling at the same terrific speed takes no less than 140 million years to reach us.

More than a hundred million years before Mount Everest had been thrust up as a tropical island from the sea the light from the star which has been caught on Mount Wilson must have started on its journey across the appalling depths of space. And it is certain that there are celestial objects far more distant still.

And so distant are the stars from one another that,

according to Jeans, if each were represented by a speck of dust, there would be only six in the whole of Waterloo Station. If the sun were represented by a speck of dust the next nearest star would be another speck 675 feet away, the limit of the galactic system to which our sun belongs would be 7,000 miles distant, the next nebula 30,000 miles, the furthest nebula seen in the Mount Wilson telescope four million miles away, and more objects still further on. Yet, even with the reduction of scale suggested by Jeans, our imagination aches as we try to visualize the scale on which the universe is built. Even with the scale reduced so that the sun is represented by a mere speck of dust and the earth would not be visible with a microscope, we cannot picture the material size of the universe. We cannot grasp what a sphere four million miles high, four millions wide, and four million miles deep would mean. And that is only the dimensions of the reduced scale model. So it would be still less possible to visualize the actual dimensions with a height, a width, and a depth of 6,420 million million million miles—and this perhaps still further expanding!

Our imagination reels as we stand out under the stars and try, even faintly, to realize those dimensions. An ant trying to picture the Himalaya would have an easier task than ours. We would have to realise that, so vast is the expanse of the universe that, numerous as are the stars and nebulæ, they occupy only a minute portion of the space of the universe. Of all the stars we see in the sky above us the nearest is about 25 million million miles away. And that may be taken as about the normal distance

apart of the stars. The stars are in number as the grains of sand upon the sea-shore, and each of them is on the average a million times the volume of this earth, yet, so vast is the expanse of the universe, each can have some millions of millions of miles in every direction to itself.

Next in our picture of the universe we have to find a place for time. Time and space have to go together. There is no space without time, and no time without space. We may picture the universe as a sphere, but it must have a great cylinder behind it representing time. The universe is an event. It is happening. It is not something fixed like a library globe. It has been happening for millions of millions of years, and it will go on happening for millions of millions of years yet. That also we have to keep in mind as we gaze at the stars.

And the age of the stars is likewise something prodigious. The age of the earth is only some 2,000 million years. But the age of the sun is put at something like eight million million years. And more millions of millions of years must have passed since the vast nebula was formed from which the sun and the thousands of millions of fellow-stars which constitute the galactic system were formed.

Whether therefore we study the number, or the size, or the distance, or the age of the stars, we are dumbfounded at the immensity of the universe. It is now believed to be an expanding universe. And before it started expanding it may have contracted from a previous expansion. It may be a pulsing universe. But, as the radius of the universe even before it commenced to expand was 1,070 million light-

years (or about 6,420 million million million miles), according to Eddington, our impression of the magnitude of the scale on which the universe is built is in no wise altered.

Next I wish to fix the exactly opposite impression, namely the almost infinite minuteness of the parts of which it is constructed. We have spoken of a speck of dust. It is barely visible, yet it contains millions of millions of molecules. And a molecule consists of two or more atoms, and an atom has one or more electrons revolving round a nucleus of one or more protons.

Such is the minuteness of the ultimate units of which the universe is built and such the immensity of the whole. And now we come to what is the crowning marvel. All the innumerable and infinitely varied parts are made of the same thing—and that a thing which completely eludes our eyesight or our touch. The stars, the sun, the earth, and all material bodies whatever, and the atoms of which they are composed, are made of energy. The atoms are not minute particles analogous to tiny grains of sand, hard, impenetrable, and of uniform constitution throughout: they are like miniature solar systems with electrons spinning at tremendous speed round a nucleus of protons; and electrons and protons are simply units of negative and positive electrical energy. Matter is only a form of energy. In the last analysis, energy is the thing of which the whole universe is made. The primordial stuff of the universe is nothing more substantial than energy. The standard bricks of which the entire universe

is built are the tiniest particles, or waves, or "wavicles" of energy. Of these are all things made that are.

And what is energy? We have perpetual and direct example of it, for it is what, in the form of light and heat from the sun, and the stored sunlight in coal and wood, makes life possible on the earth. We have examples of the energy of motion in the stream, the wind, the bullet, the train; of mechanical energy in the coiled spring; of chemical energy in gunpowder; of electrical energy in the charged accumulator. Energy is penned up and highly concentrated in electrons and protons. Electrons are spoken of as packets of energy, though they have nothing to correspond to a material envelope: they pack themselves up. A material body is, as it were, congealed, or concentrated energy, capable, if released, of doing a tremendous amount of work. For example, Jeans tells us that the energy concentrated in the atoms of a piece of coal no larger than a pea is sufficient to drive the *Mauretania* across the Atlantic and back.

Then energy, besides being penned up, congealed, concentrated in atoms of matter, is radiated away from matter in the various forms of radiant energy. The bottles of energy are broken and the energy sprayed out upon the universe at large—sprayed out, whether as a flight of bullets, or as the ripples on a pond stirred by a stick, is not yet certain. Anyhow, it is never lost. It goes forth as alpha rays, or beta rays, or gamma rays, or as light or heat. And from the depth of space appear cosmic rays capable of penetrating no less than twelve feet of lead. And

these rays cannot be so unsubstantial as they seem. Even rays of light have mass, that is have weight, and Jeans tells us that if a six-inch cannon ball were heated to a temperature of 50 million degrees (which is the temperature of the centre of the sun), anyone approaching within fifty miles of it would be struck down by the radiation as if by the jet from a fire-hose.

So energy has a vast variety of forms—the bottled up being called matter, and the unbottled radiation. But all forms are capable of doing work ; capacity for doing work being indeed the only way of defining energy.

And the ultimate units of which the stars, the planets, and every other material body are constituted being nothing else than concentrations of energy, we are not surprised to hear that they are in incessant activity. And the activity is not only, literally, unceasing ; it is also prodigious. The electrons swish round the nucleus of the atom several thousand million times in every second.

And this activity is self-activity. The ultimate units are not like microscopic marbles which would have to be set rolling by some external agency. They act of themselves—of their own inherent nature, and in their own way. They possess an individuality of their own—even a trace of freewill of their own.

Further, each ultimate unit, infinitesimally minute though it may be, exerts an influence which extends in some infinitesimal degree over the whole universe, and affects every other unit, as well as the whole. Likewise is it receptive of influences from all other units and from the whole. It stimulates all

others and is responsive to stimulation from them. So it is of a wholly different character from either a grain of sand or the wheel of a machine.

Thus there is the closest inter-connection between the ultimate units of the universe. All interact with one another, and not one can exist apart from the whole.

Moreover, throughout the whole order is preserved. There is among the units unceasing and most tremendous activity—and self-activity. Yet in spite of this, disorder is all the time and everywhere being turned into order; and what might be chaos is being continually converted into cosmos.

Orderliness is everywhere apparent. On reading a book on astronomy one is impressed with the confidence men of science place in the perfect regularity of the universe. They never doubt for a moment that an apple will fall downward to the ground and not fly upward to the sky. And though physicists cannot with the most powerful microscopes see the atoms, still less the electrons, they make elaborate experiments with the certainty that the atoms can be counted on to comport themselves in the accustomed way. The orderliness of the universe can be reckoned on. Objects, however great, or however small, and at however great a distance, can be relied on to behave in a perfectly orderly manner. And so sure are astronomers of this orderliness in the universe that if they observe the slightest deviation in, say, the orbit of a planet they at once assume some reason for it, search for the cause of the deviation, and find it in the presence of some hitherto unnoticed planet.

And this orderliness in the universe enables us to understand that the universe is a system, or organism. The stars and atoms and electrons are not disconnected units. The universe is not a mere heap, or collection, or aggregate of things great and small, like a heap of stones or sand. All the units—stars or atoms—are connected together in a whole. They interact with one another and with the whole. All parts are interlocked tightly together in one whole—the universe. Not one is loose and separated, isolated, and uninfluenced by the rest. No matter how far we retreat from an electrified particle, we cannot get outside the range of its attractions and repulsions, which show that each electron must, in a certain sense at least, occupy the whole of space, says Jeans. The sun attracts the earth and the earth attracts the sun. Rays of light from nebulæ 140 million light-years away, and cosmic rays from the depths of interstellar space, reach the earth. Thus all the parts are interrelated with one another in a single system—one vast organism.

Of this whole the earth, of course, forms part and is subjected to the influences issuing from every other part, and from the whole. Some 2,000 million years ago another star is believed to have passed so close to our sun that by the force of gravitation filaments of the fiery mist were drawn out from the sun; and these in time condensed and congealed into the planets of the solar system. So our earth is just a tiny drop of the sun, cooled down first into the liquid and then to the solid state.

Whether other stars than our sun have planets

there is no direct evidence. The sun is no exceptional star: it is just one amidst millions of others. If, as Jeans and others suppose, the planets were born as the result of the passing of a star which by the attraction of gravitation drew off great filaments from the sun, it may be only very rarely indeed that planets would be born from stars; for empty space is so enormous in comparison with the size of the stars it would be only by the rarest chance that two stars would come near enough to each other to create tides in one another, and so draw off droplets that would eventually become planets circling round their parent. But this tidal theory is not the only theory of the formation of planets. They may also be formed by fission.

The normal development of a rotating star, says Sampson, Astronomer Royal of Scotland, leads to fission. A body originally spheroidal develops into an elongated ellipsoid, then into a pear shape, then into a shape like an unequal dumb-bell or gourd, and finally breaks into two parts which recede from one another. This break could hardly be a clean one, and would result in the formation of a not very regular set of drops that would be endowed with orbital motion. Some of them would form planets round the one star and some round the other. And this, concludes Sampson, would make a planetary system the possession of a great many suns.

Quite recently, too, Jeans has spoken of our system of stars as revolving round a "hub." This would mean, presumably, that the stars nearest the hub would be closer together than those farthest away. In which case there may, even in our system

—which is only one out of millions of others—be many stars near enough to each other to draw off planets from one another.

So what occurs on this earth need not be taken as absolutely unique in the universe. Thousands of other stars may possess planets more or less like our earth.

To sum up our picture of the universe as it presents itself to us to-day. It is of a magnitude far beyond our utmost power of conceiving. Yet the parts of which it is ultimately composed are of a minuteness equally inconceivable. All these parts are made of the same thing, and that also something of which it is most difficult to form a conception, namely, energy. They are in unceasing activity. But they are self-active : they are susceptible to the influence of all about them and responsive to that influence; and their activities are so ordered that together they form an organic whole, the universe which we see around us.

But to this picture a further feature must now be added. As we see the universe to-day much of the energy is concentrated in electrons and protons, and these arranged in atoms some of which show a very high degree of organization. But the energy does not remain for ever in its most highly organized forms. The amount of energy in the universe remains the same, and cannot be added to or subtracted from. But it may descend to a lower level of organization.

The organization of the energy of the universe

steadily grows less. A finite time ago—Jeans would put it at the order of 200 million million years ago—the material universe is assumed to have been at its highest state of organization. From this definite, assumed beginning in time there has been a continual degradation of energy ever since. And it is further assumed that not the simplest atoms—the hydrogen atoms—only, but also the most highly organized atoms, like uranium, came into being at that finite time ago. Then they first collected in vast nebulæ. Rotation was gradually set up. Then, as in a Catherine firework, sparks were shot off and stars thus born—hot concentrations of matter—vast stores of those tiny bottles of energy we call atoms. But in collisions the bottles would be broken and the energy let loose. Energy in its organized form would gradually disappear. The heat of the stars is gradually being radiated away, in obedience to the second law of thermo-dynamics, and must finally be dissipated throughout space.

And a peculiarity of energy is that, while the higher forms of energy may be transformed to lower, there is no evidence of the lower being transformed to the higher. The heat of the stars is being radiated away into space as radiant energy, but it is believed to be impossible for radiant energy ever to be transformed into heat. As Sullivan puts it, the degree of organization of the energy of the universe steadily grows less. The movement of the whole universe towards a uniform temperature is a process which, so far as we know, cannot be reversed. This change from a more highly organized form to a less highly organized form is continually

taking place in natural processes. And it appears that the process must inevitably go on until the disorganization of the energy of the universe reaches its maximum. The final state, the end of the universe, must occur within a finite time. So the astronomers and physicists say, though whether we should necessarily accept their present conclusion as the final word which will ever be uttered on this momentous question we shall have something to say later.

To put it another way, those concentrations of energy in the atom and in the stars are continually being broken up and the energy dissipated. The energy, instead of being concentrated in the electrons and protons of the atom, and the atoms being held together by gravitation in stars, is being flooded over the universe at large. "Empty" space is being gradually filled with the energy now radiating away from the stars. So that we seem to be working towards a state of things in which there will be no stars or nebulæ left, but only energy—and energy no more capable of doing any work than a level pond without an outlet is of turning a water-wheel. All will be on a dead-level of unutilizable energy.

It is a melancholy prospect. But the question naturally arises: If energy was once concentrated in electrons and protons, and if atoms composed of these were once formed, may not a like concentration occur again? Jeans looking backward in time is led to contemplate "a definite event, or series of events, or continuous process of creation of matter at some time not infinitely remote." At that time,

say x million years ago, "in some way matter which had not previously existed came, or was brought, into being." But when we speak of matter being brought into being we mean energy being concentrated into electrons and protons and these being formed into atoms. Energy is not created or brought into being. Energy is always there. It is therefore only a matter of its concentration. And why if these concentrations of energy should have taken place x million years ago they should not take place again there seems to be no answer. And the very immensity of the universe, and the tremendous periods of time involved, should be considerations inclining us to suppose that this may have happened. It seems more reasonable to suppose that in a period of say 200 million million years concentrations of energy into electrons should have occurred more than once rather than only once; and that in a universe of such tremendous size such concentrations of energy should occur now here, now there, rather than over the whole colossal universe at the same time.

And this leads to the question whether such concentrations of energy may not be occurring at the present time in the vast depths of space. Some physicists believe that they are. From out of the depths of space come energy-carrying cosmic rays. And Millikan, who for years has made a special study of them, believes that they must originate in interstellar space, and that they indicate the building there of some, at least, of the heavier elements out of the lighter. Atom-building in interstellar space he considers to be a perfectly natural hypothesis.

What we may suppose to have happened, and even to be happening now, is the congealing or concentrating of energy into tiny packets or balls, the electrons and protons, which then collect together as atoms.

Millikan's views are not generally accepted. Still they point to possibilities which make us laymen hesitate to accept as final and incontrovertible a view of the universe so contrary to the rest of our experience as the one-way view that it is running down without prospect of ever being wound up. We are only just gaining a glimmer of knowledge about the amazing universe of which we form a part and with which we are inextricably bound up. And with the evidence before us we must refuse to bind ourselves to the view that the universe is doomed to end in darkness and cold. We have greater faith in scientists than they have in themselves. They have to assume a starting-point from whence the universe began to run down—a time and a place when and where the energy of the universe congealed itself or was by some agency concentrated in highly organized forms from whence the degradation commenced. And we have faith that, having discovered so much about the universe, they will, with their marvellous ingenuity, in the course of time discover how and when and where energy was thus organized into electrons, protons and atoms. And until they have definitely proved that what has happened once can never happen again in no part of this stupendous universe, and in millions of millions of years, we will refuse to believe that the light and heat of the universe must

all radiate away, and that there is no possibility of the radiant energy ever again being reconstituted.

We will be fortified in our hesitation to accept this depressing view by the consideration that a closer study of the material universe seems to indicate the presence of some intelligent guiding agency.

If we were to see small bottles of white wine and large bottles of red wine in groups, and groups of groups, always with one bottle of red wine grouped with one bottle of white wine, with two bottles of red wine grouped with two bottles of white wine, with three bottles of red wine grouped with three bottles of white wine, and so on up to ninety-two of each, we would naturally conclude that some intelligent agency had been at work arranging them in this order. Still more convinced would we be that intelligence had been at work if we found that the wine was of sufficient potency to set the red bottle spinning round the white bottle at nearly lightning speed, and the two red bottles round the two white bottles, and so on up to the ninety-two red bottles round the group of ninety-two white bottles; and if, further, groups of two or three, or any number up to ninety-two, red and white bottles were able to combine in a dance with groups of two or three or any other number up to ninety-two red and white bottles, and yet all the time to preserve the most perfect order. If we saw these animated bottles performing all these gyrations with the utmost regularity we would hardly be able to help assuming that some intelligence had been at work designing the intricate movements, and some will at work

enforcing their regularity. For without some intelligence in arranging the dance and some will preserving order in all that fury of movement the bottles would crash into one another at the very start, and there would be hopeless chaos from the first.

If we substitute energy for wine, and remove the bottles, leaving the energy concentrated in bottled form without the enveloping aid of the bottles, the above is roughly a picture of what is going on in the stars, on this earth, in our bodies, and all over the material universe. Wherever there is matter there is concentration of energy into electrons and protons, there is this spinning of electrons round protons at nearly lightning speed, there is this grouping of atoms into molecules, and there is this perfect regularity of movement in spite of the complexity of the groupings and of the terrific speed at which the movements are made. And when the layman is told that this is the way in which the material universe is made he will naturally infer that some agency with intelligence enough to design the intricate movements of the dance, and with a will powerful enough to enforce exactitude of execution, must be at work in the universe. Those who have had anything to do with parade movements at high speed, and probably those also who have had to produce ballet dances, know well what an amount of both intelligence and will is required to ensure an accurate execution of intricate movements. And they, at least, would not hesitate to admit that, if an examination of the inner workings of the material universe shows both this intricacy and accuracy of movement performed at such incredible

speed, there must be some high intelligence and some powerful will at work initiating, guiding and controlling the movements. Probably, also, they would assume that in the units themselves there must be at least some faint glimmering of intelligence and will.

Scientists, however, by some unwritten law which, as usual with unwritten laws, is more rigidly observed than the laws enacted by Parliament, are debarred from admitting intelligent guidance into the scheme of things until they are absolutely forced to by inexorable logic. (Though when reason does thus force them to admit the evidence of intelligent guidance they make the admission handsomely, as when Jeans says that the universe shows evidence of a designing or controlling power that has something in common with an individual mind, and that its creation must have been an act of thought—and of thought in the mind of a mathematical genius.) So, for the present, we will not assume any intelligent guidance in the material universe but merely record the fact that the movements of the ultimate units indicate the presence and operation of some cosmic factor which we will call the x cosmic factor; and we will leave to a later stage of our enquiry the determination of its character.

Before, however, leaving the material universe we have one more observation to make which will assist us eventually in more fully determining the main character of the x cosmic factor.

For if a study of the universe makes upon the mind of the mathematician the impression that it

must be the work of a mathematical genius, it makes upon the mind of the artist the impression that it is the work of a great creative artist. For in whole and in part it is instinct with beauty.

Whether we look at the heavens on a clear night either with the unaided eye or through a great telescope, or whether we look around us on the face of this earth, or whether we examine any part of it with a microscope, everywhere we find beauty. We are so accustomed to the beauty that we hardly notice it. But take any one object of the heavens and think of how it would thrill us if we were seeing it for the first time. Take a single star. Say we had been blind. Say our eyes were opened on a dark cloudy night, and that slowly a rift developed in the clouds, and through the rift a single star appeared, how amazed we would be! What a thing of most exquisite beauty it would appear! How we would delight in its radiancy, its steadfastness, and the sense of hope it gave us!

And then suppose that slowly the rift widened and more stars appeared, and that, eventually, all the clouds cleared away and the whole firmament were revealed, how filled we would be with the glory of it! And think of our amazement at the first sight of a dawn—of seeing a light gradually spreading on the eastern sky, of a new *colour* appearing, of the dark sapphire blue of the midnight sky gradually being tinged with a primrose yellow, of the sky getting lighter and lighter and the delicatest tinge of rosy pink mingling with the primrose yellow, of more and more light appearing, the colours deepening, and then in a great blaze of

glory a dazzling disc of light appearing above the horizon, utterly dwindling the light of the stars, and flooding the whole earth with a new and marvellous splendour! It is only that we are so habituated to it that we so faintly realize the beauty of the heavens.

And if we look through a telescope at the stars then we can actually experience what it is to see a new beauty for the first time. We turn it on to an object in the heavens scarcely visible to the naked eye and we find it to be a star cluster of sparkling gems—hundreds of them collected together in a ball, and each one shining with a radiancy far outstripping any diamond or ruby.

Then, if we turn to our own planet there also do we find beauty all about us. In whatever part of the world we be, whether in the desert, or in the mountains, or in steppes and prairies, or in flat lands, each part we shall find has a beauty of its own. A sandy waste of desert may be thought to have no beauty about it. And in the full glare of the noonday sun striking down straight upon it, and allowing of no alternating light and shadow, and of no colour save a monotonous brown, it may have none. But see that same desert at about the time of rising or setting of the sun and note the marvellous change! The dry dust particles in the air then reflect every variety and tint of glorious colour. And the desert is glowing with a radiance the greener and moister regions of the earth have not the means to display.

Then take the mountains. Formerly men used to be frightened by them, think them frightful, and

get away from them. They were cruel and ugly rather than awe-inspiring and uplifting. Now we have come more closely to them we see in them a majesty and grandeur which enlarge our whole outlook, and their towering summits touch a spring in us which sets us reaching eagerly upward to them. Cold and austere their beauty often may be. But in this very austerity we now see attraction. And the solemn beauty of the mountains is now acknowledged.

The tranquil beauty of lakes, the majestic beauty of great rivers, the rippling beauty of little streams, the rushing beauty of torrents and cascades, all can see, and, if we who are almost blasé with seeing these beauties so often cannot appreciate them, think what beauty they must possess for any who saw them for the first time.

Think, too, what beauty they would show to anyone who would see them for the *last* time—who knew that it would be for the last time that he would ever see their beauty. In a remote valley of the Himalaya where I once served there is the story of the traveller Hayward, who was seized at night by angry tribesmen, but who at his earnest request was allowed to climb once more the mountain side, and see the dawn before he died. The story is the subject of the moving poem by Sir Henry Newbolt, "He fell among Thieves." Now suppose that some artist of the calibre of Turner in the plenitude of his powers were put in such a position. With all his faculties strung up to their highest pitch, and with eyesight of his soul sharpened to the keenest edge, what intensity of beauty he would see

in that Himalayan dawn, in the purity of those snowy summits, in the ruggedness of the mountain sides, in the light-flooded valley, and in the glistening river!

Yet, who knows but that there may be beauty which even a great artist does not see? On those same mountain sides live mountain goats with an agility enabling them to reach the riskiest coign of vantage, and with a keenness of eyesight which enables them to see details a man would never detect. Yet, with both these advantages, the goat would never see the beauty that the artist sees. And one is left wondering whether the artist himself may not be blind to beauties which a later age may recognize. Great as is the beauty which we see, there may be greater still not as yet revealed. We cannot suppose that we have even yet exhausted the beauty of the universe. And it is as yet only of the material universe that I have been speaking. In that alone there is untold beauty.

What our survey of the material universe amounts to is then this: In gross it is of an immensity, and in detail it is of a minuteness, altogether beyond our unaided powers of imagination. And, if in the eye of the physicist this universe is inexorably running down to a general death, there are also indications that cosmic factors are at work exhibiting both intelligence and a sense of beauty.

A study of our experiences on our own particular portion of the universe, this earth, will more than corroborate this impression. And to this study we will now turn.

CHAPTER II

THE BIRTH AND DEVELOPMENT OF LIFE

THE notion of a "running-down" universe, of the degradation of energy, of a heat-death as the end of all things, was a dominating feature of the last chapter. Science revealed a universe assumed as "beginning" with matter composed of highly organized atoms but in the course of time dissipating away the pent-up energy and ending up with nothing higher than unorganized radiant energy. There was, in short, a descending order of things in the universe as we see it to-day.

But now, as we remove our eyes from the universe as a whole and direct them to this planet in particular, we find, to our astonishment, a very different state of things. Contrary to what astronomers, physicists, and chemists could possibly have expected, things here are not on the descendant but on the ascendant. No celestial scientist who had witnessed the birth of this planet from the substance of the sun, and who was precluded by the rules of science from calling in the operation of any "supernatural" power, could have predicted the direct overriding of the running-down order of things which actually took place.

The period—roughly about a thousand million years—between the birth of this planet and the birth of the first living thing upon it is a kind of

no-man's-land between the astronomers and physicists on the one hand and geologists and biologists on the other. Astronomers trouble little about the earth after it had parted from the sun. And geologists and biologists are little interested in it before life appeared. That period seems to be nobody's child. Yet it was a period of exceeding importance. For what happened then was the direct reverse of what might have been expected. And to picture to myself what then took place I often think of times in the Himalaya, or the Alps, when I have watched the working of some unseen power creating something out of, apparently, nothing.

The day has been the perfection of beauty, clear and cloudless, the sky a liquid blue, the sun shining with unsullied radiance. Not a breath of wind would there be, or a sound. Then imperceptibly out of the clear sky, and, apparently, out of nothing at all, delicate wisps of mist would form and creep noiselessly along the mountain sides. Away in the distance across the valley dark clouds would begin to appear. They would grow and grow till they spread over the whole sky, flashes of lightning would dart out, and the distant rumbling of thunder would roll across the valley. The sky would become blacker and blacker. Presently, a seething mass of vapour would come boiling up towards me. A furious wind would arise. Torrents of rain would be seen coming nearer and nearer. Then the deluge would be upon me. The lightning would be crackling all round, and thunder smashing down in crash after crash.

Gradually the thunder would decrease again to a

rumble, the lightning become less vivid, the rain cease, and the wind drop. Again there would be absolute silence and stillness. Imperceptibly the clouds would vanish away. The sun would once more break through. Across a sky washed pure of any defilement the rays of the setting sun would suffuse the departing clouds with the most glorious hues creation has to offer. And I would be thrilled with a sense of some unseen power operating most powerfully about me. The deafening crash of the thunder, the blinding flashes of lightning, the ink-black clouds, the pelting rain, the rushing torrent, the burning sunset colours would have given a momentary manifestation of an invisible power which must all the time, beneath the quiet surface of things, have been silently at work.

Like invisible powers must have been similarly at work on this self-same spot, as also all over the surface of the earth, during those millions of years since the sun gave birth to the earth. And these have produced results which would have dumb-founded any celestial physicist who might from some distant view-point have been observing what was taking place. For, contrary to what might have been expected from the operation of the second law of thermo-dynamics, there has been, ever since the earth parted from the sun, a distinct winding-up process counterbalancing the running down which physicists would have led us to expect. The sun, we have been told, is, like every other star, radiating away its heat. The earth, being merely a speck of the sun, would presumably also be radiating away its heat. The running-down process would proceed

according to plan, and all would end, as predicted, in the death of the whole universe.

Then the incredible thing happened. Right athwart the running-down process came the work of these invisible powers. And they clutched the atoms and organized them into higher and higher forms till, at the end of a thousand million years, that marvel of intricate organization, the primordial germ from which all life on this earth has sprung was brought into existence.

That this happened is not doubted. It is a fact of science. And as it happened—and happened in the only part of the universe we know at all intimately — we cannot help doubting whether the second law of thermo-dynamics really is the final determinant in the affairs of the universe, and whether, in accordance with it, the whole universe is bound to end in the death of all things.

Here under our eyes is an example of invisible powers working directly counter to the, supposedly, omnipotent second law. Whereas Jeans has been warning us that the human race must "face extinction and the eternal destruction of all its hopes, endeavours, and achievements," here were powers at work bringing not death but life, bringing man himself to birth, and putting into him these very hopes, the impulse to endeavour, and the will to achieve. And this great fact cannot be lightly passed over as a casual episode of no consequence in considering the great affairs of the universe. It is of the highest possible consequence, as we shall see as we proceed with our enquiry. So in this and the following chapters we shall consider the steps by

which the primordial germ of life appeared, then how it developed into the wondrously varied life of to-day, and, lastly, how man ever came to hope and endeavour and achieve.

We start at the point where the earth parted from the sun. The sun is a sphere of flaming gas. The earth, in the first instance, when under the gravitational pull of a passing star it was wrenched off from the sun, must also have been a swirl of flaming gas. Later it must have cooled down to a gigantic drop of liquid gas, and soon the moon would have been thrown off. Then a crust must have formed, and then a most extraordinary event occurred: one of those novelties, or newnesses, in nature which are so utterly unpredictable—two gases combined to form something so totally unlike a gas as water. Two parts of hydrogen combining with one part of oxygen formed water. A "jump" of momentous consequence to this earth had been made.

An important stage had now been reached, for, with water-vapour and gases pouring out from the earth's surface, an atmosphere was formed which would circulate round the earth. This, at first, would be hot and moist. Then it would condense into a permanent roof of cloud, from which rain might fall but dissolve into steam before it could reach the surface of the earth. Later on, however, as the crust cooled, the rain would fall upon it, rush over its surface, and collect in hollows. So were the seas formed, while rises of the surface formed the mountains. (But, in passing, it may be noted that even the highest mountains—even the Hima-

laya—are, compared with the whole surface of the earth, such very slight excrescences that a celestial finger passed over the earth would be unable to detect them. Shown to true scale on a large library globe they would be only of the thickness of the edge of this page.) As more rain fell the cloudy canopy would be rent. Sunlight would break through. And all the time the rain would be washing down the salts from the land surface into the seas. At first these seas would have been of fresh water. Now they would become increasingly salt.

During this period the surface of the earth would have been absolutely bare. Mountain, valley, plains—all barer than the Gobi Desert, which does have some slight signs of vegetation here and there. The seas, also, would have been utterly devoid of life—not a fish, not even a sea-anemone, in all the oceans. Yet all the time those invisible powers would have been at work—as in those times before the Himalayan storms. Nothing would be seen. But in those millions of years, just where sea and land joined, where the land would alternately be washed by the sea, exposed to atmosphere, and laid bare to the rays of the sun—on the shores of some warm ocean—atoms of the salts in the sea would be combining with gases from the atmosphere, coalescing into molecules and then forming more and more complex chemical compounds. Other than merely terrestrial and solar influences would also be at work. From the universe at large, as from the sun, invisible influences, as, for instance, cosmic rays, and who knows what other physical influences, would be streaming in upon the earth and having

their due effect upon its surface. Organisms of higher and higher complexity would be formed, microscopic in size, yet of increasing intricacy of structure. Most of these would break down almost as soon as formed. But, at last, after a thousand million years, when the temperature and pressure of the atmosphere were just right, when from the salts in the sea and the gases in the atmosphere an exactly right combination had been made, an organism would have come into being just stable enough to persist instead of breaking down almost immediately. And, persisting, it would tend to assimilate materials from its surroundings and to re-form as it broke down. Something wholly new would have come into existence. Another of the great "jumps" in Nature would have been made. The greatest event in the history of this planet would have happened. Life would have appeared. A living organism would have come into being.

We shall presently see reason to doubt whether when life thus appeared it came *only* as a result of the workings of material conditions on this planet. Wells and Julian Huxley say that the great majority of biologists agree in thinking that probably all the life upon this earth had its origin from the matter of the earth, and that life on this planet originated from not life. But that life could come from anything else than life is always doubtful. And we shall later on show that we would be wise to be less insular in our outlook and to take as the earth's environment the whole universe, and not only the solar system. And, taking that as the environment with which the surface of the earth

was in interaction during the thousand million years preceding the advent of life, we shall give reasons for believing that it was influences—living influences—from that greater environment that were the main factors in bringing about such an astonishing result as the appearance of a live being on what at the start had been nothing but a swirl of fiery gas. But for the present we had better concentrate our attention first on this original living organism and then on the development from it of all the life we see on this earth to-day, and all that has passed away during the last thousand million years.

This primordial germ, as we shall henceforth refer to the first living organism to appear upon the earth, is often spoken of as the "simplest" living thing. But what we have here to mark is that, simple as it may be, in comparison with its highly complex descendants, it is yet of an intricacy of structure astounding to us laymen unaccustomed to viewing the details of biological architectural units. Probably, it was scarcely visible to the unaided eye, and indistinguishable from the slime about it, except for the faintest trace of movement—that is of self-movement. In texture it must have been not hard or solid, but jelly-like, or of the consistency of a soup-like fluid. But, minute though it may have been, it would yet have been composed of innumerable particles tinier still. And all these jelly-like particles would have been immersed in a fluid medium, like islets floating in an archipelago, though with the difference that the "sea" would

be above and below as well as on the side of the islets, so that with their bays and capes they would have exposed surfaces immense in proportion to their volume. On those highly impressionable surfaces, laid bare to every influence bearing in upon them—and bearing in upon them, again be it noted, from the whole universe great physical and chemical changes would take place—what biologists call surface tensions, capillarities, absorptions, adsorptions, diffusions, and so on.

This is what Sir J. A. Thomson tells us about a "simplest" living thing. And when we read the description we can realize how exceedingly supple and plastic, and how responsive to stimulus the primordial germ must have been—especially when we consider, further, that each tiny islet of this jelly-like substance must have been made up of millions of atoms, each composed of highly sensitive, and excessively active, electrons and protons, with their own strong attractions and repulsions. Both a storehouse of tremendous pent-up energy and also an exceedingly responsive and adaptive entity this primordial germ must have been.

Now this primordial germ must have had certain characteristics which distinguish all living things. It must have been composed of the same chemical elements, built on the same pattern, and possessed of the same characteristic as the fundamental units of all living things to-day. The greater part of its substance, perhaps two-thirds, would have been composed of oxygen. Carbon and hydrogen would have occupied a large proportion of the remaining third. Nitrogen would be in smaller quantities.

And perhaps there would have been traces of sulphur, phosphorus, calcium, iron, chlorine, sodium, and magnesium. These would have been built up into highly complex chemical compounds, of which by far the most important would be proteins which, according to Goodrich (see his "Living Organisms"), are so complex that the exact chemical formulæ of even the simplest varieties have not yet been made out, though it is known that the molecule of them must contain hundreds or even thousands of chemical atoms, for one of even the simplest of the proteins contains over 600 atoms of carbon, over 100 atoms of hydrogen, and some 200 atoms of both nitrogen and oxygen.

Of the properties of this complex primordial germ the most striking would be its capacity for unceasing change. It would be perpetually taking in food and oxygen, and perpetually giving off carbon dioxide and other waste products. In this process of metabolism, as it is called, energy and material would continually be transformed. There would be incessant building up and breaking down. A double process would be continually going on: a building up of substances to form higher and higher compounds in the making of which energy would be absorbed, and a corresponding breaking down of these highest compounds into simpler ones, and eventually into waste products, during which energy would be freed. A stream of non-living matter with stored-up energy would be built up into living matter, and be again passed out as dead matter, after yielding up the energy necessary for the performance of the various activities of the organism.

Like a vortex, says Goodrich, the metabolic process draws in non-living substance and energy at one end and parts with them at the other. The stored-up potential energy of what is taken in is converted into kinetic energy (various forms of motion) and heat, and the energy taken in is thus balanced by work done and heat. The living organism, in fact, winds itself up as it runs down. It first stores energy and then frees it. And the primordial germ must have had precisely these characteristics.

Then, in spite of this perpetual change, there would be that in it which would abide. It would preserve its integrity, its identity, its individuality through all the building up and breaking down, the storing up, and the expending of energy. It would be self-preservative as well as self-sustaining. The power of growth would have been another of its characteristics. And it would not grow by accretion like a snow-ball but by inner propulsion and initiative. It would build up from inside, not lay on from outside. And following from this power of growth would go the capacity for multiplying itself. It would grow to a certain maximum size and then divide in two.

So the primordial germ would have these three main characteristics of feeding, growing, and reproducing itself. And, in passing, we might note that both feeding and growing indicate at least a trace of mind, for some choice is exercised as to what should be taken as food; and some faint conception of the form it should build itself into must be in the germ.

This taking in of matter, changing it chemically,

and from the changed material obtaining energy which it can utilize for its own needs and ends is the point about the primordial germ which I would specially stress. For it is its fundamental characteristic. And we shall find it of great significance later on when we shall be considering the possibility of life existing on planets of other stars than our sun. It will then not be a question of whether human beings like ourselves exist on those planets. The question will be merely whether it would be possible for a microscopic primordial germ to exist on them—whether a germ-cell with a power of initiative, and a capacity to take in matter, change it chemically, and in so doing extract from it the requisite energy could exist—the particular form of matter not being the essential thing : the essential thing being the energy, which might, of course, be taken from other chemical elements than those found in protoplasm and under other conditions of temperature and pressure than those which prevailed on this earth when the primordial germ appeared here.

I have taken the trouble to make this special study of the primordial germ not only because it is the far-away ancestor of ourselves and all living things that are, or ever have been, or ever will be on this earth; nor because each one of us individually has grown up from a single germ-cell of the same character; but because an examination of the primordial germ enables us to connect up with the rest of the universe, and affords us the best means of judging on the possibilities of life elsewhere.

And, to reinforce our impressions of the primordial germ, and enable us to visualize it better, we might take an example of one of the lowliest forms of life existing to-day. We might take the amœba on account of our familiarity with it under the phrase "from amœba to man." In size it is barely visible to the unaided eye. It may be found in pools of rain water. It is quite irregular in shape and is constantly changing its form by protruding, or contracting, certain portions of itself. It moves, though very slowly, and by a kind of streaming motion. It glides over the surface of a stone, for example, by protruding and retracting certain finger-like processes. The substance of which it is composed is almost colourless, and nearly transparent, soft, jelly-like and semi-fluid, yet not capable of mixing with water and therefore preserving its own form. In the midst of it is a small rounded body, the nucleus, which preserves its form under all the changes which the amœba as a whole undergoes. This nucleus is a world in itself, the parts of which show untold complexities of interaction. The amœba feeds on minute living organisms and also on other amœbæ, its method of feeding being by surrounding the objects of food by these finger-like processes, engulfing them, and taking them into the cell-substance. There digestive ferments flow into them. The digestible parts are absorbed and the undigested are got rid of. Then after growing to a certain point the amœba divides into two. Growth thus naturally leads to multiplication, or reproduction.

So we have an idea of what the primordial germ

must have been like. And we can see that it would have a power of self-activity and initiative not possessed by non-living organisms. Grains of sand would be driven hither and thither by the tides, and so would the primordial germ. But the latter would also have the power of moving under its own steam. In response to external stimulus, perhaps, nevertheless, responding to its own inner impulsion —from a driving force within—it would move ever so slightly in this direction or that. Again in response to external stimulus, yet, also, of its own inner impulsion, it would feed. It would take up matter from without itself, change it chemically, and from the changed material acquire the energy for movement and collecting food.

And as the primordial germ has these characteristics we would do well to give up thinking of even this simplest living organism in terms of machinery. Indeed all organisms, living or non-living, are something a great deal more than machines. Machines are suggestive of all that is hard, fixed, unchanging, unadaptive; and no analogy could be less suitable for the yielding, jelly-like, impressionable, responsive, changeable, adaptive specks of protoplasm of which all living things are built—or even for those atoms composed of tiny concentrations of energy and just as much psychical as physical of which the primordial germ is built up.

It has become the habit to bow down to mere size. Often we hear men say of the Himalaya: "How insignificant man is in comparison!" Astronomers do the same about the stars. And Mr. Wells' "Science of Life," valuable though it is,

strikes the same note of man's insignificance beside the immensities of the universe. Yet how vastly greater was even that tiny, hardly visible, primordial germ than the huge sun, or all the millions of other suns put together! Greater—higher in the scale of being—because more readily responsive to the universe as a whole, more indicative of the character of that whole, and abler to adapt itself to the cosmic requirements and, within constitutional limits, control its own destiny.

In contrast with this lowliest form of life representing what the primordial germ must have been like let us now briefly recall to our minds that rich and varied life of to-day which has evolved, as Darwin showed, from that single, tiny, scarcely visible progenitor. Such a review of present-day life may bear the appearance of a catalogue, but it will perhaps serve to refresh our minds in regard to the marvellous wealth and variety of life. And some general conspectus of life to-day is important for our purpose, as a view of the outcome of the evolutionary process will help us to understand the process itself.

At the top is man. About 2,000 million men there are on this earth. Each one, like all other animals, is directly descended from the first living organism. Each one has grown up from a single cell of like character. But each one is now built up of millions of millions of millions of such cells. And each one possesses powers of perception of the world around him, capacities for reasoning on what he perceives, and powers of creation, which one

would think not even a god could have foretold would develop from that minute first speck of living matter. Then each one of these millions of men is different in some measure from the other inwardly as well as outwardly, though all conform to a single type, *homo sapiens*, and are easily distinguishable from all other animals, even from the nearest, the apes. Thus we have the energetic highly-trained white races of Europe and America, and the more indolent, backward, black races of the African forests. We have the quick-witted, supple-minded, highly spiritual Hindus, and the intelligent, cultured, art-loving Chinese; and we have uneducated Indian forest-livers able, indeed, to detect and draw conclusions from a broken twig, an upturned stone, a faint distant sound, that the most highly educated European would not be able to see, even when pointed out, yet wholly without the power of abstract reasoning or any strong sense of beauty. We have gentle timid races to whom war and murder are unknown, and fierce tribesmen living in a perpetual vendetta. We have whole tribes of an average height of six feet; and we have little pygmies and bushmen who hardly reach as high as their waists. And, even among us Europeans, we have men as different as are the solid, sturdy races of the North from the excitable, quick-witted Latin races in the South. All these and many other varieties of men there are. Yet all are built on one mould and are easily distinguishable by the other animals as being quite apart from themselves.

Next to men come the apes and monkeys—very similar in some ways, very different in others.

They can scarcely be as numerous as men. Yet they seem to be almost more varied. For what a difference there is between the massive gorilla, heavier and more powerful than any man, and the agile, nimble-witted, chattering little monkeys we see in an Indian forest. Then we have chimpanzees, and orang-outangs, and langurs, and a host of others—all differing from one another, but all distinctly of the ape and monkey tribe.

Then, not so very dissimilar, but quite distinct, are the bears—grizzly bears, brown bears, black bears, polar bears. Enormous elephants, massive hippopotami, powerful rhinoceroses, graceful antelopes, gazelles, and deer, quaint giraffes and kangaroos, and fierce courageous boars. And the cats, how many, and how different! Lions, tigers, leopards, panthers, jungle cats, and just the plain, ordinary domestic cat—itself of many varieties. Dogs, too, in many varieties, wolves, prairie dogs, Newfoundlands, St. Bernards, on the one hand, and little Pekinese sleeve-dogs on the other. Fierce bloodhounds, and gentle spaniels. Swift, graceful greyhounds, and slow, heavy bulldogs. Then horses in much variety, the diminutive, still-existing wild horse of Mongolia, the race-horse, the cart-horse, the hunter, the pony. Some strong, some swift, some tall, some short, but all definitely horses and not donkeys or antelopes.

Cows too, how varied they are! The wild buffalo, standing sixteen hands high and, though of enormous size, alert in mind and quick in movement. And domestic cattle of many a kind—Jerseys, Guernseys, Herefords, Frisians, and so on.

Some great producers of milk, others valuable as meat. Sheep also, the quick, alert wild sheep and the slow, fat sheep of our pastures. Ibex, graceful in form, and swift and sure in movement on the steepest precipices; and the more lethargic tame goats. Finally, we have an innumerable company of creeping, climbing, crawling animals, some living above ground, some burrowing into it, some inhabiting the trees—rabbits, hares, stoats, weasels, moles, voles, squirrels, and so on.

These are only the mammals. Besides them are the birds, the reptiles, the fishes, the insects, the molluscs, and all the lower sea-anemone jelly-fish-like forms of life.

Take the birds. As we think of them we see again the prolific and varied outcome of Nature's efforts. Compare the huge ostrich and the tiny humming-bird, the gorgeous plumage of the bird of paradise and the sombre feathering of the London sparrow; the quaint penguins, pelicans and hornbills, and the graceful cranes and flamingoes; the swift-flying swallows and the heavy turkey, the voluble, many-coloured parrot and the solemn, gravely-apparelled owl; the radiantly adorned peacocks and pheasants, and the sombrely-attired rooks and ravens; the soaring skylark, and the ground-tied cocks and hens of the farmyard; the great birds of prey like the eagles, vultures, hawks and kites, and the gentle singing birds like the thrush, the blackbird, the robin, the mocking-bird, the golden oriole, and the nightingale. Think, too, of the dainty little wagtails, the homely little bulbuls, the far-flying seagulls, the great wide-

spreading albatross, the vast tribe of finches, the partridges, pigeons, woodpeckers, swans, and sun-birds.

From the air we must descend again to the earth and consider the reptiles—great crocodiles and alligators, graceful little lizards, and beautiful though repellent snakes. Then of amphibians, like frogs, toads, and newts. And then of the astoundingly varied and numerous insect life belonging to both land and air, and, in a few instances, water also: the gorgeous butterflies, the intelligent bees, the industrious ants, the innumerable flies, gnats and midges, and the vast array of beetles. Then the spiders and scorpions—loathsome to us but with an interest of their own. Then the whole great tribe of crustaceans, wood-lice and centipedes on land, and, in the sea, prawns, shrimps, crabs, and lobsters. Then beneath them the worms, both on land and in the sea. And the many molluscs, such as snails and slugs, shell-fish, oysters, and octopus. Lower still, the star-fish, sea-urchins, sea-anemone, jelly-fishes, sponges, and corals. Finally, those myriads of tiny microscopic forms of one-celled life like the amœbæ, the algæ, and, lower still, microbes and bacteria of all kinds.

We have only to run through the animal life in this way to see how numerous and varied it is. And this is the outcome of the evolutionary process to date. Biologists are now agreed it has all developed, during the course of something like a thousand million years, from that single minute primordial germ which we have already examined so carefully. And this outcome will be a guide for us in under-

standing those stages by which the evolutionary process has advanced which we will now briefly enumerate.

A chief factor in bringing about this development is believed to be the Darwinian principle of natural selection. And what that principle is we had better have in Darwin's own words: "As many more individuals of each species are born than can possibly survive; and as, consequently, there is a frequently recurring struggle for existence, it follows that any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving, and thus be naturally selected. From the strong principle of inheritance any selected variety will tend to propagate its new modified form."

Darwin was contending against the view prevalent in his time that each species—cat, dog, horse, man, sparrow, rose, butterfly—had been independently created at the creation of the world, 4004 B.C. And he maintained that all species were derived from a single progenitor, the primordial germ. And he argued this process of natural selection was the main factor in bringing about this result. But he did not say it was the only factor. He said, "I am convinced that Natural Selection has been the main but not exclusive means of modification." Nor did he study in detail the question as to how the variations arose upon which the principle of natural selection acted. His principal concern was to establish the great fact that all species

derived from a single primordial germ. And the question of the origin of the primordial germ itself, and of the variations which occurred in the course of its multiplications, was left to the study of future generations. Natural selection operates on the variations and sifts the profitable from the unprofitable. But it does not produce the variations. And how those variations are produced we have now to enquire.

Darwin himself had an inkling. "The reproductive system," he says, "is eminently susceptible to changes in the conditions of life; and to the system being functionally disturbed in the parents I chiefly attribute the varying or plastic condition of the offspring. . . . But why, because the reproductive system is disturbed, this or that part should vary more or less, we are profoundly ignorant. Nevertheless, we can here and there catch a faint ray of light, and we may feel sure that there must be some causes for each deviation of structure, however slight."

To this statement of Darwin let us join the following statement by Sir J. A. Thomson: "Deeply penetrating environmental changes, saturating through the body, may provoke changes in the genes"—the genes or marrying cells being the most important parts of the germ-cell in the reproductive system.

Both Darwin and Thomson attribute the occurrence of variations to the susceptibility of the reproductive system to changes in the conditions of life—that is, in the environment. But here, again, I would urge that the environment must not be re-

stricted to the merely solar system environment: it must be deemed to include the entire universe. As we shall presently see, it may, indeed, be from the environment beyond the solar system that came those deeply penetrating changes which provoke changes in the genes of the reproductive system. Thomson himself suggests that gamma rays (unknown in Darwin's time) may serve as variational stimuli provoking the genes to change. And from the universe at large may come other forms of radiation which may likewise provoke change in the genes.

In tracing the causes—or sequences—of development we are impressed by the occurrence of certain crises when the slightest deviation one way or the other may have momentous consequences. Things work up to a critical point and then of a sudden comes a newness—a new departure, the appearance of a new quality or property. Even in atoms come these crises. The atom is compared to the solar system in that it has bodies revolving round a central body. The electrons spin round the nucleus of protons as planets revolve round the sun, though with a far dizzier speed. But, after swishing round for millions of millions of times, an electron will, of a sudden, jump from one orbit to another—just as if Venus were suddenly to spring from its own orbit to the orbit of the earth. And this change of orbit of the electron may change the character of the atom.

This is one instance of a "crisis" which may have important consequences. Another is described by Dr. W. H. Mills in an address to the British

Association in 1932 when, speaking of mirror-image forms, he said that "if there were the slightest departure in either direction from an exact equality in the two mirror-image forms this would increase with growth continually according to compound interest law." It does not matter for our present purpose what mirror-image forms are. The point is that there are occasions when things are so nicely balanced that a minute initial bias in the one direction or the other may have incalculable after-effects. There was apparently such a tipping of the balance in the primordial germ at the start, and we are now enjoying—or suffering—the consequences. And when we hear that cosmic rays, wherever they may come from, can pierce twelve feet of lead, and can break up an atom, we can readily understand that in the environment of living things on the earth's surface are agencies which can quite easily tip a nicely poised balance. And, as we shall have to note later, that tip to the balance may quite possibly be given by mind. For mind may directly affect matter, as everyone knows who has had bullets fired near him.

Having depicted in some detail the original germ from which all life on this planet has sprung; having briefly surveyed what has resulted from the development initiated by that primordial germ; and having summarized what are accounted the principal factors which produced that development, I would now propose very shortly to trace the steps by which from that tiny speck of living matter there has, in the course of a thousand million years, arisen all

this wondrous life about us, and even man himself. But it will not be necessary to devote much time to the telling of this dramatic story, for it has often been told before, and just recently in a manner that is easily intelligible to the laymen by Wells and Huxley in "The Science of Life." All that is necessary, therefore, is to enumerate the principal stages in the wonderful progress, and to dwell briefly on such noteworthy features in it as the first associations of cells, the appearance of plants, the appearance of tentative vertebrates, the branching off of the insects, the rise of birds from reptiles, the appearance of tentative man. For these will give us indications of what may be developing on planets of other stars from other types of primordial germs.

The primordial germ we have seen had the power to grow. And this implied eventual multiplication. For having grown to a certain size it would divide in two, as we can observe with amœbæ. And having divided in two, each of the two would grow, and then also divide in two. And so the process would go on. Every few hours each unit would give rise to two units. And what the result would have been in the course of a few million years mathematicians might calculate. But from the start—as even before the appearance of the primordial germ—the principle of natural selection would come into operation. All the products could not possibly survive: there would not be enough food. Those therefore would tend to survive which varied ever so little in a direction profitable to themselves. All the time, too, the environment itself would be changing, if ever so slightly. More

of the salts of the land surface would be washed down into the sea, in which these first animalculæ would be living. Temperature might vary this way and that in some small measure. And in the course of time these animalculæ themselves would become an important part of the environment for one another. So, through hundreds and thousands and millions of years, the totality of their surroundings —terrestrial, solar, cosmic—would be both stimulating these jelly-like and extremely impressionable little creatures to respond and also sifting out those among them who had most effectively responded in their own interests—that is those who had best adapted themselves to their changing environment. The animalculæ, on their part, and of the initiative which was inherent in them, would be feeling their way, trying experiments, selecting or rejecting this food and that, and taking from the environment whatever seemed to suit them best, making use of the environment to the best of their ability. Creature and environment would be thus continually adjusting themselves to one another. And so nice is the adjustment of things in the universe that "a grain in the balance," as Darwin said, or a cosmic ray in the balance, as a modern naturalist would probably say, would decide which individual should survive and propagate its kind and which should succumb; though we know from the long result over a thousand million years that the grain which tipped the balance must itself have been moved by some agency—some cosmic factor—making on the whole in a man-ward direction. For the balance was not tipped now on this side, now on

that. A direction was given by the cosmic environment to the whole process. And that direction we now at the end of these millions of years can clearly discern. It was towards ourselves—towards men as the creatures most sensitive to the creative cosmic environment in which they are placed, most responsive and adaptive to it, and most capable of using it to their own ends.

Thus did the world of these primitive animalculæ proceed. For a hundred million years not much change would be noticeable. The creatures would still be very minute—still only one-celled such as the amœbæ and one-celled animalculæ in the seas to-day. But somewhere about this time there would have been an important parting of the ways. One set of these lowly organisms would have come to use the sun's energy directly and would be the progenitors of all plant life, and the other set would live by feeding on the first and so acquiring their energy indirectly. And from these latter all animal life would be descended.

And this will be as good a place as any for setting forth what is the essential difference between plant life and animal life. They resemble each other in many respects and yet have a fundamental difference. A plant, like an animal, feeds, breathes, digests, grows, and multiplies. Simple plants swim about, young shoots and roots move. And all plants are sensitive to light or heat or cold. Plants, like animals, are either composed of single cells or built-up of cells and various modifications of cells. These are the resemblances between plants and animals. In contrast, plants get from the air the

oxygen they require, while animals get it from plants or other animals. Most plants get their nitrogen from the soil through their roots, while animals get their proteids formed within other organisms.

To return to the evolutionary process. A second hundred million years pass with the insurgent life ever pushing forward, and finding new forms in which to express itself. And now another striking change takes place. The units, instead of remaining separate units, come to unite themselves in pairs and pairs of pairs. The principle of association comes into play. After dividing in two the pairs would tend to combine in a larger unity, each retaining its individuality and growing and multiplying. Colonies of units would then be formed and primitive jelly-fishes and sea-anemones begin to appear.

A third hundred million years would roll by, and on the main stem to man and still in the sea worm-like creatures would appear. Branching off would come molluscs—soft, sluggish, boneless creatures, distinguished for great staying power and adaptability, and capacity for going a long time without food and surviving all kinds of adverse conditions. Their later descendants include oysters, octopus, limpets, whelks, mussels, and, on land, snails and slugs. But the primitive molluscs would not have shells, or fossils of them would have been found, and we have not nearly reached the age of fossil records.

A fourth and a fifth hundred million years go by, and while the main stem continues through worms towards the tentative fishes, another great branch

from it appears, namely the one eventually to develop into the crustacean world of shrimps, crabs, and lobsters.

At last, in about the beginning of the sixth hundred million years from the start the original jelly-like animalculæ have so developed in size, and acquired such hard exterior protection, that they are able to leave traces of themselves in muddy or sandy sea, or river bottoms which eventually rise above the sea-level and harden into rocks. We arrive at the lowest rung of the fossil record in the rocks.

Of the main stem there is evidence in the traces of jelly-fishes and worms. Then on branches from it are found sponges, snails, numerous trilobites, and many crustaceans, like shrimps. But not yet were there any fishes, or land animals or insects or spiders, and there were no land plants with roots, seeds, or flowers. The land was still absolutely bare of any vegetation and what life there was was "invertebrate," backboneless, and confined to the sea or sea-shore. It had taken five hundred million years to make this advance from the minute jelly-like primordial germ to these sea-worms and slugs. But the foundations had been laid. The environment for each living unit was becoming more and more composed of other living units and forms of life. In the next five hundred million years to the present day the advance was to be far more rapid. And the crescendo of rate of progress was to increase the nearer the present was approached.

In the sixth hundred million years the main stem continues through the worms, but huge sea-scorpions now predominate and progenitors of the

scorpions of to-day begin to live partly on land, partly in the sea, like crabs to-day. And in the sea, between the sixth and seventh hundred million years since the advent of the primordial germ, the tentative vertebrate—backboned animal—appears. In the simplest, most primitive form a little higher than its worm predecessors, it is of a lamprey-like form, and is called a lancelet. The body is elongated and supported by a long elastic rod (termed the notochord) running from one end of the body to the other, and being the precursor of the backbone of all the higher animals. Above the rod runs the central nerve-cord, starting with a concentration of the nerve-tissue—the forerunner of the brain; and beneath runs the main artery of the body. Later on, this elastic rod will be replaced by a series of bony cylinders joined to one another by fibrous tissue and will be the vertebral column, or spine. But for the present there is merely a rod. It is through these tentative vertebrates that the main stem of ascent to man is carried. And from it branch off the fishes in one direction, and in another reptiles, from which eventually birds develop. This little lancelet, a direct ancestor of man, of fishes, reptiles, and birds, though only two inches in length, and living in the sand in shallow waters, is a most important stage in the evolutionary process. And from now onwards the advance is rapid.

But first life had to get out of the water on to the land. And the land was still barer than the barest desert. How this was done is told with rare skill in Wells' "Science of Life" and need not be retold here. But what does need emphasizing in this

place is that this tremendous feat—the feat of clothing the land with vegetation and peopling it with animal life (in the broadest sense of the term)—does seem to indicate unmistakably that within all these humble creatures there must have been some mighty urge or drive, as well as initiative, resource, and inventiveness, or such a wonder could not have been effected. For on the one side was barren land and on the other soft backboneless creatures without even legs and accustomed to live in water—or at most in mud and wet sand. Yet these had, somehow or other, to win their way right up on to the land and spread far out over the deserts and up into the mountains. It was a stupendous undertaking. And that they succeeded—and succeeded even in conquering the air—leaves us doubtful whether the principle of natural selection alone will explain the feat. One cannot observe a movement on so grand a scale without hazarding the conclusion that in these little slimy creatures on the edge of sea and land there was some inward driving urge, and that over all there was prevailing some co-ordinating agency directing their efforts to some common end. That, at any rate, is the impression which the telling of the story leaves upon the layman.

First, plants, such as seaweeds, had to become land plants. Plants to get and use carbon have to reach upward into the air and light; and to get water and mineral salts they have to drive down into the soil. The seaweeds in salt-marshes, lakes, and lagoons would press nearer and nearer the high-tide mark to get the advantage of food-building sunlight, and the more the root penetrated down

the less chance there was of the plant being carried away. The earliest known land plants occur in the early Devonian peat bogs six hundred million years from the primordial germ. They were from four to eight inches high and were something like both ferns and mosses, with no regular root but only a creeping underground stem with absorbent hairs on it. Plants of this nature appearing in salt-marshes or in fresh-water bogs would, when these swamps, owing to a rise in the land, became dry, slowly adapt themselves to land life. And so the first great step of peopling the land would be taken.

Then as land plants spread and multiplied there would be an inducement for animal life to follow. And it would be by the drying up of lagoons and pools that animals also would be forced on to the land. Yet we must entitle these wriggling, legless little creatures to some initiative and spirit of adventure in the matter. Without it they would have simply dried up with their pools and lagoons and marshes. They must have had some dim sense of the worth-whileness of life, or they would not have put forth the necessary effort to keep themselves alive under increasingly adverse conditions. Perhaps, also, even among them, there may have been some faint spirit of emulation. As one ventured thus far another might venture further still. One is tempted to think that these little embryo fishes, with only embryo lungs, and only fins for legs, when they started off on their dry land adventure were something more than strugglers for mere existence. They must have been embryo explorers and embryo inventors as well, and have cared not

so much for internecine warfare with their fellows, and not so much for merely surviving, as for wriggling a tiny bit further than their fellows into the unknown and enjoying the thrill of adventure. They must have had some of the real *élan* of life. The drying up of their pools may have furnished the immediate incentive. But, unless they had had it in them to rise to the occasion and meet and overcome it, the land would have remained unconquered, and animal life would have been confined to the sea. So we should recognize in these humble creatures the embryo of that spirit which will risk life rather than save it and which, in risking life, finds it. This is a wholly other spirit than the spirit which only struggles for existence. And it should be particularly noted at this very important stage in evolution.

And with the spirit there the body soon finds means of adapting itself to the spirit's requirements. The Everest climbers, with the spirit to ascend into altitudes where there is very little oxygen in the air, discover, to their relief, that their bodies, gradually adapting themselves to the new conditions, find improved means of taking in what oxygen there is. The spirited first invaders of the land found the same thing. They already possessed little air-bladders which enabled them to gulp in air as they lived in the pools to supplement their water-breathing. And as they ventured on to the land and became more and more dependent on the air for their oxygen they gradually developed primitive lungs.

Then on land they had to develop some other

method of progression than wriggling. In the medium of water, which nearly supported their bodies, fins were sufficient. But on land they had to raise their bodies from the ground and progress by, at least, crawling. And to crawl they had to use their fins. And these fins, from constant use as legs, gradually came to have the form of legs.

And as they were developing lungs and legs, and *as plants* were making their way on to the land, so also were early scorpions (derived from sea-scorpions), and the ancestors of insects, and these would form food for the new adventurers. Thus nicely adjusted are the different forms of life to one another.

In this way in the Coal Age, about 700 million years from the beginnings of life, there appeared the primitive amphibians, the forerunners of all land vertebrates, ourselves included. They naturally had their resemblances to the lancelet, from which they originated. But they had little feet and legs by which they could crawl. And by this time vast forests had grown up on the land—forests now fossilized as coal—giant club-mosses, lepidodendrons, tall, slender, primitive conifers, ferns, tree-ferns of huge size, and horse-tails as large as trees. And in the swamps and forests were cockroaches, scorpions, centipedes, ancestral spiders, primitive insects. There were not yet birds or bees or butterflies, nor any animal that could stand. But the great pioneering step had been made. The land had been definitely occupied. And in the next 100 million years tremendous advances were to be made.

For life was now approaching the age of reptiles.

The legs of the amphibians were getting stronger under them, enabling them to lift their bodies higher off the ground. They were acquiring tougher skins and were thus able to withstand the danger of desiccation. And as they developed into reptiles they acquired the habit of producing eggs with a water cushion inside the egg and so were able to reproduce their kind without resorting to water. The earliest reptiles mostly fed on other lesser animals or on insects. Later other forms of vegetation-feeding reptiles appeared, developing huge bulk, as in the dinosaurs. And, while most of them continued the land life, a few, like the crocodiles, went back to the water.

Now, however, was approaching another of the great turning points in evolution: the conquest of the air. The land had been invaded and conquered. It only remained to invade the air. Among the many kinds of animal were there any who could make the next tremendous venture and become at home in the air? Now that we see birds and insects flying about all round us it seems easy and natural enough. But what a venture it must have been at first! And what a venture it must be to-day for each young bird as its seemingly heartless mother pushes it out of the nest apparently to fall to destruction—to fall or fly! How exactly from some reptile crawling on the ground there developed birds flying in the air the fossils have not yet told us. Possibly some fast-running reptile in the open plains may have developed strong hind-legs enabling the creature to run at great speed, while the fore-

legs developed into flappers and sails which, gradually becoming feathered, enabled it to take the weight off the ground. Or, again, some reptiles might have taken to clambering in the trees, then jumping from branch to branch, and then gliding. The skeleton of the archæopteryx with its large primitive wings and tail suggests the latter alternative.

How insects came to fly is even less known. But it is believed that flap-like outgrowths enabled certain of them to parachute from branch to branch, and that these outgrowths gradually developed into wings.

And, as these first bold efforts to conquer the air were being made, an important development was *taking place.* Mammals were beginning to arise—at about 900 million years from the primordial germ. The distinguishing feature of the mammals is that, instead of laying eggs, like reptiles, they bring forth their young alive, and the females have special milk-producing glands wherefrom they are able to suckle their young. The first mammals were on the borderland between reptiles and mammals, and were small, insignificant creatures. Through all the last 100 millions to the present time these mammals have been rapidly developing. As is customary, there has been a branching off in many different directions, the main stem continuing from a small shrew-like animal—itself developed from a reptile—through some tree-climbing animal, to some primitive ape, and so on to tentative man, and finally to man himself. And, while the main stem thus

developed, branches were leading off to the horse and its relatives, to elephants, to tigers and others of the great cat tribe, to deer, antelope and such-like, to the pig tribe, and to apes and monkeys. Meanwhile, all the bird life had been developing with great rapidity; insects of endless variety had developed from the primitive flapping ancestor; fishes of great variety had been developing in the sea; and, finally, the whole great wealth of plant life, trees, and flowering plants had grown out of the seaweeds and algæ. And so we reach the climax of evolution up to date—the climax of the wondrous development of plant and animal from the single original primordial germ.

But, as the story closes, a significant point has to be noted, namely, the way in which, while on the whole there is a steady progression, different types rise, come to maturity, achieve a dominant position, and then dwindle away. There seems to be a rhythmic waxing and waning of species, of genera, and of phyla. The great movement of life proceeds rhythmically forward to some far-distant culmination, we may presume. But within the general process are these subsidiary rhythms—at one time sea-squirts rising to dominance and afterwards fading away to insignificance, at another time reptiles occupying the dominant position and then dwindling in importance as mammals appear upon the scene and take the leading place. And now within mammals man seems to show the same tendency.

From that intelligent little tree-shrew of early mammalian days going about on all fours must have

arisen some primitive species of long-tailed monkey from which various types of monkeys branched out. From that monkey would have arisen the apes, branching out on different sides to chimpanzees, gorillas, and orang-outangs. From one species of these apes would have developed the genus *homo*, branching out to Rhodesian man, to Heidelberg man, to Neanderthal man, but giving birth also to the species *homo sapiens*, which in its turn has given birth to Negro, Australian, Mongol, Alpine, Mediterranean, and Nordic races. Out of the several species of monkey one became the dominant and developed into an ape. Out of the several species of ape one became the dominant and developed into man. Out of the several species of man one became the dominant and developed into *homo sapiens*. But *homo sapiens* has existed only one million years, and there has not yet been time to decide which of its varieties will become a new species and become dominant.

And yet a remarkable circumstance is that, while the great families thus rise and fall, in their fall relics of them remain. There are creatures to-day as primitive as the primordial germ itself. There are sea-anemones, slugs, worms, scorpions, tentative fish, the lancelet, very lowly reptiles, amphibians, spiders, insects, plant life of every kind, birds, lemurs, monkeys, and among men themselves men of a very lowly type surviving alongside the most cultured.

Just as in the growth and development of a man, or of any other creature, from a single germ-cell there is repeated in brief the whole evolutionary

process, so at any one moment may be found actually living at that moment representatives of almost every stage of that development.

So, for the present, closes the great story of the development of all the life around us to-day from a single primordial germ which appeared about a thousand million years ago, and which was itself the product of still another thousand million years of evolution from a glowing ball of fire. Nowadays we take this astounding story as a matter of course, though seventy-four years ago, when Darwin first propounded the idea, it seemed so incredible that he was met with a storm of criticism. But what we have here to note is that the ultimate cause of the wondrous development has still to be traced. Only the fact of evolution has been established. Where, if we had been only physicists, we would have expected this earth by now to be nothing but a cinder we have found this amazing development of life. And it is how this all came about that has yet to be determined. We have yet to find what gave the impetus to this extraordinary development and directed its course. In describing the process we have noted that the terrestrial environment could not alone have caused it, that we must take into consideration the total environment, namely, the universe as a whole, and certain unknown factors in it which we call the x cosmic factors, if we are to discover the ultimate cause of the evolution. And into the nature of those x cosmic factors we shall enquire at a later stage.

CHAPTER III

THE BIRTH AND DEVELOPMENT OF MIND

To this planet as it was when it was drawn off from the sun we now return. We have seen how, through the working of invisible powers for a thousand million years, life in lowliest form came to it. And we have traced in bare outline how from the primordial germ of life all the varied life of to-day, including our own lives, has been developed. In like manner we will now see how mind appeared on this planet, and then trace its development from the first faint glimmerings up to the varied mental manifestations of to-day.

The only mind we can be absolutely sure of is our own. The existence of any other is a mere inference. From the manner in which other men, or other animals, act we infer that they possess minds more or less analogous to our own. But this is only an inference. We do not know it to be an absolute certainty. We have no positive proof of it. It is, however, a safe enough inference for all practical purposes. And we will proceed on the assumption that other beings besides ourselves have minds.

And by mind I mean the sum of our inner experiences—the whole system of knowing, feeling, and willing. I mean not intelligence alone, but intelligence with will and emotions gathered into

one. And in a human being mind would mean also the spiritual part of him : the soul as distinguished from the body, though the one may imply the other.

We can see about us almost as numerous varieties of mind as we can see varieties of living beings. We have at the top certain men whose burning emotions fire the intellect to the finest acuteness of perception and fuse the whole personality into one glowing inspiration with peculiar power both of repulsion and attraction. These are the men who get into closest touch with the inmost essence of things. They are the great spiritual leaders of mankind who by the spirit they have imparted have lifted their fellows on to a higher level of being. Then there are those of less fire of soul but of clear and powerful intellect, the great philosophers, like Plato and Aristotle, Descartes and Kant, and those men of glowing imagination and fine insight into the heart of things—the great poets, like Dante and Shakespeare. All these are on the topmost rung of being. But, besides them, even among men, what variety of mind there is! The heavy, slow-moving mind of the country yokel, and the nimble, supple mind of a Bengali student; the hard, practical mind of a modern business man, and the sensitive, appreciative mind of a French artist; the impulsive, child-like mind of the savage, and the highly disciplined and controlled mind of a President of the Royal Society. The variety of mind we meet among men is endless.

Just as varied is mind among animals. Besides the bird mind, and the animal mind in the more

restricted sense, and the insect mind, there is immense variety within each of these great divisions. The animal we know best, perhaps, is the dog, but even among dogs there are wide varieties of mind: the gentle, affectionate spaniel, the almost humanly intelligent poodle, the vivacious fox-terrier, and the heavy bulldog. And how different are alert hares and rabbits, dull-witted cows and pigs, and timid sheep, from one another! And among birds, what could be more different than the slow, "wise" owl and the quick little tits? Among insects the same variety is observable. Then we have sluggish-minded snails, and so on down the scale till we come to the lowest forms of one-celled animalculæ with only the dimmest glimmer of anything which might be called mind, but who yet do show slight indications of something that inanimate objects never display—a power of choice, for example, which we would not expect from a crystal, and which we have to associate with mind.

These are a few of the varieties of mind existing around us to-day. And as we examine them closely we may observe certain common characteristics. There is some degree of spontaneity in all living things. None can act exactly as it likes. All have to act within certain prescribed limits. But within those limits and conditions all display some amount of spontaneous activity. They are not forced to act in *one* way only, as is the wheel of a machine. Some small degree of freedom is allowed to the lowest. And being free (within limits) to act of themselves, a certain power of discrimination, discretion, selectiveness, and therefore of responsi-

bility is possessed by each. Each can choose for itself how it will act and will bear the responsibility—suffer or enjoy the consequences—of its action.

But no living thing liveth unto itself. Each is part of a whole—and of the whole universe. And each is influenced by and influences the whole—and the whole universe. No living thing can, therefore, be considered in and by itself, but always in its relationship with the whole to which it belongs. The reciprocal relation between a living thing and its environment has always to be considered. The living thing is unceasingly being impressed by its surroundings—never-endingly being bombarded with stimuli from the world outside it, for ever receiving influences from its environment—its environment being the whole cosmos. And it is receptive to these influences, stimuli, impressions. They do not rebound from it without making any effect upon it. It displays a receptivity to them. And, besides receiving them, it responds to them. There is response as well as receptivity. And besides responding, it discriminates between what it will respond to and what it will reject. There is discriminative response. And in this discrimination, or selection, we have an indication of mind. It is a characteristic of all living things.

And further there is a co-ordination of receptivity and response so that the living things act as a whole. Not only is there discrimination in the receipt of stimuli, but the response is made as a whole. This response will vary according to the degree of mind. It may be reflex, instinctive, or

intelligent. But it will be made by the living thing as a whole. And when there is discrimination in receptivity of stimuli and co-ordination in response, there is evidence of mind. And from the lowest animalcula up to the highest living being, there is evidence of such mentality.

Even in the amœba, we may detect the rudiments of mind. The story is told in Wells' "Science of Life." Its whole body is sensitively receptive to such stimuli as heat, strong light, chemicals, or food. And just as any part of it can be contracted or protruded, so any part of its surface can conduct impulses from a stimulated part to any other part. And this communication from part to part is the primitive type of co-ordination—just the first faint glimmering of mind.

Slightly higher in the scale of being is a little one-celled creature called the stentor, upon which experiments have been made by Professor Jennings. Carmine particles were suspended by him in the water in which the stentor was under observation. The flood of carmine grains was useless to it, and at first no reaction took place. Then, as the flood continued, the creature bent over on one side to avoid it. But the reaction not removing the stimuli, the creature beat its cilia (very fine waving rods) so that the carmine particles should not reach its mouth. Then, as the rain of carmine particles continued, the stentor contracted more or less violently. And, as this also proved ineffective, the stentor, finally, detached itself from its moorings, broke away, and swam off. He had tried four different

ways of escaping from the useless rain of carmine particles and found that flight was the only effective one.

Further was to follow. The stentor, after being subjected a few times to the experiment, soon ceased to go through the whole four responses. Instead, almost as soon as the carmine stimulus began to act, it responded in the fourth way : it detached itself and swam away. This was a new departure which indicated memory and the profiting by experience. The little creature had discovered for itself the best way of relieving itself of the nuisance of falling carmine particles. And having found the way it had remembered it. Then from remembering the way of escape it had come to form the habit of escaping. So here we see the genesis of what in higher animals is called the intelligence. Even among these lowly one-celled animalculæ we see evidence of such mental qualities as memory, profiting by experience, and habit. The internal state of these stentors was such that they could choose among different courses of action in response to the stimuli, and could show purpose in the choice made. There were distinct signs of the operation of mind.

To account for the appearance of these signs we shall have to look, neither to the internal state of the stentor alone, nor alone to the external influences operating on it, but to the interaction between them. And into that matter we shall have to enquire later. All that we need note, at present, is that physical and chemical activities, by themselves, could not have produced even the incipient mind of the stentor. In that whole, the cosmos, of

which the stentor was part, and with which it was incessantly interacting, must have been some factor, or factors—what for our present purpose we call the *x* cosmic factors—capable of instilling into these primitive living things the disposition to respond in this mental fashion to external influences. Again, to quote Sir Arthur Thomson, "deeply penetrating influences" from the cosmos must have "saturated through" the tiny organism to the core of its being and stirred in it the desire to accommodate itself to its surroundings.

A stage higher than the stentor we come to the jelly-fish. It is a transparent, jelly-like bell, composed not of one cell but of many cells. Round the margin of this bell are certain sense-organs, one of which gives a primitive sense of balance, another of which serves as a primitive eye, while others are sensitive to chemical stimulation; and so on. Then there is a very simple nervous system—a diffuse lacework of nerve-fibres pervading the whole bell rather than definite tracts or nerves, but with a denser ring of nerve-fibres round the rim faintly suggesting a brain. Thus it has better means than the stentor of receiving stimuli from the outside world and better means of responding to them. Some of the cells are specialized for the detection of stimuli, some for muscle-fibres, some as nerve-cells for the rapid conduction of messages from part to part. The nervous system may be primitive, yet it does ensure that the jelly-fish is able to act as a whole.

As creatures develop the rate of transmission of messages increases in rapidity and a central

nervous system is formed where the information from the different sense-organs is collected, from whence co-ordinated impulses are sent to the different organs designed for carrying them into effect.

Worms are at this higher stage. They move with one end always first, and not, like a jelly-fish, with just any part of its body in the direction of movement. A head is thus formed with its special sense-organs, and with a primitive form of brain sending off two main trunks, one down each side of the body. And it is found by experiment that even a worm has rudimentary intelligence and can learn by experience—can unlearn its lesson and master a new one.

Living creatures then developed a readiness to respond to many sorts of stimuli, says Goodrich in his "Living Organisms," and a power of storing up the impression of past responses so as to benefit by experience. In course of time, a system of behaviour was built up of such a kind that the character of the final response to the initial stimulus depended on the number and quality of the responses previously called forth. Then with the development of elaborate discriminating sense-organs for receiving the stimuli, with a complex nervous system for conducting the impression to a centre, there co-ordinating them, and then, in response, sending out impulses to the organs which would carry them into effect, this power of storing up the impressions of past responses and of profiting by experience was greatly improved.

And from this point the development of mind

branched off in two main directions—the one of instinct, the other of intelligence.

When the responses to stimuli of the same nature are fixed in a definite direction, instincts come to be formed, and to be inherited. So, eventually, creatures are born with them, though it may be only in later life, as a result of the work of the creature's own constitution, that they may develop. They have been described as congenial behaviour, and are usually the result of the interaction between the inborn structure of the nervous system and stimuli from the environment. Just as when we put a penny in the machine a ticket from Charing Cross to Westminster comes out, so, when a particular stimulus is applied, a series of interlocking responses which must succeed each other in such an order as to reach a predetermined end are formed. So, wonderful as are the instincts when highly developed in bees and ants, there is that in them which savours of the automaton—something rigid and unadaptable. And that is why the naturalist Hudson speaks of the amazing stupidity alongside the seemingly astounding intelligence of ants.

Intelligence, on the other hand, is ready to learn and profit by experience, and to modify and supplement habits so as to adapt them more perfectly to changing environment. While a highly complex inherited instinct may lead a creature to deal in a fixed conventional way with a changing situation, intelligence, profiting by experience, will lead the creature to adapt itself more readily to the situation

as it presents itself at the moment. Intelligence will be distinguished by memory and learning.

Such are the main characteristics of the two branches, instinct and intelligence.

Of instinct we have many familiar examples. The young spider, without ever being taught, spins a perfect web. The caterpillar weaves about itself an intricate cocoon before it turns into a chrysalis. The bees build honeycombs for their honey. These are noticeable enough; but perhaps the most remarkable instance of an instinct at work is the classical case of the solitary wasp. The adults live upon fruits or the nectar of flowers: but the grubs are carnivorous. Consequently, caterpillars or some such food have to be supplied for them. So the impregnated female wasp first burrows a hole in the ground, then searches round for a caterpillar, and having found one proceeds to sting it in its nerve-centres in such a deft manner as not to kill it outright but only to paralyze it. Thus paralyzed, so that it may live on and not decay, it is carried by the wasp to the burrow, and there the wasp lays an egg on it, or beside it, and seals up the burrow. She has thus made provision—and of a kind she does not feed on herself—for progeny she will never see. Her life is not lived wholly on automatic lines, for she seems to have some capacity for memorizing where she has dug the burrow. But the main operation is of a blind, unreasoning character. And it is along this line of automatic instinct that the whole great insect life developed.

The same method of acting by instinct, rather than by intelligent reflection and reasoning, is

carried into the social life of the higher insects, the ants, bees, and wasps. Ants or bees or wasps work together in communities. The parents look after their offspring, and the young help their parents. Ant communities are the most highly developed, and among them the different types of members each has his own particular part to play. Males have the instinct for nothing but fertilizing the queens. The queens have only an instinct for laying eggs. Workers instinctively build the nest, collect food, and tend the young. The soldiers' instinct is only for defending the colony. The different functions are most rigorously apportioned. But males, queens, workers, soldiers each emerge fully equipped with its own instinct and the structure requisite for carrying it into effect. All is carried out with perfect precision, though the actions have never been learnt. The defect is that there is no flexibility of action. All is rigid and automatic. As a result, there is no progress. Ants, bees, and wasps are probably now no more advanced than they were when man made his first appearance.

While mind developed in the direction of instinct on the branch of the insects, it evolved in the direction of intelligence on the main stem leading to the mammals and man.

Fishes have sense-organs putting them more in touch with the world about them than the jelly-fishes can possibly be. They have eyes, they have a vague sense of smell and taste, and, of course, of touch, pressure, pain, and so on. But at the best these organs put them in contact with a very small world. Light does not penetrate far through water,

so they can see only a few yards. Sound travels badly in water, so they can hear only noises near at hand. And they can only smell at a short distance. As a consequence of these drawbacks fishes are not intelligent and learn but slowly.

With amphibians we have a slight advance. Part of their life they spend in a lighter medium than water. Light penetrates through air much more deeply and sound carries on it much more readily. Amphibians, therefore, see better and hear better. Also they are able to voice their feelings: frogs, for instance, can croak.

As life on land increased and multiplied and varied, as competition intensified, as the interdependence of various types of animals upon one another increased, as animals of all kinds moved more freely, ran, and leaped on the ground, climbed into the trees, flew in the air, their wits were sharpened, their eyes, ears, and other sense-organs developed to meet the requirements of the mind; and, with improved sense-organs and improved internal structure, including the nervous system and the brain, intelligence, as distinguished from instinct, rapidly developed.

On the line from reptiles along which birds were evolved intelligence did not develop to nearly so high a pitch as it did along the line from reptiles which led to mammals and man. Birds do not learn by experience so readily as even such mammals as rats. In dealing with new situations they display only a limited amount of intelligence. They are highly emotional, and they are bundles of the most complicated instincts, but in capacity for putting

two and two together they are far below the higher mammals. It is the line of the mammals, therefore, that we must follow to reach the highest development of mind.

And when we observe the activities of mammals, as distinct from the lower vertebrates from which they were derived, we note that they are more adaptable to their changing environment and better able to cope with new situations. As they spread over the vast land spaces of this earth, and as the surroundings with which they had to accommodate themselves came to include an increasing number and variety of living organisms—both plant and animal—they were continually being forced to exercise their intelligence in confronting fresh circumstances. The more intelligent came to the fore. The forced use of their intelligence brought about an expansion of their brain. And the expansion and increased intricacy of structure of the brain rendered higher intelligence possible. So it came about that they were able to remember more accurately, to learn more rapidly, and to deal more effectively with novel situations.

Not yet, perhaps, would they reason. It would be more by a process of trial and error that they would proceed. They would push out in this direction and that, grope here and there, till they found the right way. But they would be acting of their own accord, and would remember which way had been useless or harmful and which had brought them good; and remembering, they would in future avoid the bad and adopt the good. So would habits be formed which might or might not be to their

advantage according as they did or did not allow themselves to become their slaves.

The next advance was made when the higher mammals began to use their own mental capacities —when they stopped to think—instead of using only this rough and ready method of meeting a situation by trial and error. When they tried out a new idea—such as using a stick to knock down fruit—and saw how it worked in practice, they were much more competent to face changes in their surroundings. And through interaction between themselves and the rapidly increasing intricacy of their surroundings, the faculty of memory and of associating ideas continually developed. Higher mammals, like dogs, horses, and elephants, exhibit examples of both these faculties, which it is hardly necessary to mention. How a horse will remember his groom and his master, and will associate the trumpet call for feeding with the arrival of his feed, every cavalry officer knows. Not many of us are habitually in the company of elephants, but we have all heard stories—and they are true—of the long memories of elephants, and of their associating the idea of friendship with one man, and of enmity with another. All such animals have risen a stage above pure stereotyped habit. They have their automatically-executed habits just as we have. But, in addition, they have power of memory and capacity for associating ideas.

The family and community life of the higher mammals is also a great incentive to development of intelligence. In many instances the parents would deliberately teach their young, and in any

case the young would have the opportunity of profiting by the experience of their elders.

And when we come to monkeys and apes a great stride has been made. Not yet has language been invented, though they can express their feelings—as distinct from describing objects—in a great variety of sounds. They cannot say anything about an object; but they can express their hunger, their affection, their anger, their surprise, their satisfaction, and so on. They are full of curiosity and fond of adventure, and eagerly explore their surroundings. They enjoy doing things with their hands, pulling off branches and using them. Above all, they imitate: and imitation practises them in learning.

The highest apes, like the chimpanzee, possess a certain degree of intelligent insight. And Wells quotes the case of one which taught itself to obtain bananas hanging from a roof by placing one packing case on the top of another to climb on to, and then using a pole to beat the fruit down. It thus showed a considerable advance on the blind groping method of proceeding by trial and error. It displayed insight into the situation.

This is as high as animals reach in the development of mind till we come to man; and then a great step forward is made. Perhaps, in the highest mammals, there may have been a dim awareness of themselves and a dim striving after definite ends. There may have been faint foreshadowing of self-consciousness. But it was not till the arrival of man that there was full and real self-consciousness. In

him culminated all the possibilities which lay in animals lower down the scale. Here, at last, was a being who was aware of himself as an individual—as connected and interrelated with all other living beings, it is true, yet with a distinctive individuality of his own, able to think and feel and strive, and assuming that other men did the same.

And though in this chapter we have been restricting our attention more particularly to the mind, we must here recall that mind and body go together in a relationship more intimate even than interaction—that as the mind developed, so likewise did the body and more particularly the brain, and that as the brain developed, the mind was the better able to exercise its faculties to their full. As Broad says, mind acts on body in volition, and body acts on mind in sensation; and if their relationship is not described as one of interaction, it is mainly because that word does not express adequately the intimate character of the relation. The mind does not generate the brain, nor the brain the mind. Each implies the other. And a conscious being is a body and mind in one.

Such was man. And with him came not only power of thought but power of language. Monkeys and apes could voice their feelings, man could speak his thoughts, describe objects, communicate his ideas. And with increased power of association and of analysis he could grasp larger situations, decide between alternative courses, and take swift action.

And with the development of mind in men, the environment of which the mind is conscious has

enormously expanded. The tiny amœba has the tiniest world—a few inches in diameter so far as it is aware. But man is aware of an environment embracing the whole universe, and aware, also, that he is inseparable from it and in unceasing interaction with it.

From this cosmic environment he receives stimuli, and he responds to them. He receives and he gives. He is stirred and he stirs. There is perpetual reciprocity. But he has that in him which discriminates between which of the endless stimuli that rain in upon him he shall respond to and which he shall ignore, or reject. There is a sensitive and discriminating responsiveness to these cosmic stimuli. As a result the specifically receptive organs, like the eye and the ear, which receive these impressions from the cosmic environment, the conductive nervous system which transmits the impressions to the co-ordinating centre in the brain and afterwards carries the directions to the responsive muscle or gland, are all exceedingly highly developed. And on the mental side all comes under the control of one dominant impulse, many and varied tendencies being organized in the service of one ideal end, memory of a far past being combined with anticipation of a still further future, and will, thought, and feeling being fused in one single effort.

This is a far cry from the simple response to the simple stimulus in the amœba. But we have been able to see how step by step the mind of man has developed from his far-back primitive ancestors. In tracing those successive stages I have merely re-

capitulated in brief what is set out in full and with ample illustration in many scientific works. But I trouble my readers with this brief summary because I want to stress the point that mind did not—as was supposed not so very long ago—make a sudden entrance into living things. It is probably co-existent with life itself. Whenever and wherever there is life, then and there also is mind. When life appeared, mind appeared. As life developed mind developed.

But now at the close of the story of mind's development I would draw special attention to a very noticeable feature just coming into view which is likely to prove of salient importance in the future. We have seen how in the evolution of mind one line branches off in the direction of instinct and culminated in the insect, while the main line continued on in the direction of intelligence and culminated in man. But man is only a million years old, and in the very infancy of his development. And already in the core of the central line there may be faintly detected indications of the direction along which future development will take place.

Instinct has the advantage of going straight to the point. The solitary wasp has not to think out with solemn deliberation what will be the best kind of food for her offspring. Instinct tells her straight-away that a caterpillar is the most appropriate diet. She therefore wastes no time. She at once seeks a caterpillar. And having found it, she does not weary herself by going laboriously through the trial and error process of finding out the exact place in

which to sting it to ensure that it should only be paralyzed, and not killed outright: she stings it straight on the nerve-cords so that it is rendered harmless but kept alive so as to be good food for her offspring. This directness is the advantage of instinct. It saves endless time and labour. Its disadvantage is its rigidity. Confronted with a new situation it is unable to cope with it. It is unadaptive. And unadaptability in a world which is ever changing is the gravest disadvantage.

Is there a possibility of combining the directness of instinct with the adaptability of intelligence? It appears that there is. The human mind seems to be feeling its way in the direction of such a combination. Certain men are endowed with what is variously called sympathetic imagination, poetic or intellectual imagination, the capacity for being able to put themselves inside others, or inside different situations, penetrative insight, vision, the ability to divine rather than to discover, the faculty of piercing into the heart of things. Such persons are exquisitely susceptible to impressions and passionately responsive to them. In a word, they display intuition. Just as even in instinct there is a strain of intelligence, so also in intelligence is there a strain of intuition. And we may expect that it will be upon intuition that men will more and more rely for dealing with the ever-varying situations of the future.

This may seem to be a risky procedure, for intuition is regarded by some philosophers with suspicion as being too primitive and too much founded on emotion. Fancy and whims may be mistaken

for intuition. But reasoning also has its dangers. Anyone who has listened to debates in Parliament, or to counsel in a law-court, or to philosophers discussing a philosophical paper knows how readily arguments may be found to justify any point of view and how fatally easy it is to argue round in a circle. Wisdom would seem to lie in keeping intelligence and intuition together. Intuition would never supplant intelligence. Intelligence would always be needed to sift, test, and prove the intimations given by intuition. But intuition will divine and illuminate the way. And intuition with its surety of conviction will always be needed to keep reasoning to the point and steadily orientated on a definite line.

It is intuition, with its inward spiritual energy, its ardency and fervour, that has shown us the beauty in the world about us. Coldly reasoning intelligence alone would have remained blind to beauty. It was through intuition that the poet in every man saw the beauty. By exercising the intuitive faculty with which he is endowed man was able to put himself inside the flower or the scene, to penetrate to its essential being and so perceive a quality which mere intelligence could never have shown him. He was able to feel in touch with the deep life of the object, and from his association with it sprang the beauty which he perceived. And the joy he had in that beauty he owes to intuition.

Intuition also has pointed the way to the solution of great world problems. It is said of Faraday that he "smelt" the truth. Clerk Maxwell, who, in Einstein's words, "changed the axiomatic basis of

scientific thought," had the power of intuition in a marked degree. He has been described as possessing that "mysterious, indefinable sense called the sense of physical reality." And Sullivan says that it was "this extraordinary intuition combined with philosophic breadth that made his achievement possible." Darwin used his intelligence in observing the marvellously varied animal and plant life of the world and in furnishing an array of arguments to establish his theory to account for the development of all this life from a single primordial germ; but it was by intuition that Darwin arrived at his theory of natural selection. On reading Malthus on population he saw in a flash of intuition the solution of the problem which had vexed him—more were born than could possibly survive, and those who varied in a favourable direction were naturally selected for survival. His subsequent work lay in establishing by his intelligence what he had first learned by his intuition.

In everyday life we come across similar examples. We know of some men who in contemplating a situation with a view to action see various lines which may be taken, who elaborately weigh the pros and cons for each, who nicely balance them against one another, who then decide to their own satisfaction on which side the scales have tipped, and who then take action accordingly. We know of other men who can rapidly size up a situation, intuitively see the right line to take, and instantly take it. These latter may not themselves be able to furnish particularly good reasons for their decision, though amply adequate reasons may be available. But

when the responsibility is on them, they will show their faith in the rightness of their intuition by unhesitatingly acting on it. It is, indeed, often under the hard pressure of responsibility that such intuitions come.

And what responsibility can do to quicken intuition is well shown in the case of the nursery. Nowhere perhaps—except in the hospital—is responsibility more direct and the consequences of action more immediately evident. And no one shows intuition in dealing with sudden situations more clearly than a really good nurse. She has no time for lengthy procedure by trial and error, nor even for reflection and carefully considered judgment with the ponderous weighing of arguments for and against. Action has to be instantaneous or the damage may be done. Only swift intuition will suffice. So, by a process of human selection, nurses who are fortunate enough to possess the quality of sympathetic imagination well developed and who are capable of entering into the lives and feelings of their little charges are put in charge of children. Exercise then develops the intuitive faculty. They become capable of rapidly seizing a nursery situation, and intuition tells them, on the instant, how it should be tackled.

In the conduct of world affairs, as in managing a nursery, the same faculty of intuition is most evidently needed, and being needed will eventually be acquired. Highly complex international situations face the statesmen of all countries to-day. The world situation seems to us especially grave. Yet there is no reason for supposing that there will ever

be a time when the world situation will not be grave. And in the future, as now, situations will be incessantly arising which urgently press for immediate settlement. Intelligence will, of course, be necessary for dealing with them, and hard, clear, cold reasoning. But far more than that will be required. The situations will imperiously demand fine insight, clear vision, vivid imagination—all that is comprised in what we call intuition. World statesmen will need quick intuition. And once they have that, intelligence will supply them with any number of the amplest reasons for justifying the course which intuition has first promoted.

Intuition we may take, then, as an indication of the line along which mind will develop in future.

But again we must insist that from the primordial germ alone there never could have developed minds with intelligence and intuition. The primordial germ by and of itself could not have produced such a marvel as a man of intuition. It was only through the unceasing interaction of the primordial germ with both its terrestrial and its cosmic environment that such a result was possible. And, as in the case of the development of life, so also in the case of the development of mind, we shall subsequently have to enquire what was the nature of the x cosmic factors in the cosmic environment which enabled this astonishing development to come about.

CHAPTER IV

THE BIRTH AND DEVELOPMENT OF CREATIVE LOVE

CREATIVE love, as the activity to which each of us owes his very existence, and as, possibly, the mainspring of the universe, is obviously a subject demanding the closest attention. The genesis and development of so universal an activity should receive a deeper consideration than has yet been accorded to it. In its human manifestations it does, indeed, receive marked attention from poets, dramatists, novelists, and, now, film producers. But in its universality—in the way in which we share it with all living creatures from the lowliest animalculæ upwards—it is seldom noticed. As the great driving force at the foundation of all life, and maybe as the dynamic, unifying activity at the foundation of the universe, it is hardly recognized. Too often it is shunned as something essentially shameful, to be hidden away, not mentioned, put out of mind. Too often, also, it is made fun of as having in it something ridiculous. Many regard it as a temporary lapse from ordinary sanity and not to be taken on a level with high intellectual pursuits or with the conduct of great state or business affairs. And it is doubtful if even the poets yet see the sublimity of living to which it points in the future. We have good reason, then, for dwelling particu-

larly on this fundamental activity of all life as we proceed with our enquiry into the final direction of things. For our conclusions on the nature and working of so universal an activity may have an important bearing upon the opinions we may subsequently form in regard to the character and destiny of the universe.

When we reflect that the ultimate units of which all organisms, living or non-living, are made up, namely, the electrons and protons, have their potent attractions and repulsions we are not surprised to learn that even in the one-celled animalculæ there is evidence of that attractive power which in its higher development we call love. Thus we hear of these microscopic creatures meeting, coming together in pairs, and then completely and wholeheartedly uniting so that they do, literally, become one. They melt and merge into one another and become a single individual. At a higher stage, among the many-celled creatures, such as the ciliates, two individuals come to lie side by side, and then exchange portions of their nuclei. In this case the whole organisms of the two are not united in one. Nevertheless, the essential portions of each are thus merged. And their procedure is developed in greater particularity in higher organisms where from the main organism reproductive, or "marrying," cells are formed which, uniting in one, constitute a new individual.

So we come on to creatures who show the first signs of courtship. Wells and Huxley tell of male fiddler-crabs who in the mating season when a female crab appears stand tiptoe in her path with

their single huge claw held aloft, and in this way cause excitation in the female. Then we are told of male spiders who send a message of love along the web by vibrating its strands. Fabre tells how scorpions perform a sort of set-to-partners of courting male and female. Grasshoppers and crickets are brought together by the instrumental music of leg on leg, or wing-case on wing-case. Fire-flies flash light and glow-worms glow to attract their mates. Stickleback males become a rich iridescent red as they court. A frog does not court but tightly clasps the female till she lays her eggs, when he ejects his sperm upon them. Newts in order to rouse the female to play her part develop a magnificent nuptial dress and perform a courtship dance in which with arched back they prance in front of the female. Snakes assemble in writhing, intertwined masses in the spring apparently for the purpose of choosing mates. Deer, wild sheep, and other animals fight for the possession of females, who passively await the result of the combat.

These are various examples taken from works on natural history to show how males and females of the most varied kinds of animal life are attracted to one another under the mighty impulse of creative love. But it is in birds that the development of courtship in animal life below man may be seen at its completest. Birds have highly emotional and deeply impressionable natures, and have power to express their emotions with peculiar vivacity in song, in gesture, and in flight. What they are inwardly feeling at the moment is outwardly manifested with such unmistakable effect

that we are able to read with the utmost precision what is going on within them. They do not hide their feelings. They express them with so unrestrained an art that none can fail to see and understand them—that is if he has patience to watch them and take note.

One who thus patiently watched them is Mr. Howard; and the record of his observations of the bunting in his book "Bird Behaviour" is invaluable as giving us an insight into the workings of creative love not only in the bunting but in birds in general, and not only in birds but, through them, in animal life in general. We shall even see in the manifestations of creative love in the bunting a kinship with its manifestations in human beings.

From Howard's description, augmenting our own more casual observation of birds, we can realize the intense liveliness of these little buntings, their quick and vivid responsiveness, and their no less vivid expressiveness. If one is angry there is no mistake about it: he darts fiercely at the object of his hatred. If he is in a loving mood his feelings are equally apparent: he pours out his heart in song, he displays all his charms, and makes gestures quite evidently of the most ardent love.

From these manifestations of his deepest feeling we can trace the whole course of that creative love which runs in him. We can see that he must be made up of the most amazing network of the delicatest inherited instincts, and the internal state of the bird must be such that these varied instincts are linked together and subtly interrelated with one

another to form a whole. Though one is neither more nor less important than the other. Each has its place. Each reinforces the other. And each comes into prominence at the appointed time.

In winter male and female are indifferent to each other. But if winter comes they know by instinct that spring is not far behind, and before it actually arrives the male sets about establishing a "territory." He settles on a branch and commences to call, and within certain boundaries round his position he will allow no other male bunting to intrude. If one does so intrude he is hastily ejected. The males indeed fight furiously on the slightest provocation. By his call he makes known to all hen buntings that he is there, ready and willing to receive. As the days lengthen and grow warmer, and as the creative love arises within him, his call becomes a song. And as his ardour rises his song increases in complexity and its tone grows in purity.

At this stage a hen appears within the confines of his territory. If she is followed by a cock admirer, that admirer is vehemently assailed and driven forth. But the hen, also, has her say. If she elicits from the cock what she considers to be adequate intensity of feeling towards her she remains, but if the cock should happen to be "off colour" at the time of her appearance, to be tired, or flagging in his ardour, and not very fervently disposed towards her she departs. Or perhaps the cock, though not particularly ardent on her arrival, may have his feeling so aroused by her presence that he may utter his song with more and more perseverance,

and be stirred to the utmost exertion to attract her. Then the mating begins in earnest. Together they turn and twist with amazing rapidity, both enjoying the thrill of the moment. But in the end she gladly succumbs. At last there has come a perfect synchronization of the complex of internal states in herself with the internal states in him, and of both with the complex external conditions. The culminating moment of the whole long interplay of inherited instincts, of inward excitation, of countless stimuli from outside, and of selected response, has arrived, the consummation of the whole process is reached, and union takes place.

This union is not the actual melting of the whole body of the one into the whole body of the other, as in those very lowly one-celled animalculæ of which we have spoken. Nevertheless, the germ-cell which is a true microcosm of the one does thus merge itself into the germ-cell which is a microcosm of the other, and become one. And from that moment onwards that single cell grows and develops with exceeding speed, finally developing into the likeness of the pair, and eventually displaying all the very same instincts which they had themselves manifested.

And besides this entire merging of the respective germ-cells of each in one there is what may almost be called a "spiritual" union of the two. They become, says Howard, one organism. There are not two sexes, but one. All the delicate and tentative approaches to one another, all the pushings forward and drawings back, all the alternating hopes and doubts, are now over. They are interlocked as

one creature, held together by creative love. What the one needs the other supplies. Each has made the other be himself or herself to the full of his or her constitution. Each has been satisfied to the utmost by its mate. The spiritual union, so far as birds are capable of spirituality, is complete.

The joint life together now begins and the inherited instincts of each are seen to dovetail into one another, in the nest-building, the egg-laying, the food-fetching, the egg-brooding, the feeding and care of the young, and finally the launching of the offspring upon the world. In all these activities the pair act as one—the cock not leaving the hen to fend for herself, but fetching food while she broods the eggs and tends the young.

And in this tending of the young we see a development of central importance. From out of the core of creative love has evolved that prophetic activity, maternal love, which we shall presently find may be not only symbolical of but actually be the very power that drives the world. This bending-over, forward-reaching activity, so readily observable in bird life, is typical of all the higher animals, and as we can see it coming to fuller and fuller maturity in man we may take it as indicative of the direction in which the great main line of evolution is working. For that reason all the descriptions of it by those devoted naturalists who so patiently watch the ways of birds, and all those observations which we can ourselves make of those homely birds about us, the thrushes, the blackbirds, the robins, the chaffinches, and even the sparrows, are so very valuable. They enable us to see how this inner urge

has prompted the hen first to build the nest for the eggs and consequently the chicks which must be coming (though she hardly "knows" that they are); then to brood over the eggs so that they may hatch out; and then, with the aid of her mate, to feed them. In all this there is a clearly anticipatory activity—an instinct providing for the future. And afterwards, in the way in which a mother bird will defend her young, will stay crouching over them to hide them, or else dart angrily out in attack, but, in either case, readily risking her own life for her offspring, we can see that most beautiful trait of maternal self-sacrifice highly developed. The mother bird has not only shown this capacity for living with her mate in a real spiritual union so that they form one creature, but she has shown her readiness to sacrifice even her life for her offspring.

And this forward-reaching self-sacrificing maternal love is common not only among birds: it may be found among many of the higher mammals. We all know, for instance, how dogs and cats will take care of their little ones and the fury with which they will attack the intruder.

There are instances of callousness, coldness, cruelty among individuals, and even among species. But these are exceptions among higher mammals. Clearly, they are not indicative of the great main sweep of evolution. Creative love is quite obviously developing in the direction of forward-looking and self-sacrificing motherly love.

These examples, taken at random from the varied

animal life, will show the universality of creative love and so the kinship of the animals with ourselves in the manifestation of this common creative activity. We see there the same delicacy, yet strength and persistence of approach, the same alternating ardour and indifference, the same discrimination in choice, and the same irrevocability in the choice once it is made, that we know in human life. And we also see the beginning of that forward-reaching maternal love which is so characteristic of human mothers. We share creative love with all living things. From it we are all derived. And by it we are all bound together.

Now we have to examine its more particular working among ourselves. And with man creative love enters on a new phase. Not the two individuals only but the whole community to which they belong become interested in the relationship between them arising from the working of creative love. Further, and most important of all, both the pair and the community come to regard the union as something sacred.

In some primitive communities of men a certain promiscuity is allowed, and the community interests itself but little in the approach to each other and union of individual men and women. In the highest civilization, too, individual men and women do form unions without the approval of the community. But, in general, from almost the earliest communities of men, and in almost every community to-day, the community has looked upon the matrimonial affairs of the individual men and women who compose it as the concern of the whole community.

And the reason is obvious. The union normally leads to an addition of one or more members to the community. What may add to their membership necessarily, therefore, concerns the community. Consequently, the community lays down conditions under which union may take place and forbids union under certain other conditions.

And, besides the community as a whole, the family to which the man and woman respectively belong also interest themselves in the possibility of a union between them. An animal family—even a bird family—has no concern with the matrimonial affairs of its offspring. But a human family has; for the union of a man and woman means an increased degree of intimacy between the families of each. It is some concern, then, of the family, as well as of the individual. Also fatherly and motherly, brotherly and sisterly interest in the man or the woman is deeply anxious that no harmful union should be made. It is agony to a parent if he or she thinks that his or her son or daughter is entering upon an undesirable union, even if the formal sanction of the community has been obtained. Then there is the economic factor which also counts with the parents. Their care and interest in the material welfare of their children stretches much further over them than does the interest of animal parents over their offspring. And they are deeply concerned that their son or daughter shall not marry before the pair can afford to keep a home. For these and other reasons the community, and especially the families of the pair, are interested in the union to a degree not known among animals.

Also the happiness of the pair is of real interest to the community. Perhaps birds may share the happiness of a mating pair of birds. Certainly, in human beings there is an astonishing interest taken by the community in general, and, of course, by their families in particular, in the courtship of a man and woman. No subject is more often dealt with in plays and novels; and no subject—except perhaps a murder—attracts more attention in the Press. To such an extent is this carried that it is thought necessary to drag a "love interest" into cinema films at almost any artistic cost. The engagement and wedding of the son, or more particularly the daughter, of any of the leaders of a community, such as Kings or Presidents, arouses interest beyond everything else. And it is noticeable that in all cases there is an intense longing for the happiness of the pair—especially of the bride. Perfect strangers yearn that she and he may be happy. That is the supreme desire. For even the humblest wedding a small crowd will collect. And for the wedding of a well-known bride, vast throngs will assemble, and not only from curiosity to see the bride, but in some measure to share her happiness, and to add to it by their cheers.

And the bride herself, brimming with happiness and surrounded by those who are there wishing her happiness, radiates happiness all round her. She has dedicated herself to the one, yet so happy is she that she would embrace all, as all would wish to embrace her. She is at the very top of her being. The supreme moment of her life is at hand. She decks herself out in loveliest array that she may

present herself at her best. To add to her happiness presents are sent her by each one of her friends. The choicest flowers decorate the scene of the wedding. Her friends assemble in their most ceremonial attire. All is made to contribute to both the importance and the happiness of the occasion.

More noteworthy still is it that the solemnity of the occasion is recognized—and recognized by the followers of every religion. There is a certain number of persons in all communities who regard marriage in a matter-of-fact way, as a commonplace affair, and no more worthy of special reverence than a great friendship. But to the generality in all countries there is something especially solemn, as well as happy, in a wedding. Laugh as people may at some of the episodes in the process of love-making, always a hush comes over an audience when lovers in a play finally embrace. In the presence of a manifestation of true creative love they feel awed to silence. And this sense of its sanctity becomes still more evident on the actual occasion of the marriage ceremony. The majority of people in all countries—except for the present moment in Soviet Russia—have a strong innate desire to have their union solemnized in some special manner. They like to be married by a priest. Possibly they may not have been regular in their attendance at church, or temple, or mosque; and they may not be very orthodox Christians, Hindus, or Moslems. But on this supreme moment in their lives they feel a vague, yet very pressing, need for divine sanction and divine blessing. They are feeling raised above their ordinary selves and for the time dwelling in a

realm beyond the world of everyday life. And they want to be kept in touch with what will sustain them and keep them there. They feel themselves in the grip of some mysterious power which is at the same time within and yet above and far greater than they. They grope towards this power. They know not quite how to draw it down upon them. So they come before a minister of religion that he may better express their feelings for them.

Among the followers of all religions this is the same. And in the beautiful symbolism and glorious phrasings used in the marriage ceremonies of every religion there is evident this same feeling after the great creative Power of the world if haply they may find it, and this same beseeching for blessings on the heads of the wedded pair. It is quite easy to scoff at some of the expressions used in these ancient forms which have served for so many centuries. It is quite easy to find flaws in some of the ideas contained in them. Nevertheless, it is the fact that these age-old forms and ceremonies and their beautiful wording do serve to express, in some measure, that feeling men have that the creative love which is now so manifest in the bridal pair derives itself from whatever Power it may be which governs the universe. They feel, too, that their future happiness does depend in some mysterious way upon the intimacy of their relationship with it. And this is a great deal more than the survival of a superstition carried forward from more primitive times. Rather is it an indication of a sentiment at the very core of life itself which is now only beginning to find its adequate expression. It is not a harmful relic of

the past: it is a happy adumbration of a more enlightened future.

Lastly, we come to the final outcome of creative love, namely, maternal love. Nothing more nobly pure than a mother with her first-born can anywhere be seen. None knows better than she at what cost a man is brought into the world. None is more conscious than she how dependent woman is on the power of creative love working within her. And none is more anxious to invoke every power there may be for the welfare and happiness of her child. Careless and callous some mothers may be. And foolish still more. But the whole development of mankind is in the direction of that type of mother, far commoner than the careless, who would sacrifice all and even life for the good of her child, and who would do more—who would work year after year, forgoing even necessaries for herself, that he might have every advantage and attain still higher in life than she herself or her husband. And my own cannot be the only mother who with all her soul has yearned, and prayed, and worked, and striven, for her children far beyond their childhood days—right into their full-grown manhood and womanhood that they may grow up, and ever remain, lovely in their lives and wholly acceptable in the eyes of their Creator. For the spiritual welfare of their children in the full maturity of their lives mothers especially crave. Mothers in every land, and of every form of religion, have in their hearts high spiritual ideals which they pray their children may realize. And they will go to temple, church, and mosque to

beseech for divine help in bringing up their children in the way the highest may require.

Most spiritual mothers the world can show—in India and China just as well as in Europe and America; and in India, perhaps, more than anywhere else. And the noble, self-sacrificing, forward-aiming love which they display is the latest and fullest development of the creative love whose beginning we dimly saw in those original forms from which all life has sprung.

How so noble a love could have developed from so lowly an origin we shall have later to enquire. At this point, as before, we have only to note the fact that it has so developed. Though here again we have to mark that it was in the interaction with their environment of successive forms through a thousand million years, and through countless generations, that the development took place, that that environment must be taken as inclusive of the universe in its entirety, and that, if such a marvellous development has thus taken place, we shall have to look to some unknown cosmic factors in the environment to account for it. The examination of those x cosmic factors we will undertake in a subsequent chapter; though before we come to that we have yet to note the crowning achievement of the whole evolutionary process on this planet.

CHAPTER V

THE BIRTH AND DEVELOPMENT OF WORLD-LOVE

ALL of us are born of a creative love which, as we have seen in the last chapter, has its roots deep down in the beginning of life itself. All men inherit, therefore, a disposition to love.

The normal man in his normal state is disposed to love. It is his natural inclination to throw out tentacles in search of some object on which he can fasten his love. He is also inherently disposed to receive any love shown towards him and to respond to it. This is the natural endowment with which he is born into the world. This is his heritage from a thousand million years of evolution.

And all men in some degree, and some men in large degree, possess that faculty of intuition which we have seen in the chapter before last is gradually developing out of the main line of evolutionary process. They have the power of insight and of being able to enter into the feelings of others, to see with their eyes, and hear with their ears, and, also, to enter into the whole spirit of things about them.

So when we find certain persons in whom the disposition to love has grown into a perfect passion, and with the passion there has developed a glowing intuition; and when, in consequence of the pas-

sionate love and glowing intuition, we find that they are the recipients of unusual love from others and can see beauties in the world about them not ordinarily perceived by men, we should not be surprised if these exceptional men, at moments of peculiar tensity in their lives, experience a joy almost past endurance. And this is just what happens in the state of mind known as the mystical experience. Mystics in these moments of exaltation feel an intensity of joy which convinces them past all shaking that a world which can bring them such blessing must be good at heart. They are filled with love for it. It has loved them, and they would love it. There is reciprocal love between them and the world. World-love has arisen.

Instances of it are rare—but not nearly so rare as is commonly supposed. They occur in all countries, and at the present time no less than in the past. Those who have the experience are termed mystics. And mysticism is much misunderstood by those who have never enjoyed the experience. It is believed to be something of a reproach, something vague, misty, opposed to all clear thinking, and practical common sense. But as Bergson points out in his latest book, " Les Deux Sources de la Morale et de la Religion," the true mystics, " sure of themselves, because they feel in them something better than they are, show themselves as great men of action, to the surprise of those for whom mysticism is only vision, transport, ecstasy." What they feel is felt as " a jet of love—love on which each of them impresses the mark of his own personality—love which is to each of them a new emotion, capable of

giving another tone to human life—love which makes each of them loved for himself, so that by him and for him other men will let their souls be opened to the love of humanity." And if, as Bergson affirms, the end of mysticism is the contact, and consequently a partial coincidence, with the creative effort which is manifested by life, it ought to be a subject of most serious import.

What critics of mysticism assert is that it is purely subjective and has no objective reality. A mystic, they say, may have all these wonderful experiences, but they may be evolved out of his own inner consciousness. He may have simply hypnotized himself by long contemplation of certain objects. And the plausibility of this objection will be understood when we hear of an Indian mystic seeing a Hindu god—when we read, for example, of a Hindu priest, daily engaged in the worship of the goddess Shiva, having a mystical experience and seeing the goddess herself. The fact of his seeing the image daily, and having it deeply imprinted on his consciousness, would make it easy—almost natural—for him, when in a state of high spiritual tension, to see the goddess of which the idol was an image. And perhaps Indians would take the same view of the way in which devout Christians may see Christ or the Virgin Mary. This may or may not be so. But in either case it does not account for what is a great deal more important and significant in mystical experience, namely the overpowering joy with which the mystic is flooded.

The experience is, of course, subjective. But it may also be objective. The mystic at the time

immediately previous to the experience is at extreme tension. He is strung up to concert pitch. He is intensely subjective. But no living being dwells in a vacuum. He is always under the impress of his surroundings. There is continual interaction between him and his environment. And the mystic immediately before his special experience, being in a highly impressionable state, is peculiarly sensitive to stimulus from outside. And it is not unreasonable to suppose that it was an impact from his environment (and again we must remind ourselves that the environment for each of us is the whole universe and not merely persons and things on this earth) which brought about that state of soul which we call a mystical experience. In which case, it would not be a case of subjectivity alone, or of objectivity alone, but of the interaction of subject and object—of a most receptive subject and an impressive object.

What I would imagine would be the process is this. The mystic would probably have inherited a strong, perhaps passionate, disposition to strive after spiritual things. The whole inner bent of his being would be in the direction of appreciating whatever there may be of beauty and goodness in the world. He would be perpetually hungering and thirsting after all such things of the spirit. Probably also he would be of a plastic, malleable, impressionable nature. Then on some occasion when he was peculiarly tuned to spiritual heights he would be conscious of this overwhelming influence bearing in upon him from outside—something which every mystic knows is far greater and better than any-

thing he has in himself. Of himself alone and without external influence he could not have had this experience. And doubtless it would be correspondingly true that the external influence, whatever it may be, could not without a sensitive and responsive agent have been able to express itself. Reciprocity would evidently be essential—reciprocity between the impressionable agent and the impressing environment.

Of the totality of that environment with which mystics, at times, so intensely interact, we are profoundly ignorant. We have only to think how circumscribed is the world of which a fish, or a bird, or even a savage is conscious to realize that we ourselves may have around us a world as different from the world of which the average man is ordinarily conscious as that is above the fish world. Our experience of broadcast radio concerts gives us an example. We go about our ordinary ways wholly unconscious that most beautiful—as well as some hideous—music is all the time impinging upon us. It is only when we have a radio instrument that we are aware of this music. It is part of our environment, but ordinarily we know it not. What we would surmise, then, is that the sensitive mystic in his moments of high tension becomes aware of a spiritual world, and of influences beating in on him from it, just as the radio listener, when he uses his instrument, becomes aware of the world of music and of the influences beating in on him from that world. For the mystic a new world is being revealed. And it would, in that case, be because he is not yet attuned to such a world, because man is

not yet fitted with the organs to receive and to respond to influences from it, that he finds those influences so overpowering and that he suffers so fearfully from the strain. We can imagine something of the feelings of the first amphibians when they began to leave the water, and be exposed more and more to the air and sunshine of dry land. The more sensitive of them would have been exhilarated by the impact of their new surroundings and by the new world gradually opening to them. But the glory of it must have been almost more than they could bear. And certainly they would have been unable to make those who had remained in the dim light of the sea understand anything of the thrill which the new world brought them.

Men who have not had the mystical experience may be unaware of that world by which the mystics are influenced; but for all that it may exist just as surely as the world of light and sunshine of which the majority of early amphibians were still unaware. The mystical experience may be perfectly valid, though 1,999 millions out of the 2,000 million inhabitants of the world may be wholly unable to comprehend it.

Other critics of mysticism say that it dwells on the unity in the world and ignores the differences. If the mystical experience really did lead mystics to ignore the differences the criticism would be justified. But, as McTaggart, who had himself enjoyed the mystical experience, and who was also a great philosopher, has shown in an article on Mysticism, there is no necessity for such ignoring of differences. There may be a unity of individuals

differing from one another. Indeed unity necessitates difference. Mystics emphasize the unity, certainly, for they are deeply conscious of a principle at work in the world for ever striving to harmonize the differences. But this does not imply that all men are the same. I myself am constituted of *millions* of units, and each differs in some measure from the others, and some differ a great deal. But I am a whole—a unity. Any unit of which I am composed might emphasize the unity of this great self to which it belonged. But that unit would be wrong in ignoring the differences between the units. So also should it be with the mystic. He may justifiably find satisfaction in the unity of the world to which he belongs. But he would be giving a wholly wrong impression if he were to insist that that unity implied that there were no differences.

Another example may make the point clear. In the previous chapter we have quoted Howard's view that after the consummation of mating the two birds form a single organism. There is an almost spiritual unity between the pair and they henceforth act as one. Yet there is obvious difference between the two in bodily form, internal structure, inward instincts, outward appearance, character, and many other respects. Unity of the pair does not mean annulment of the differences. The differences remain and are fundamental. But no less fundamental is the unity. And while there are times when the difference has to be insisted on, there are other times when the unity must be emphasized.

So also is it in the marriage of a man and a woman. The difference between the man and the

woman in outward bodily form, in inward bodily structure, in instinct, in character, in peculiarities of mind, manner, disposition, are too obvious to need drawing attention to. And they are fundamental. There is no gainsaying them. Yet what the pair themselves are most impressed with is their unity. To themselves they appear one—compactly united in spite of the differences. Their differences even contributing to their unity. For if each of the two were in every particular exactly like the other they would obviously never have united. It was only because the one, through his or her difference from the other, supplied a deeply felt need of the other that union took place.

These examples should help us to see that mysticism need not, and should not, mean the obliteration of differences, or the conviction that there is only unity and no differentiation in the world. True mysticism recognizes the differentiation, though it may concern itself chiefly in emphasizing the unity.

And in recognizing the unity as a unity of differences advantage may follow. For differentiation need not imply opposition. It may imply contrast. And contrast of varieties of units may add greatly to the richness of the whole. As McTaggart showed, if differentiation meant fundamental opposition great pain might be caused. But, though differentiation is fundamental, opposition is not. There is unity at the base, and unity in the long run. There is violent opposition in Parliament. Approximately one-half is officially styled the Opposition. But on great national occasions,

though the difference between individuals and between parties remains, the opposition fades out of the picture and the unity comes to the front, and is only enriched by the difference, as when a Conservative, a Liberal, and a Labour leader rise one after another to voice the common sentiment, each in his own way.

While, therefore, mysticism does mean unity, and unity actually implies differences, those differences, far from implying fundamental opposition, mean rather that the opposition is ephemeral and that while the contrast remains that contrast only serves to bring out in a stronger light the excellence of each.

There is yet another objection to mysticism which must be cleared away. Mystics are criticized as ignoring the evil and emphasizing only the good in the world. This may be a fault of mystics, but it is not a necessity of mysticism. We can well understand how a mystic would naturally dwell more upon the goodness in the world than on the evil. A patriot at some great moment of national rejoicing is overwhelmed with love of his country, and the goodness in her stands out so evidently that he thinks and talks little of the evil. A man and woman in the fresh bliss of their consummated union see only and speak only of the goodness in each other. Perhaps, therefore, it is natural for mystics fresh from their mystical experience to speak only of the goodness in the world. But this need not mean that they are unaware of the evil. It need only mean that they are so impressed with the all-conquering power of goodness that they are

convinced that evil has not a dog's chance of winning in the end. In so far then as mystics deny or ignore the evil in the world, their critics are justified. But in so far as they assure us that there is a power working—and working successfully—to overcome evil with good, they are worthy of a hearing.

These are the main objections to mysticism. And if these hindrances to a whole-hearted acceptance of it be removed it will be found that mysticism falls very readily into the great Scheme of Things, and is the natural and quite logical prolongation of the general evolutionary process from amœba upwards to man.

Proceeding now to study the phenomenon itself and to appraise its value, we will observe that though it is a "newness," a "jump," a "mutation," as scientists say, it is an upward leap in the same main direction as life itself. As in all the other newnesses in the evolutionary process, there are approximations to it beforehand and below, and development from it afterwards and above. And a comparison of these approximations with the actual thing itself and with what it develops into is a great aid in enabling us to understand what the mystical experience really is.

Rupert Brooke and Wordsworth may be taken as approximations—as just being on the brink, but no farther. In a rapturous spring letter Brooke writes of "the excitement and music of the birds, the delicious madness in the air, the blue haze in the distance, the straining of the hedges, the green mist of shoots upon the trees," and then says that

"it wasn't in these details—it was beyond and around them—something that included them . . . the spring makes me almost ill with excitement." Now this was very near, but not quite the mystical experience. And in the little gap there is all the difference. It was excitement, exhilaration, radiant gladness. But it was not exaltation. There was no sense of being lifted on to a higher plane. He would say to everyone he met what a jolly day it was. But he had not felt something so sacred that he would not dream of mentioning it to a single soul for years after. This exhilaration might have led on later to mystical exaltation, but on this particular occasion Rupert Brooke had not experienced it.

Compare this with McTaggart's experience. McTaggart at the age of thirty-two was on holiday in New Zealand. He was enraptured with the scenery. He was bending his mind on spiritual things. He was exhaustively studying the Hegelian philosophy. He had formed a great man-friendship. He was also in love. In these conditions he had what he called the "Saul" feeling—the feeling described in Browning's poem "Saul." It had been an absolutely perfect day. In the evening he looked out on the beautiful mountain Egmont, the Fuji of New Zealand, and he wrote in his diary: "What with the moon light, the Hegel, and N. [his friend] I was ecstatic, and the happiness was so intense as to be painful. The thing I felt most was how one could give up everything for love. Yea, though thou slay us, arise and let us die."

There must have been something in this more

than an exhilaration which he was bursting to talk about to everyone he met. He must have felt it as something sacred, for he never spoke about it even to his friends. Yet it was at the foundation of his life, for his whole life work afterwards consisted in an endeavour to put it on a rational basis. And as a final conclusion of all his thought and all his feeling he wrote that our lives are gradually approximating a final stage which they will some day reach in which the good will infinitely exceed the evil. "Of the nature of that good we know something," continues McTaggart. "We know that it is a tender and endless state of love—love so direct, so intimate, and so powerful that even the deepest mystic's rapture gives us but the slightest foretaste of its perfection."

The love of one person for another McTaggart put as higher than the mystical experience. But referring to an experience of the present writer on the mountain-side near Lhasa, McTaggart wrote that if this mystical experience and the love of one person for another "could be united at the same moment, if the love for one person could be felt as what did sum up the whole Universe, that would be the culmination of all things."

What that subtle, indefinable something is which distinguishes the mystical experience from anything that has gone before we shall try to find out as we proceed. And our next comparison will be between Wordsworth and Traherne. About Traherne there is no doubt whatever. We say for certain that Traherne was a mystic. But Wordsworth is sometimes included among the mystics, sometimes ex-

cluded. In our view he should be definitely excluded. His passionate love of Nature is, of course, well recognized, as well as his love of man. And in the words of Sir Walter Raleigh he concerned himself "with those moments of suddenly awakened feeling when something comes to the mind in a flash . . . those sudden flashes of intelligence, often lost before they can be directed to the dark places . . . the inexplicable and almost incredible quickness of movement which is produced in the mind in the presence of a strong emotion—those significant moments when the mind, acting spontaneously and without forethought, reads new values into life and experience." He had, too, "a sense of the unbroken chain that binds the least thing to the greatest."

The flowers, still faithful to the stems,
  Their fellowship renew;
The stems are faithful to the root,
  That worketh out of view;
And to the rock the root adheres
  In every fibre true.

Close clings to earth the living rock,
  Though threatening still to fall;
The earth is constant to her sphere;
  And God upholds them all.

Wordsworth had also felt, as has been so often quoted,

A presence that disturbs me with the joy
Of elevated thoughts: a sense sublime
Of something far more interfused,
Whose dwelling is the light of setting suns,
And the round ocean and the living air,
And the blue sky, and in the mind of man.

Yet, near as he has come to the true mystical experience, we feel that he has never really had it. There is a certain tepidity and restraint that gives us the impression that he is just below the boiling-over point. We do not gather that he is trying to suppress a veritable geyser of feeling, or that he has felt something altogether too great for expression in words. He lacks the boiling, burning, radiant joyousness, and the invincible conviction that great mystics display.

Like Wordsworth, Traherne sees things in their togetherness, and has the same sense of intimate union with Nature. He, too, has the receptive soul to respond to those fine intimations which come from the world about us. But there is in Traherne a joyous thanksgivingness which is not found in Wordsworth. He saw what he called "the Value and the Glory" of the world with the over-abounding delight of a child and with irrepressible thanksgivingness. "When you enter it," he says, "it is an illimited field of Variety and Beauty, where you may lose yourself in the multitude of Wonders and Delights."

> I felt no stain nor spot of sin,
> No darkness then did overshade
> But all within was pure and bright,
> No guilt did crush nor fear invade
> But all my soul was full of light.

Wordsworth was the greater poet, but Traherne was the truer mystic. Wordsworth was just approximating to the new realm. Traherne had just crossed the border. He was a "mutation." He had made the leap.

It is difficult to say exactly where the line lies which demarcates the boundary between the one and the other. But that which distinguishes the true mystic from the great poet becomes clearer when we observe the intenser forms of the mystical experience which India affords. From living Indians who have had the experience and who have also known others who have enjoyed it, one can see how innately qualified they are for the mystical experience. It is indeed regarded by them, if not as commonplace, at any rate as sufficiently common to be accepted as a matter of course, and not to be looked upon with suspicion as indicating a lack of intellectual rigour or of the much bepraised "sound common sense."

Ramakrishna has so often been referred to by me that I hesitate to speak of him again. But he lived so recently and was so well known to those I have myself asked about him, and his life has been so vividly portrayed by Romain Rolland, that he furnishes an easily verifiable illustration of what we mean by mystical experience.

Ramakrishna was of a magically plastic, sensitive, receptive, impressionable disposition. He had a special capacity for entering into and becoming other persons—living, dramatic, symbolical. His soul took on instantly each of the beings whom he saw or imagined, and he had a genius for expressing the souls of others. He was a born artist, a great lover of beauty and of his fellow-men, and he was himself most lovable, with an attractive smile and charming voice. So great a love of beauty had he, and so impressionable was he, that even at the age

of six he was seized with such an access of joy at the sight of a flight of white cranes against a dark cloud that he fell unconscious to the ground. He passionately loved music, poetry, acting, and modelling images of the gods. As a child of eight, when taking the part of the goddess Shiva in a sacred representation, he suddenly became so possessed by the part he was playing that the tears ran down his cheeks, and he lost himself in a transport of glory. From that time ecstasies became more frequent. And an occasion came when, as he said, he was torn with unutterable anguish at the thought that he might never be granted the blessing of the Divine vision, and then lo! the whole scene changed and he saw an ocean of the Spirit, boundless and dazzling. In whatever direction he looked luminous waves were rising which bore down upon him with a loud roar as if to swallow him. He was suffocated, lost all natural consciousness, and fell. Round him rolled on ocean of ineffable joy; and in the depths of his being he was conscious of the presence of the Divine Mother.

The shock of the experience was so violent that his whole being remained in a shuddering state. His body seemed on fire. His spirit was a furnace. Later he could not understand why his reason, and even life itself, had not foundered.

This was the state of Samadhi, well known among Hindus. Beyond it he reached the state of Nirvikalpa Samadhi, a terrible experience at the thought of which Hindus tremble, though they long to attain it. For Ramakrishna the Universe was extinguished. Space itself was no more. Monoton-

ously a feeble echo of the Ego went on ticking. Then that too faded away. The soul was lost in Self. Dualism was blotted out. Finite and infinite space were as one. Beyond word, beyond thought, he had attained Brahma. Even his guru regarded Ramakrishna's body with awe. It remained rigid as a corpse but radiated the sovereign serenity of the spirit.

Later his great disciple, Vivekenanda, also experienced this highest state. And when he returned to the ordinary consciousness he said that in his infinite joy he had forgotten the world, and he begged Ramakrishna to let him remain in that state. But Ramakrishna told him he had a work to do in the world bringing this spiritual consciousness to men; and he sent Vivekananda forth to carry out his mission.

Shattering as must have been the impact of the spirit upon Ramakrishna and emaciated as was his body, it is said of him that he was like a spiritual dynamo conveying a kind of electric shock, that contact with him gave a sudden access of power, causing each to attain his ideal at a bound. And what is further remarkable about Ramakrishna is the deep impression he made upon leading Indians of his time. He could scarcely read. He knew no English. But he could read men, and men could read him. The great religious reformer Keshub Chunder Sen was not only deeply influenced by him, but had the greatest personal affection for him. The brilliant Vivekananda, another religious reformer, was forced almost against his will to follow Ramakrishna and carry out his great mission

to the West. And the leading Hindus of to-day, including men of affairs like the Delegates to the Round-Table Conference, have the deepest reverence for him. Frail and delicately sensitive as he was, he has exerted a profound influence upon modern India. And his influence has been an uplifting power raising men on to a higher level.

A Hindu does not shrink from losing his individuality. He looks forward to being absorbed in Brahma. But a European likes to preserve his individuality. And when on the last of the three occasions on which the present writer was blessed with a mystical experience and felt the power of the Spirit about to come on him he fought hard to resist it. He feared it might shatter him. And he collected all his strength and all his presence of mind to resist it. But he was powerless. It sounds strange, but he felt it in his legs first, as he lay in bed. They were convulsed and shook violently. Then the power came all over him, till he was filled with it. It took absolute possession of him and he could only submit. Then, contrary to expectation, a wonderful peace came over him—most beautiful and sweet—and a feeling of great thankfulness. The following day he was collected and composed and full of power. And the power forcing its way so terrifically through him had an extraordinary purging, purifying effect upon him. Instead of losing his individuality he felt reinforced, and refreshed, like the sky which a storm has left washed, clear, and serene.

Such an experience makes the mystical experience of these much more sensitive Indians com-

prehensible. And understanding the experiences of present-day Indians, we are able to understand better the experiences of the great ones of the past. Take, for instance, the case of the Arab mystic, Hussain-al-Hallaj, also known as Mansur, who for saying he was God was crucified at Baghdad in the tenth century, and whose poems, written just before his cruel death, were translated by Sir Cecil Spring-Rice. A voice from heaven crying in the night says :

"Behold I call my creature, even thee,
The poor, the frail, the sinful, and the sad ;
And with My glory, I will make thee glad ;
Come unto Me, My friend, come unto Me !"
Even so the voice from heaven, I heard and came,
And veiled my face and plunged into the flame.

Last night I lived a mean and abject thing,
Content in bondage, glad and prison-bound,
With greedy fingers blindly groping round
For such brief comfort as the hour might bring.
To-day I am the North wind on the wing,
And the wide roaring of the clamorous sea,
And the huge heaven's calm immensity,
And all the bloom and music of the Spring.

I lived and loved. Now is it life or death
Here in this vast world wherein I move?
How, when the winds of heaven are my breath,
And the great sun the eye whereby I see?
I live not in myself, only in Thee,
Last night I loved. This morning I am Love.

Yet further back we may go to Mahomed, to Christ, to Buddha. And what we would here note is not so much the teaching of each as the mighty impress that each made upon the human race. Christ left not a single written word behind. Yet upon those he collected round him during at most

three years he was able to make so deeply-penetrating an impression that through them his influence has grown and spread for nineteen centuries till to-day it compasses the whole world and is probably even now only beginning to be understood and have its main effect. He came of a spiritually-minded race. He lived in a time of expectancy—expectancy of the long-awaited Messiah. At the Baptism by the Holy Ghost he must have experienced something more than even the highest expectations. Some little of what he then felt he was able to communicate to those he gathered round him, for they, too, on the Day of Pentecost, were filled with the Spirit. And it is that Spirit which has been spreading through the world ever since, and which will not have its full fruition for centuries yet to come.

Followers of the great religious leaders of mankind are disposed to put their respective leaders in opposition to one another. But this disposition is nowadays abating. The followers of each are beginning to see that there is no radical opposition between their leaders—only difference. And difference is no detriment. It furnishes those sharp contrasts which are so valuable in bringing out the peculiar excellences, and thereby manifoldly increasing the appreciation, of each. All the time there may be a deep-rooted kinship between them. And it is that kinship in enjoyment of the mystical experience that is now being more clearly seen.

So, if now we sum up our impressions of the great mystics, we shall see that with all their differences—and it is remarkable that in each single

mystic each mystical experience he enjoys is different from every other—there is yet a common basis to them all. A deep sense of the goodness of things, an ecstatic joy in the world, and a brimming over thankfulness, characterize every one of them.

They were all men of high-strung temperament, emotional to the last degree, and of a plastic impressionability which made them capable of receiving the subtlest stimulation from the world in which they were immersed. But equally fitted were they to respond to the stimuli they received—fitted to appreciate and to create beauty, fitted to be loved and to love. In consequence, they were able to exert an influence on the course of human history which seems incredible as emanating from men of such delicacy. And this influence is just as much a scientific fact to be studied and accounted for as, for instance, the effect of cosmic rays. The influence exerted by the great mystics is indeed the most significant fact in the whole evolutionary process.

Now these men all found in the world about them and of which they were members and integral parts just what would arouse—and not only arouse but sustain and satisfy—their highly emotional natures. In their environment, in the beauties of Nature and of art and the fascination of intercourse with their fellows, they found the power to fill them with the very ecstasy of joy and thanksgiving. And joy refreshes and strengthens. It enhances the vitality of the body, it expands and quickens the intellect, and it purges the mind of cares and worries.

And as the world had the power to produce in them these most admirable and desirable and in every way excellent effects, they concluded—or rather the sure conviction came straight to them—that the world in its essential nature was good—and good to a superlative degree, beyond human imagining.

And the world being thus superlatively excellent and beautiful they naturally came to love it. They did not merely appreciate the beauty and goodness in a cold, arid, intellectual way. They became passionately devoted to it. They loved it.

And joy is a dynamic emotion, and love a dynamic sentiment. Possessing joy and love, they could not keep still under them. The joy they felt they had to share with others. And loving the world they had to impress others with the goodness of it that they might see it too—as a child when it sees the beauty of a flower likes to point it out to others that they also might enjoy its glory. And as their joy intensified, so did their love increase. And as their joy and love increased, so did their longing to communicate them to every other human being, and so also did their compassion grow for the weak and afflicted and all incapable of sharing their joy to the full. And with the exercise of compassion, so did their sweetness and grace develop.

Then, as joy became permanent with them and sweetness and grace developed, so did they become possessed of the power to move the emotions of other men. They exercised this power and were able to fill others with joy, and make others see the goodness of things.

And so the great mystics have come by degrees to make the world all they saw it was in the world to be—to make it what they saw it should be—to realize in the concrete world about them the vision they had had of its possibilities. In Christian language, to bring about the kingdom of heaven upon earth. And that the vision is not too "dreamy" and impracticable to be considered by men who have to encounter the hard realities of life is shown by the way in which Christmas is welcomed by the most critical of men. Joy is of the essence of Christmas time. We all wish each other a Happy Christmas. Goodwill among men develops from this joy. We recognize the differences in men; but at Christmas time all feel united in the joy of the occasion, and a spirit of goodwill prevails even between those engaged in warfare against each other, as was shown on the Western Front. Men also recognize the eminently practical desirability of extending the Christmas spirit throughout the year. If only the joy of Christmas could be extended from January to December, and individuals and nations be always animated by the spirit of goodwill that prevails at Christmas, it would be a consummation devoutly to be wished for by the most "realistic" statesman or hard-headed business man. And such a consummation would be something of greater value to the race than the most marvellous inventions or discoveries of science. We welcome aeroplanes, wireless apparatus, telephones, motor-cars, and all other results of science as means and aids for the enjoyment of life. But the Christmas spirit is the enjoyment itself. And it is as

readily available to the poor as to the rich, and to the rich as to the poor.

As the great mystics who have brought the gladness and goodwill into the world come to be appreciated more fully, so will the value of their creative power in uplifting the race be recognized. And as it comes to be more valued, so will it come to be more cultivated. For they have not only the exquisite insight to see into the inmost essence of things; they have not only the intuitive power to see what the world might and should be; they have also the creative power to make their vision come true. This intuitive and creative power is one which is only just beginning to develop in the race, but the Hindus with their system of Yoga, and the Roman Catholics with their spiritual directors, are feeling their way towards the best means of training it. And when science has overcome her suspicion of the "emotionalism" of the mystics, and mystics can deign to utilize the services of scientists; when reason, also, has been employed as a corrective to intuition, to discriminate between artificial and true exaltation, the creative power of great mystics may become so potent in the affairs of men that a new dawn may appear upon mankind, and Christmas time meet summer time, and all the earth be blessed.

The great mystics who have initiated this development we may safely recognize, then, as the crown of the evolutionary process to date. In them we see the highest expression of the human spirit. In them we see a deeper, wider development of consciousness—a consciousness not only of themselves,

not only of their terrestrial environment, but of the whole cosmos. In them is the fulfilment of the promise which life brought with it a thousand million years ago. And in them is contained the promise of a future incomparably more glorious still.

But again we must remind ourselves that it was not alone from anything which was contained in the original primordial germ that they arose, but from that interaction of it with the universe as a whole. From some x cosmic factors in the universe as a whole acting upon the various forms of life, and, eventually, upon the great mystics themselves it was that this wonderful development occurred. And into the nature of those x cosmic factors we have now, at last, to enquire.

PART II

MAINLY INFERENCES

CHAPTER VI

THE COSMIC SPIRIT

To account for the direct reversal of the "running-down" process which we have observed to have taken place on this planet since its separation from the sun, 2,000 million years ago, we have had to assume the existence and operation of certain cosmic factors, which we have called the x cosmic factors. When the astronomers handed over this planet to the geologists and biologists it had just parted from the sun. And the sun, like all other stars, was radiating away its heat so that, according to the second law of thermo-dynamics, at some definite time in the future all its heat and light would be radiated away. And, as the other stars would likewise be radiating away their heat, the time would inevitably come—however distant the date—when all light would have gone from the universe, when energy would be at a dead-level of unavailability, and when temperature would be evenly distributed throughout space. The future held nothing but cold and darkness, so far as astronomers could tell.

This was the prospect before our planet when it began its career. Presumably, it would soon radiate away its own heat, and as its parent, the sun, was also radiating away its heat there seemed no future before it but darkness and death. Then the in-

credible thing happened. In defiance of the law of thermo-dynamics this earth in dying brought forth life. From somewhere, somehow, it was enabled to bring forth something which could fly in the face of that hitherto omnipotent second law, and, in place of death, produce life, and love, and beauty. As we have seen in a previous chapter, certain atoms on the surface of the earth were moved to group themselves into more and more complicated groups of groupings till, at length, life appeared, grew, spread, developed, covered the face of the earth with all that marvel of varied plant, insect, fish, bird, animal, and human life which we see about us to-day, and beings arose showing those qualities of heroism and love which we so reverence in the saint and the mother. And it is this great fact which we have to face and account for.

How are we to explain it? There was a time when it was supposed that it all came about by chance: the primordial living germ was the result of a fortuitous collocation of atoms, and after its first appearance the operation of the process of natural selection and survival of the fittest did the rest. But it is demanding altogether too much of the ordinary man's credulity to ask him to suppose that all the most delicate adjustment to one another of the many factors involved in the production, the persistence, and the development of that inconceivably complex entity the primordial protoplasmic germ could have been the result of pure chance, or the working of blind force. We have seen in the first chapter how it was only after the earth had cooled down to a certain temperature, after that

wonder, the formation of water from two gases, had been performed, after the compounds of other chemical elements had exhibited certain properties —only when the changes of temperature and pressure during a thousand million years had resulted in the earth's surface having such a condition, the sea having a certain consistency, the salts in the water, and the gases in the atmosphere over the water, being just rightly combined, that protoplasm could occur. And we cannot possibly believe that such a combination happened by chance. The probabilities against any such an arrangement of the atoms having come about by chance are overwhelmingly great. But if they did not come about by chance they must have come about through guidance. Some agency must have guided the atoms. What was it?

What is that agency, and whence did it come? We must assume that the sun shining on the minute portion of itself could not have produced this wonder. We must, therefore, look to the universe at large. We must assume that it was from the universe outside the solar system that there came the influence which produced these marvels.

We shall get our first clue from Jeans himself. When he for the moment threw aside the rôle of the astronomer and adopted the rôle of the philosopher, he said that the universe looked more like a great thought than like a great machine, and that we were beginning to suspect that we ought to hail Mind as the creator and governor of this realm of matter.

The scientist is just hesitatingly beginning to

discern a Mind behind the mighty process of things. But this which scientists are so chary of admitting, as it is traditional with them to proceed on any other assumption than the very obvious one that Mind is at the source of things, is freely assumed by philosophers. And, referring to this particular conclusion of Sir James Jeans, Dr. J. E. Turner says: "I shall regard Jeans' principle of a creative intelligence as by no means tentative, but as the perfectly logical corollary of modern scientific facts." The facts themselves force us to the conclusion that there is intelligence at work in this material universe. If energy is organized into electrons and protons and these into atoms, and these into groups and grouping of groups of ever-increasing complexity, and the whole set moving in figures of amazing intricacy but danced with the perfect regularity that physicists show, the only possible assumption is that intelligence of the highest order and an all-powerful will have been and are at work. The universe is something more than a mere materialistic mechanism of matter and blind force. Mind is operative throughout, always and everywhere. We have found mind operative here, therefore it must be operative everywhere. We have found mind operative now, therefore it must be operative always. For if it operates anywhere it must operate everywhere; if it is operative at any time it must be operative at every time.

This is our first conclusion.

It is confirmed by what we observe of the uniformity of Nature upon which scientists so confidently rely. There is evidence of some ordering

activity, some central directive principle at work, keeping the whole together and in order. The universality of the constituents of matter, namely the atoms and electrons, and of their structure, also indicates cosmic control and guidance : it could not have come about by chance. And, in each unit, as in the whole, the processes are never entirely physical but always as much psychical as physical. The very electron has its mental aspect. Mind and matter seem to be indissolubly connected. Mind, then, must be one of the cosmic factors at work, and when we note the beauty in the plant and animal world on this planet, as well as that which we have already noted in the whole material universe, again we can only conclude that the Mind behind the universe must be the Mind of an artist as well as the Mind of a mathematician. Not in all animal life do we observe beauty. Some forms of deep-sea fish are monstrous, some insects are loathsome, water hogs are repulsive, there appears little of beauty about a rhinoceros. Yet even these, seen in their natural surroundings, and with a mind to the life they have to lead, and the purposes they have to serve, might appear merely grotesque rather than ugly. In any case, they are the exceptions. In the main, plant and animal life is bursting with beauty. What appears to us ugly may be beautiful to the naturalist or the artist who knows how to look at it. And most of us when we look with an eye for beauty at the birds, butterflies, flowers, fishes, would agree with Mr. Priestly that if that is what Nature can do, then somewhere in or behind Nature must be an exuberant artist shouting with

laughter as he plunges his brush into pots of coloured fire.

With these clues we can now probe deeper still and find out what are those factors which not only bring about the appearance of the primordial germ, but also its development. It is valuable to know that there is Mind behind and operative throughout the universe and that the Mind has the genius of a mathematician and the feeling for beauty of a great artist. We thus know something of those x cosmic factors which we saw must be at work in this solar system to have prevailed against the operation of the second law of thermo-dynamics and reversed the "running-down" process so far as this planet is concerned. But the mind of the mathematician and the sense of beauty of an artist are not in themselves sufficient to account for all that has happened on this earth during the thousand million years since life appeared. The mind of a mathematician may be a wonder at calculating, but may be cold and callous. So also may be the mind of an artist. An artist may not care a rap for anything outside art. He might produce a most beautiful world but without a spark of love in it. So we must search further to find out what other cosmic factors there may have been, and be, at work to have brought about what has happened on this earth since the primordial germ of life appeared.

And as a guide in our search we cannot do better than take with us that combined mathematician and philosopher, Dr. A. N. Whitehead, for he is thoroughly versed in the mathematics of the uni-

verse, and yet, as a philosopher, has trained and accustomed himself to view the universe as a whole and to study its fundamental character. Whereas the astronomers and the physicists would, by the very nature of their procedure, confine themselves to a study of the material aspects, Dr. Whitehead would view all aspects and factors in their togetherness. It is indeed their togetherness and their ultimate nature that would be his chief study as a philosopher. With these the scientist is not concerned. But for the philosopher they are the main interest. And it is to him that we have at this stage to turn.

Now what Whitehead stands for is the "organic" view of the universe. Many other philosophers, of course, hold the same view. But he perhaps more than others has expanded and developed it. We have already noted that all the stars and every heavenly body throughout the universe are made of the same thing, namely, energy in its variety of forms. The stars are built of the same material as this earth and the sun is made of. The energy is organized into atoms of various degrees of complexity. But there is not an element in the stars or nebulæ that is not to be found in the sun or this earth. The same materials are used throughout the universe. And the materials are all made of one stuff, namely, energy. This is the first point to note.

Next we note that things are not only made of the same thing but are also made on the same pattern. All electrons are of the same pattern. All atoms are of the same pattern. And all these things

are on the same general pattern as the universe as a whole. There is even a pattern of behaviour. Atoms have the same pattern of behaviour. Birds have their pattern of behaviour. Lovers have their pattern of behaviour. These patterns differ in detail but in general character they are the same.

Then we note that the same physical laws prevail all over the universe. Far as astronomers may peer into the depths of the universe with the 100″ telescope on Mount Wilson they will always find the stars and nebulæ complying with the self-same laws as we find hold here in the solar system. There is not one law here and another there. The same laws run throughout the entire universe.

A further point has to be marked. The universe is not just one vast heap of stars. It is not a mere aggregate, or collection, like a heap of stones by the roadside, or a heap of sand by the seashore, or a saucer of rubies in a jeweller's shop. Nor is a star itself just a heap of atoms. The whole point about the universe is that it is not a heap, nor an aggregate or collection of units : it is a system.

There is observable in it a co-ordinating activity keeping the units together as a whole—an ordering relation which we do not see in mere heaps or collections or aggregates. The units of which it is composed—however minute they may be—are all interrelated with one another. They all interact with one another and with the whole. Not the minutest part—not a single electron—could, indeed, exist outside the whole. The whole is necessary to it, as it is necessary to the whole. Each unit affects every other unit and the whole together.

And the whole and all other units affect each. And this is perhaps the easier to understand when we recall that the ultimate particles of which the universe consists are not the hard, gritty, impenetrable bits of matter, analogous to microscopic grains of sand, that we had up to the present century supposed them to be, but are exceedingly sensitive, receptive, and responsive concentrations of energy, with a psychical as much as a physical side to their nature. Such being the ultimate constituents of the universe it is not difficult to conceive of it as a highly coherent system.

So we get a view of the universe as made up of firmly interconnected parts. All is tightly compacted together without a possibility of escape. Between all the parts there is constant interaction under the control of the whole. The parts are mutually connected and dependent and are constituted to share a common life. Their activities have reference to one another and to the whole in such a way as to supplement one another and to promote the continuity and harmony of the whole. Thus the universe is an orderly, interconnected system. In short it is an organism. As Whitehead insists, organism is a fundamental feature throughout the whole of nature. Electrons are organisms. Atoms are organisms. Molecules are organisms. Chemical compounds are organisms. And so on through all the stages to the lowliest living things which are, of course, organisms of extremely complicated character.

And here it is necessary to pause and note that an organism is a very different thing from a

machine. In this mechanical age we are too apt to think in terms of machinery, and Mr. Wells' "Science of Life" is permeated with the conception of machinery. "The Body is a Machine" is the title of one of his chapters. But, in our present view, not only the body but every atom of which it is composed, and the whole universe, are organisms. And the difference between a machine and an organism is vast. In a machine the motive power resides in one special part, for example, the mainspring of a watch, or the boiler of an engine: in an organism each part has its own inner impulsion or propulsion, for example, the self-active electrons of the atom. In a machine the parts merely fit into one another but make no characteristic contribution of their own to the whole: in an organism each unit makes its own special contribution as, for example, the different units of hydrogen and oxygen in the molecule of water. In a machine no part has a share in the control of the whole: in an organism, while each part makes its own contribution to the whole, all in their togetherness control their own united action. Again, two or more machines cannot join themselves together to make a combined machine, whereas two or more organisms may combine to make an organism with characteristics different from those possessed by either of them in separation, as when molecules join to form a chemical compound. Another very important difference is that a machine cannot respond to external stimulus whereas an organism can. Yet another is that in a machine the individual parts count for nothing apart from the whole and there-

fore the stress made is on the whole rather than on the parts—on the society rather than on the individuals—while in an organism the whole is just as much for the individual as the individual is for the whole. Further, the organism, in contradistinction to the machine, is self-sustaining and self-directive: an atom, or a molecule, or a chemical compound requires no winding up or stoking. Lastly, in an organism, in the whole is an ordering activity, or co-ordinating principle, which keeps the parts together and an ideal of itself which directs its activities. And living organisms, in addition to the above characteristics, have what no machine can possibly have—the capacity for growth, for development, and for reproduction. They feed themselves, grow to maturity, and reproduce their kind.

And the universe itself may be an even closer and more vital unity than an organism.

These are the main differences between a machine and an organism and the comparison will serve to show how important it is to think of the universe in terms of organism, as it is an organism, and not let ourselves, from mere familiarity with motor-cars, watches, and steam engines, drift into the habit of regarding the universe and its constituent parts as machines. In terms of machinery the universe, we ourselves, and all about us are hard, metallic and unyielding, without initiative or resource, just grinding monotonously on. In terms of organism we and all about us and the whole universe are pliable, plastic, initiative, and responsive; and no individual—not even an atom—is a

mere cog of a wheel driven round and round by an external force: each has and preserves his own individuality.

It is this organic view of the universe, as opposed to either the mechanical view, or the view of it as the outcome of pure chance or blind force, that I would now wish to elaborate.

And the crucial point I would make is that if the universe is an organism, and if our earth is part of it, and has during the last 2,000 million years developed life and consciousness, then it follows that life and consciousness are characteristics of the universe as a whole—that it was because the universe was a living universe that life developed here.

Let me develop the idea. If the universe is an organism of the kind described above, with each of its component parts also an organism, then, as Whitehead shows, each part will repeat in microcosm what the universe is in macrocosm—each unit will be a microcosm repeating in itself the entire all-inclusive macrocosm. And this will have a bearing of critical importance upon our study. For it follows that if we study the character of a part we shall know the general character of the whole. If we study the "flower in the crannied wall . . . root and all, and all in all," we should know not only "what God and man is," but what the universe is.

To illustrate the point, let us take the case of a cell of my body as representing the microcosm and take myself as representing the macrocosm. I am composed of, literally, millions of millions of millions of cells, though I have developed from a single

one. Each of these cells does in some measure bear stamped upon it my main characteristics. But many of them bear my stamp upon them so distinctly that any one of them is capable, when placed in appropriate conditions, of developing into a human being with all my main characteristics. From a minute examination of any one of these germ-cells in me it would be possible to gain some knowledge of what I am like—that, for instance, I am a human being, and not a crab, or an angel. All this must be implicit in one of my germ-cells or it could not develop into someone like me. Even so, on the theory that by an examination of the microcosm, we can get an idea of the character of the macrocosm, will we, by an examination of a part of the universe, be able to gain an idea of the character of the universe as a whole.

Or, for another example, take a Frenchman as representing the microcosm and France as representing the macrocosm. By an examination of a Frenchman we can get an impression of the general character of France. A Frenchman does bear on him quite distinctly the main features that go to make the soul and character of France. Some Frenchmen will bear the stamp of France upon them more unmistakably than others. But from all, in some degree, we would be able to gain an impression of the character of France. We would know that France, though in many respects like Italy, or even England, was very different from Fiji for example.

Perhaps these illustrations will have shown how we are to proceed if we are to gain a knowledge of

the character of the universe. By examining the part, the microcosm, we shall gain an idea of what the whole, the macrocosm, is like. And the part we had better first take is that part which, immense as it seems to us (though minute in comparison with the whole universe) is anyhow the part best known to us and the part from which we all have sprung, namely, the solar system. Having examined that, we may each examine that part of the universe which he knows still better, namely, our own self. A study of himself as a microcosm will give a man an impression of what the universe, the macrocosm, is like. And knowing the character of the universe as a whole, he will know the character of the determining factor in it. That is the hinge upon which the rest of our enquiry will depend. It will all hinge upon the theory that by examining the impression which the whole has made on a part we shall gain a knowledge of the whole.

Commencing, then, with the solar system, we find that it was formed roughly 2,000 million years ago. What has happened on other planets of this system we do not know. But on our earth we have had this amazing event, the development of life in the vast variety we see about us, culminating in the human mind. And if we are to judge this universe as a whole from this part, the solar system, this should form the most conclusive evidence that the universe as a whole had life and mind. If there is any validity at all in Whitehead's argument that each part repeats in microcosm what the universe is in macrocosm, then what has happened during the last 2,000 million years in the solar system would be

a repeating of what the universe essentially is. And this would mean that the universe is a living organism actuated by mind.

We thus see justification for the conclusion we were trying to establish that life and consciousness are characteristic of the universe as a whole, and that it was through the interaction of the earth with the universe as a whole that living things developed here.

And this confirms the view we had reached on other grounds, that behind the phenomena of nature there must be working a mind with the genius of a mathematician and the love of beauty of an artist.

But what has happened on this earth during the last 2,000 million years indicates something more. It indicates the operation of mind; but it also indicates the operation of a power for good. Some may doubt this. Some with their attention concentrated on the evil and misery, the pain, poverty, and cruelty in the world, the horrible injustice by which a good man is stricken with disease while the useless flourish, would say that while these things can be we are not justified in speaking of a power working for good. On the other hand, if we take a big scale view of things it is hard to deny that in spite of all the present-day evil there is evidence of things being now very distinctly better than they were in the distant past. If we compare the state of this earth as it is to-day with what it was ten million years ago, and the state then with what it was a hundred million years ago, and that with what it was a thousand million years ago, it would

be impossible to deny that, however much evil we may see about us, there has quite evidently been at work a power for good perfectly capable of making its way through all the evil, sometimes making use of it and sometimes transforming it into good. That part of the universe which we know best and whose history we know for 2,000 million years is evidence that the universe as a whole is a living organism working for good.

This is the first main impression we would get of the universe as a whole from an examination of that part of it, the solar system. But if we want to get a more intimate impression we would examine ourselves, as being the highest product of the solar system. We, also, are parts of the whole. We also are microcosms repeating the character of the macrocosm, the universe as a whole. And as we know ourselves better than anything else in the universe we ought, by a study of ourselves, to learn most about the universe.

And in examining ourselves we will start with the manner of our birth. We each of us came into being as a creation of creative love. And upon that we must concentrate our attention, for it leads us straight into the heart of the mystery. Actuated by love of each other—by the love which each was the means of arousing in the other—our parents brought us into being. And the point is that this was no unusual or extraordinary event, but universal. Every human being was born of this creative love. More remarkable still, every animal, bird, insect, even flower, came into being of the

selfsame mode of activity. And the creative love in our parents derives back, far and far, deep and deep, right down from the origins of life—through the whole long ancestry, back and back, through our pre-historic ancestors, through ape-like men, and man-like apes, through the lowlier animals from which they sprang, down and down, to the very simplest forms of life. Creative love is of the very essence of life itself. From its faintest foreshadowings in the simplest living organism up to its most perfect flowering in the loftiest-natured men and women we can trace its unbroken history. We can observe a pair of unicellular animalculæ with an unaccountable attraction for one another, slowly finding their way to each other, coming together, uniting and then from their united substance giving forth offspring bearing an exact proportion of the characteristics of each. Then branching out in one direction we have those astonishing features of it among the insects, the bees and butterflies which naturalists record, and among the birds those beautiful illustrations of it which we may observe on any spring day, and those expressions of it which we may hear in their song. And finally in its highest stage among men—and among the most perfect of men and women—we shall gain our best impression of it, for it is always in the highest expression of any activity that we see its real character.

These then let us study. In its first phase this most perfect form of creative love is to the last degree exclusive and selective. Each selects the one above all others with whom he or she will unite.

Discrimination, testing, selection to the extreme are exercised. A man meets hundreds of women, a woman hundreds of men. Not deliberately always, but always decisively, a selection is made. All the rest are excluded. Only the one is included. The highest creative love in its first phase is exclusive to the extreme degree. Yet of this very exclusiveness a new being is created. And from the very moment that the union has reached its climax the exclusiveness is abandoned and a love is generated which in widening out would include the whole world.

If then we would judge the macrocosm by the microcosm, this love from the working of which we and all living things about us have come into being and which is first stimulative—and stimulative towards the highest perfection—then selective —and selective to the extreme of exclusiveness, then creative, and then as widely inclusive as it was formerly exclusive, must be the fundamental characteristic of the universe. And of it each of us is a living exemplification, for not one of us would be here but for it.

An exponent of "emergent" evolution might indeed say that this creative love simply "emerged" when a critical combination of the chemical elements had been reached. But ultimately there must have been either a push or a pull to make things emerge to anything higher than they were before. A drop of water cannot rise above the level of the lake unless it is drawn up by the rays of the sun or driven up by some such power as drives the fountain at Geneva. We have to take the en-

vironment of this earth and the sun to be nothing short of the whole universe. The solar system is rigorously bound up with the entire universe in its wholeness. And it can only have been under the stimulus of the universe as a whole that creative love could have "emerged" and developed here —only through some up-thrusting impulse from below and within or from some up-pulling attraction from above and without, or from both, that it could have arisen in the primordial living organism and developed into the exalted love of men and women. At any rate such a conclusion is more reasonable than the supposition that creative love of the type we see in the highest men and women can just have "emerged."

And of course it is wholly unreasonable to suppose that anything requiring such fine discrimination and such unceasing and delicate adjustment to continually varying situations could have arisen by a pure fluke from chance combinations of chemical compounds.

It may still be objected, though, that all men are not born of this highest type of creative love—that some are born of nothing else than animal lust, and we might as well judge the universe by them as by the highest type. A lustful man is just as much a "part" of the universe as a loving man. And if we are to judge the whole by the part we have no right to select our "parts." We might judge the universe by the lustful man and say that lust was just as much a characteristic of the universe as love. This might be argued against us. And if we had any reason to believe that the great main trend and

tendency of life—human and animal—was towards lust and away from love, or that there was a doubt as towards which of the two it was trending, there might be justification in the objection. But when it is quite obvious that even among the animals, and especially among the birds, there is a decided tendency to " sublimate " lust into love, and when among the most lustful men there is always a sense of unsatisfaction and a yearning for something that lust cannot give and only love can afford, then we are justified in taking love and not lust as characteristic of this " part " and therefore as reflective of the character of the " whole," the universe.

Another may object that it is unfair to judge of the whole by the best part of it. Instead of judging the universe by the highest man let us judge it by, say, a tape-worm. A tape-worm is a real degenerate—a loathsome parasite feeding itself on others and causing excruciating and permanent pain to both animals and men. A tape-worm is just as much a " part " of the " whole " as a man is. And if we are to find the character of the macrocosm by studying the microcosm we must form our estimate of the universe by studying the tape-worm as well as the man. Let us then examine the tape-worm. To us men it is a repulsive object living as it does in the intestines of men and animals and feeding on them. But, if the finger of scorn were pointed at it, the tape-worm might very well retort to the owner of the finger that he himself lived on innumerable sheep, cattle, fowls, and birds, and animals of many different kinds. And the tape-worm in itself, degenerate though it be, is an

organism of wonderful complexity and intricacy of adjustment of parts. Under a microscope it would reveal most exquisite beauty of structure. It would reveal the operation of a mind, and of a mind with a sense of beauty. Even if we had nothing but a tape-worm whereby to judge the universe, we would say that the universe was a live universe and dominated by mind. We would have to admit that there was no evidence yet of any high standard of morals. But we would also have to allow that even a universe which could produce nothing higher than a tape-worm was a very wonderful thing.

Another critic may object that we are fairly presumptuous to select ourselves as the highest beings on this earth. Let us be humble and impartial, then, and give the preference to the birds. Let us take that very common bird, the ordinary skylark, and putting him in the position of the microcosm, judge the macrocosm, the universe, by him. What then do we find in the skylark? He is, of course, in bodily structure a very marvel of intricacy and delicacy of adjustment of parts to each other and to the whole being of the bird. But he is a great deal more than that. In his quivering flight he is a perfect expression of the very ecstasy of love. Among the wonderful sights in the world there are few more impressive than the sight of a skylark leaving the earth and driving himself upwards with all the might of his little frame, insistently striving to reach higher, and singing without ceasing as he soars. What finer exhibition of pure enjoyment does this earth afford than this exhibition of the enjoyment of love, of the effort to express by all

the means at his disposal, by upward flight, and by incessant song, the bursting love that is in him? If, then, objection be taken to using man as the measure of the universe, and in his place we use the lark, we can only say that if the universe as a whole is like the lark, then it must be compacted of the sweetest love and over-abounding joy.

In spite of any such possible critics we know very well, however, that man is the highest product of the solar system, unless there are higher beings on other planets of the sun. And we place him highest because of his reasoning powers and more especially because of his awareness of the universe as a whole. Therefore, to obtain our completest conception of the universe, we would naturally study the highest men.

Who are the highest men? Are they the men of largest brains, and sharpest intellect, and most powerful capacity for reasoning? Or are they the men of finest intuition, of the most exquisite delicacy of soul, and of the readiest capacity to attune themselves with the inner working of the universe? I will assume that these latter are the highest, for it is these great mystics who have been able to divine the direction in which men should align their lives and who have done most to raise men on to a higher plane of being, make them conscious of something more than themselves. I will assume, with Bergson, that these great mystics are the forerunners of the race, and that therefore by studying them we shall know most of the inner character of the universe, what is its driving motive, and what it is driving at.

And from our study of the great mystics in the last chapter we have found them to be men of superb initiative, of an exceptionally sensitive nature, highly susceptible to influences about them, to a peculiar degree receptive and responsive, quick to take in and to give out. Men who at certain culminating moments in their lives have had flashes of intense insight in which they have been able directly to divine the real character of the world. Men who have had an authentic revelation of the inmost springs from whence all wells forth. Men who have had by their intellect and reasoning to relate their experience with other experience, to discriminate, and to construe correctly what the revelation exactly has been, but who have been convinced past all possible shaking that they have seen the inner motive of all. Ordinarily they were regarded as "unworldly." As a fact, no more perfect men of the world have existed. So-called men of the world are mere innocents in comparison. For the world in which the great mystics have lived, and to whose influences they were so readily receptive and so eagerly responsive, was the whole universe. It was the common world of all lesser worlds. And being in intimate touch with that common world they were in touch with the deep heart of every human being.

These men have all been conscious of the evil in the world about them. None have been more conscious. For their sensitive natures made them peculiarly susceptible to evil influences. And none have inveighed more vehemently against evil. But what they have been still more acutely aware of is a

power in the world which can redeem the evil—the power of redeeming love. It is of this all-powerful love in the world that they are most insistently conscious—of this flaming spirit of love which can transform the world and make of evil the very means to good and elevate men's souls to the highest transports of delight. This rapturous love is what the great mystics tell us of. To them it is the one all-inclusive, all-compelling motive in life—the source of all things and their highest end. They see it as a burning fiery furnace, capable of melting the stoniest heart and set it running over with tenderest feeling towards all around it. And their one urgent craving is to open the eyes of their fellows that they may see it also.

Now these highest men may be said to bear to the universe as a whole much the same relationship that a germ-cell in my body bears to me. A brain-cell may possibly carry on it only the impress of my intellect. But a germ-cell most certainly bears on it the impress of my *whole* self, for it is capable, under guidance, of reproducing in my offspring all my main characteristics and dispositions and even minor details. The great mystics do undoubtedly, therefore, more than others bear upon them the impress of the universe as a whole. And when they are one and all characterized by the consuming passion of love and of desire to lift all others to the heights to which they themselves have been transported, we may be certain that what is so characteristic of them must be characteristic of the universe as a whole.

Taking all these instances together, we may say

then that, just as the mathematician sees in the regularity with which the material universe is worked the indication of a mathematical genius at the source of things, and as an artist marking the beauty in the world sees in it the presence of a lover of beauty, so would our own parents having experienced the rapture of creative love at its climax, and the great mystics having enjoyed that love intensified to infinity, see in these experiences evidence of the joy and love in the heart of the universe.

And more still has to be noted. Creative love of the highest type implies personality, and personality at its extreme stretch. It is selective, and selection implies intelligence. It is purposive, and purpose implies will. And it is of course loving, and loving means feeling of the intensest. Intelligence, will, and feeling are all three fused in one active whole, the knowing increasing with the intensity of the feeling, and the love increasing with the depth of the knowing, and the will deepening in its purpose as the knowledge and love increase, till finally all are joined in one great giving forth of the whole personality. This is the "I" of each of us to the full. It is the "I" of which each of us is conscious every moment as we thread our way through the varied life in which we are immersed. It is the "I" which thinks and deliberates and compares and selects and plans. It is the "I" which wills and carries out decisions and puts through its ambitions. It is the "I" which fears and hopes and loves. And it is the "I" which keeps all these together, thinks, and feels, and acts as one—as a personality.

And personality is not an attribute of individual human beings only. Highly organized communities of human beings may also be said to possess personality. Thus the French philosopher, Jacques Maritain, speaks of the Roman Catholic Church as "a living person." Most philosophers refuse to accept the idea of corporate personality. They argue that only individuals, not societies, can possess intelligence and will. McTaggart, in particular, is insistent on this point. Only the members of a society—a college, or a nation—not the society itself, have personality. With this view I cannot agree. The experience of life goes dead against it. And when Maritain refers to his Church as a living person, he, in my view, speaks in no figurative sense, but quite literally. The Church is a person. Certainly it is conscious of itself—conscious of itself, for instance, as something quite distinct from the Church of England or the Lutheran Church. It is conscious of its history and proud of it. It is conscious, too, that it embodies and is designed to give expression to a certain spirit—the spirit of Christ. Also it deliberates. It deliberates, for example, on who shall be its Head. It comes to decisions and publishes those decisions in Papal Bulls and Declarations. And it takes action: it makes strenuous efforts all over the world to spread the spirit of Christ. And most certainly it is capable of feeling, for it loves and is loved. The lives of the Saints show what devoted love they bore to it in their lifetime, and the way in which they were canonized after their deaths shows the love the Church can bear to those who serve her. The

Church can thus know, and will, and feel; and its knowing, feeling, and willing clearly interact upon each other and unite in a single whole. Maritain was perfectly justified then in saying that the Roman Catholic Church was a "living person."

The same may obviously also be said of other well-organized bodies. I would, for example, say it of the Royal Geographical Society. But the best example is a modern nation. Take, for instance, France. Again it is in no figurative sense, but in a quite literal and practical sense, that we speak of the soul of France, the genius of France, the mind of France. France really does have a soul and a mind and a character of her own. She is as conscious of herself as I am of myself. She is conscious of herself as quite distinct from England, Germany, or Italy. She can feel, for she has a great pride in herself, she has fears of possible enemies, she has hopes and ambitions. Also she can think, for she makes appeals to her citizens and deliberates upon certain courses and then comes to a definite decision as to the line she shall take, whether, for example, she shall or shall not reduce her armaments. And then having come to a decision she has a will wherewith to take action. Also she can love and be loved. The love of Frenchmen for France is proverbial. And how France reciprocally can love her sons we have had evidence in the magnificent tributes to Foch, Clemenceau, Briand, and Doumont. And France has the faculty of combining all this thinking, willing, and feeling in a single unity—herself. Then has not France personality? And has not England, Germany, or Italy?

Many instances there are, then, of personality in organized bodies of men, as well as in single separate individuals. Personality, individual and collective, is a characteristic of men. And, if it is a characteristic of the microcosm, it must reflect in some measure a characteristic of the universe as a whole. The universe we assume must have personality—personality, at least, though it may be of a much higher kind than we yet know. The universe must be able to think, and will, and feel, and by its personality unite these in one—the great "I," or "We," of the universe. The universe must be a living person, just as one's Church, or one's country, or oneself.

And it would be from this personality that would issue that creative love to which we owe our existence and which all desire to experience for themselves. And, while a human creative artist may produce works which remain in static beauty but are themselves unable to take action, that creative organism, the universe, can create creators—beings capable of understanding the world, of loving it, and in the ecstasy of their love creating offspring more capable than themselves of enjoying the world.

More still we may learn about the universe. The whole may contain other and more than may be found in even the highest of its parts. So when to the best of our ability we contemplate the universe as a whole we recognize that it may display all these characteristics and yet perhaps contain something more. Over and above these can we dimly discern something greater still? I believe we can.

In the presence of great mountains, or of a still dawn, or of the love of lovers, or of the silently working processes of Nature at the advent of spring, or the emergence of a butterfly from a chrysalis, we are filled with a sense of awe which the explanations of science heighten rather than dispel. Science tells us that the mountain is made up of certain chemical compounds, and these of atoms, and these of protons and electrons, and that at one time it lay in soft deposit at the bottom of the sea and has, inch by inch, year by year, through millions of years, been slowly raised to its present exalted position. But this knowledge acquired from science does not belittle the mountain in our eyes or diminish our awe in its presence. That awe remains the same—and possibly enhanced. The same also is it with the appearance of the first leaf-bud in spring. Science will tell us of the physiological processes which are going on, of the rising of the sap, and the effect of the increasing temperature and strengthening rays of sunlight. But all the most learned scientist can tell would not lessen our awe at the sight of that tender leaf-bud unfolding, before winter is hardly over, from the branch of a hard, dry, murky tree. Nor could all science tells us about the physiology of human beings take from us that hushed sense of awe we feel in the presence of love. Science does not diminish, it only increases, our wonder, and with wonder our awe, before these manifestations of some unseen, silently working, yet almighty Power.

This awe we feel before single, separate manifestations of Nature. But when we exert ourselves

to view the universe as a whole this sense is immeasurably increased. In the mighty whole we sense a Power and a Majesty and a Glory before which we prostrate ourselves in humblest reverence. And yet in no abject mood of servility. For are not we ourselves of that Power? Have not we that Power in ourselves also? Above all, is not this Power a Power of Love? Does It not attract us to It with an all-compelling attraction? So, as the mountain draws us to it—and at the risk of our life, to its very summit—are we drawn to and not repelled by that Almighty Power. We plunge into It. We rejoice in It. We feel ourselves part of It. It is working in us as in all about us. Our awe is mingled with delight. We are awed by the Majesty of the Universe. But we joy in belonging to it. The Majesty is our own—as a King's Majesty is also his subjects' own, and they delight in it, and cheer it, at the same time as they reverently salute it. And for Glory, Majesty, and Power, combined with Love, and Beauty, and Intelligence—all in supreme degree and compelling both this awe and this attraction—the most fitting word is Holiness.

So the final, the all-embracing characteristic of the universe is holiness. In the whole is holiness. A holiness which awes yet attracts us. A holiness in whose presence we prostrate ourselves in profoundest obeisance, yet a holiness of a sweetness sweeter than the sweetest lovers' kiss, so that we are caught to it with far more than a mother's love for her child, or a lover's love for his loved one : we fly to it as a moth to the light, to give all ourselves to it, and only long to have more in us to give.

This holiness, at least, though it may be far more, is the summing up and culminating, yet also basic characteristic of the universe. The Cosmic Spirit which drives the world is a Holy Spirit, and It drives it towards a higher and higher quality of holiness.

And this Spirit of the universe inspires, and animates, and drives the world just as my spirit inspires and animates and drives me. In a sense it is high above and beyond the world as I am above and beyond my material body. Yet, also, it permeates the whole world and penetrates to every remotest corner and narrowest crevice of the universe. And it operates without ceasing. Never for a single fraction of a second in the minutest particle does it halt in its working. Possibly—who can say?—it may operate with fuller force here and with lesser force there, with the full might of its being now and with a more delicate touch then. It may not exert a constant and uniform pressure at all times and in all places. There may be a rhythmic rise and fall in the force of its impact. Yet, whether with full force or with lightest touch, always and everywhere in some measure it is operative. And it may be counted on for righteousness, as the astronomers infallibly count on it for the fulfilment of their predictions. Men may have as firm a faith in the goodness of the world as a scientist has in its intelligibility. And as a patriot trusts in, loves, and gives his life in the service of his country, so may a man trust in, love, and give his life in the service of that universe which gave him birth, nurtured him, and of which he ever remains a part.

On this view the Cosmic Mind has not merely produced the universe as we see it. It is embodied and embedded in it as a creative artist is in his work of art—embodied in it as a dramatist is in the play that is being acted before us. This universe is not a machine designed, constructed, and set going by the Cosmic Genius, and then left to take care of itself. The material universe is only the outward face expressive of the Cosmic Mind ever active within. Mind must have some material upon which to act. It cannot operate in vacancy. There is no such thing as pure spirit. And the universe is the living body embodying the Cosmic Mind, and the vehicle for its expression, as my body is the vehicle for the expression of myself.

So, as we sum up, we discover that it is in the universe as a whole that we must look for those cosmic factors which brought about that direct reversal of the running-down process which was going on when the earth was parted from the sun. It was due, not to chance, or blind force, that the conditions on the surface of the earth, over a period of a thousand million years, were prepared for the appearance of the minute primordial germ of life, and that from it developed the abundant life that the surface of the earth presents to-day. It was due to the unceasing operation on the earth's surface, not only of the rays of heat and light from the sun, not only of cosmic rays from the depth of space, but, also, of the illuminating rays of love, and love of beauty, from the universe as a whole, and of all these directed by a personality causing them to

work together to fashion beings more and more in its own image—more and more holy in their nature. The universe is an organism for creating holy beings.

Natural selection and survival of the fittest played their part in bringing about this marvellous result. But not the major part. They did not originate life or give the great upward impulse. They merely acted on variations when they had originated. The preservation of favourable variations and the rejection of injurious variations (which is Darwin's description of natural selection) does much to account for the evolution of life from the primordial germ once it has appeared. But for the activating, controlling, directing, co-ordinating, and initiating power which preserves and rejects, and which originated the primordial germ itself, and originates more and more favourable variations, we have to look to the universe as a whole. The environment to which these living organisms are continually adjusting themselves is not only the narrow terrestrial environment, nor even the larger solar system, but the whole universe, and nothing less. And it must have been from the universe as a whole that came those stimuli which first gave them the impulse to respond and then aroused response.

On this view, life would have originated in nothing else than life. It would not have originated on this planet at all. Life would have come to this planet because this planet is part of a living organism. It would have come here as it comes to those particles of matter which I take into my body as food and water and air. As I fashion these material

particles into living cells so would the universe as a whole fashion the particles of matter on the surface of the earth into the primordial living organism. Sir Arthur Thomson has spoken of deeply penetrating environmental changes saturating through the body and provoking changes in the genes of the germ-cell. And it may be precisely the same as between the universe as a whole and the particles which composed the primordial living germ. Deeply penetrating influences from the vaster environment, the universe at large, may have penetrated to this earth, fashioned the primordial germ, and be continually penetrating its offspring, and provoking those changes which we have seen have occurred and which are occurring to-day.

And the theory I would now put forward is that as I fashion cells in my body of higher and higher complexity, till at last I fashion germ-cells in the express image of myself, and capable of developing into a being possessing all my leading characters, so did the universe as a whole fashion living beings of higher and higher complexity—more and more in its own image—till finally it fashioned the great mystics in its express image and capable of loving even as they were themselves loved.

This is what I would suggest. And the conception of the universe which I would offer is that it is essentially a living universe, exhibiting on the grand scale what each of us is, and has been, on the minute scale. Biologists are unable to account for the origin of life, and for the origin of variations, but they do present us with two great facts of cardinal importance. The first is that all life on this

planet has evolved from a single primordial germ of minute dimensions which had itself evolved from a series of increasingly complex chemical compounds. And the second fact is that each of us in himself repeats the same process—evolving from a single microscopic germ-cell which is itself built up of chemical compounds. What I suggest is that these two facts be put together and joined with the third great fact that the universe is an organic whole—not a mere mechanism. And in putting these three facts together the idea naturally arises that, just as a human germ-cell originates in the living body of the mother, through her selecting, and rejecting, and organizing within herself the atoms, molecules, chemical compounds, radiant energy to be found in the air she breathes, the water she drinks, the food she eats, the radiant energy she absorbs; and, besides these terrestrial elements, the heat and light from the sun; and besides these solar elements, the cosmic rays and other influences from the universe at large; and through her maintaining the needful conditions till the germ-cell is formed with its capacity for growth and development into the very likeness of herself—so also did the primordial germ from which all terrestrial life has evolved originate in the living body of the universe, through the universe as a whole selecting and rejecting the atoms, the molecules, the chemical compounds, the water, the air, the radiant energy, the solar heat and light, the cosmic and other radiation from the universe at large and organizing them into this first living thing.

In short, I would suggest that the universe stands

in the same relation to the primordial germ that a mother stands to the germ-cell which eventually develops into a human being. Then that "minute initial bias" in favour of the one system rather than the other, which, increasing at the rate of compound interest as it gathers momentum, gives the upward trend to variations, would come from the universe as a whole.

As long as we regard the universe as essentially material we shall seek in vain the origin of life, for to regard it merely as a chance product of chemical combinations is too fantastically absurd a proposition to be maintained nowadays. But, as soon as we conceive the universe as essentially a living universe facts begin to fall into their place and the appearance of life upon this planet becomes intelligible. It is a miracle, no doubt. But it is no more of a miracle than the appearance in our mother of germ-cells which will develop into ourselves. The x cosmic factors may be summed up in that creative love to which we all owe our very being, and which, in its intensest form, widens into that world-love which the great mystics experience, and which ultimately springs from that Mighty Personality of whom the whole vast material universe is the bodily manifestation.

This would seem to be a saner and far more reasonable and justifiable conception of the universe than the opposite view that the universe is fundamentally material in its nature, that life evolved from matter, and that its appearance on this planet was an evanescent episode not likely to have occurred elsewhere or to occur again.

CHAPTER VII

THE INHABITED UNIVERSE

ASSUMING that the universe is a living universe, and that the primordial germ of life appeared as the result of the interaction of the earth with life in the universe as a whole, we have now to enquire whether the development—the development as apart from the appearance—of life may not likewise be due to the interaction of this earth with life in the universe as a whole. We have to enquire whether there may not exist on the planets of other stars (or, less probably, in the depths of space) beings at least as high as the highest here, and whether it may not have been due to their influence, transmitted on the connecting medium of the universe, that this wonderful development from the primordial germ to man occurred here. In other words, while in the previous chapter we were chiefly concerned with the first appearance of life, it will be with its development that we will be mainly interested in the present chapter. And this enquiry will necessarily involve the question as to whether intelligent beings exist in other parts of the universe, and, if so, where? And speculating on the answers to them is no mere idle pastime without practical value in life. For it will make all the difference to our view of the universe, and our consequent attitude towards life, if we continue to think of the universe

outside this earth as being entirely material, as the teachings of astronomers and physicists would dispose us to think it, or if we find good reason to suppose that it is generously peopled by beings like unto ourselves in all but bodily aspect, as would be the logical conclusion a philosopher might draw from the facts with which science presents him.

An astronomer, concerned as he has to be with the material world only, gives us the impression of a vast universe without any sign of life. It is not his business to look for life. At the utmost, he may report some apparent signs of it in another planet of our solar system. And biologists concern themselves only with life on this planet. We are apt to suppose, then, that the universe is one vast waste of blazing suns with life only on this planet, and only here by the merest chance, and as a transitory incident which will comparatively soon be over. Science, probably, did not mean to produce this impression. But this is the impression which, owing to its being concerned with fragments, and not with the whole, it actually has produced. When most people look up at the sky on a starry night they think only of heat and light, not of life. They do not look upon the universe as peopled.

But if, in accordance with the conclusions reached in the last chapter, we regard the starry firmament as merely the outward face of the Cosmic Spirit, and look upon the Cosmic Spirit as the really important thing to lay hold on, as being what ultimately determines all that is, we would be disposed to take an exactly opposite view of things. We would assume, as a matter of course, that that

Spirit must have expressed and embodied itself in living beings on many another part of the universe than on this insignificant planet alone. It would seem to us the very height of absurdity, arrogance, and improbability to suppose that this planet alone was inhabited by intelligent beings, and that all the rest of this stupendous universe was nothing but a dreary waste of burning suns. We would almost take it as a foregone conclusion that there were other intelligent beings than ourselves in the universe. If there are life and mind in the universe there must be living and intelligent beings we would be disposed to argue. Their existence on other parts of the universe would seem almost necessarily to follow from the conclusion we have already reached. For, if the universe is a living organism informed through and through, and controlled and directed by a Creative Spirit, always and everywhere at work, then, among those millions of millions of stars, and in those millions of millions of years during which they have existed, that Creative Spirit must have found means and localities for embodying itself in intelligent beings. During all that time and throughout all that space the Cosmic Mind could not have remained unexpressed and unembodied until quite recently on the tiny planet of a mediocre star.

But before we adopt these as our final conclusions let us again look into the relationship between what goes on here and what goes on in the rest of the universe.

We are prone to conclude that what has developed latest has been produced by what has

gone before—that when a chicken emerges from an egg and develops into a hen, then that hen has been produced by the egg. And this is, of course, true, but only to a certain extent—only within certain limitations. The hen develops out of the egg, it is true. But we know by practical experience that the egg alone by and of itself could not develop into a hen. If the egg were left alone, by itself, nothing would result—except that eventually it would rot. It is only with the aid and guidance of an already existing hen that the egg develops into a hen. It is only through this hen providing the requisite amount of warmth to the egg, and subsequently, when the chick has hatched out, guiding the chick to obtain the necessary food, day after day, that the egg eventually develops into the hen. Without the existence of intelligence and guidance in its outward surroundings the egg would never produce the hen. The hen would never "emerge" from the egg if it were not for the actual existence of a hen. The actuality, the hen, must exist prior to the potentiality, the egg.

In the same way we are given to think that the primordial living germ which appeared a thousand million years ago did of itself alone produce all the varied life around us. We are rather led by scientists to suppose that the life about us to-day was latent in that primordial germ—that the germ held within it the potentiality of all the colossal later development and that all that has happened since has been a progressive unfoldment of what was already latent within the primordial germ. And that is true to a certain extent. All has sprung

from that original primordial germ as the hen has sprung from the egg. But could that primordial germ, alone, by and of itself, and without intelligent guidance from its cosmic surroundings, have produced all the wonderful life of to-day? Must we not, as in the case of the hen and the egg, assume that the actual already existed prior to the potential—that life and intelligence already existed in the universe at large before the primordial germ of life appeared here, and that it was due to intelligent guidance from the universe as a whole that the primordial germ was able to produce the intelligent beings of to-day? Potentiality for such development would have existed in the primordial germ as the potentiality of the hen exists in the egg. But those potentialities could have only developed into actualities if those actualities had already existed in the universe at large.

Intelligence and life, it would seem, must already have existed in the universe at large before they appeared here. And just as neural messages are borne along the nerve fibres to various parts of the body from the brain, and as light is borne from the stars to the earth on the common electrical continuum which joins all parts of the universe together, so would life and intelligence be conveyed here from those parts of the universe where it was already in existence. As previously argued, life could not have just "emerged" out of chemical compounds however complex; and, similarly, the intelligent life of to-day could not have simply "emerged" out of the primordial germ without external intelligent guidance. To account for the

appearance of life and for its subsequent development we must look to external conditions—and conditions not only on this earth but in the universe as a whole.

These are the reasons which lead us to believe that in the universe as a whole there must be higher levels of existence which would give the impulse to the creative evolution on this earth. They have been most convincingly demonstrated by Boodin in his "Cosmic Evolution." The impulse to organization must come from already existing organization. In the history of the earth the simpler stages of evolution are prior to the more complex and so seem to produce them. But in the universe as a whole the more complex stages would be prior to the more elementary—the actual to the potential—and furnish that little "more" which makes any one level of development potential of a higher level. The lower levels would furnish the body, or instrument, to the higher. But it would be from the higher levels that would come the vitalizing impetus to the lower to raise itself in the scale of being.

These are the grounds for supposing that life could not have appeared and developed here as it has unless intelligent beings had already existed elsewhere, and that in the vast universe around us beings at least as intelligent as ourselves must somewhere exist.

It may be objected, perhaps, that, as life appeared here only under very exceptionally favourable conditions, these might seldom, or never, occur again. But it is not, in the least, necessary that

life should always appear in the same form as it appears on this planet. Here it has come in the form of protoplasm. And it is because protoplasm can only exist between very narrow ranges of temperature, and with a certain amount of moisture, that it has been assumed that life must be so rare an occurrence in the universe. But there is no ground whatever for making such an assumption, or for supposing that life can only appear in the form of protoplasm as we know it here. Life may appear in a multitude of other types of primordial germ. Just as, once it has appeared in a protoplasmic germ, it has branched off into those millions of different forms of life we have on this earth, so protoplasm itself may be only one of thousands of different types of primordial germ in which life may manifest itself in different parts of the universe.

Energy appears in various forms, and there may be many more which have not yet come to our knowledge. Matter is a form of energy, and we know many different forms of matter. Then there are the many forms of radiant energy—light, heat, chemical energy, electrical energy, and so on; and alpha rays, beta rays, gamma rays. And we have no reason to suppose we have exhausted the number of different forms of radiant energy. And so may it be also with life. In other parts of the universe life may have developed from many other primordial germs than protoplasmic forms.

Life may use other chemical elements than those used here in the constitution of protoplasm. There are ninety-two elements to choose from. Not all might be appropriate. And carbon, on account of

its very special properties, might always be a necessary ingredient of living matter. But other elements than those used here might be employed where other conditions required their employment.

Nor can we be sure that those limits of temperature outside of which life cannot exist here are the most favourable for all forms of life. Other forms, displaying a much more vivid activity, might require far higher temperatures than we can bear.

What life essentially is biologists do not profess to be able to tell us. But they do tell us what are the leading characteristics of living matter, and from that we can judge for ourselves whether or no it is possible for life to appear on other planets. Put briefly, life is a way of converting energy into action. We have gone into the matter in some detail in the second chapter and have there seen that life takes up matter from without the living organism, changes it chemically inside the organism, and from the changed material obtains the energy for movement and for other work to be done. So, fundamentally, all that life requires is energy, though it does require that energy organized into such forms that from them it may be able to release the energy for its own purpose. All living things (1) feed, (2) grow, (3) reproduce themselves. Growth (and therefore feeding) and reproduction are fundamental characteristics. And, like organisms of every kind, living organisms have the power to respond to stimulation. But the power of responding to stimuli, growth, and reproduction, all depend upon this building up and breaking down process which we have previously described,

whereby the stored-up potential energy of the food taken in is continually being converted into kinetic energy, that is work done and heat given out. The chemical compounds employed in this process are inconceivably complex, and the process itself is elaborately intricate. But what it all amounts to is that life is simply a process of transforming energy—of organizing energy into higher forms. It takes the most highly organized forms of energy, as found in the most complex chemical compounds, and—for a time—builds them up into still higher forms. As Professor Goodrich says, "A stream of non-living matter with stored-up energy is built up into living matter, having yielded up the energy necessary for the performance of the various activities of the protoplasm."

These are the fundamental characteristics of living matter. And when we take Goodrich's further statement that if we analyze one by one the distinguishing features of living matter, they can all be paralleled in inorganic nature, no one universally present in the first being universally absent in the second, complex chemical compounds, cyclic changes of matter and energy, even self-regulating mechanisms, all occurring in the non-living world—if we take this also into consideration, then there seems to be no insuperable obstacle in the way of our supposing that on other planets the energy in complex chemical compounds may be seized upon by life and built up into still higher forms, capable of yielding up energy for still higher activities.

And if this is the case it follows that a primordial germ need not be of the protoplasmic type which

appeared on this planet. The chemical and physical processes may be integrated, and potential chemical energy accumulated, in other parts of this universe, in many forms different from the protoplasmic form in which the energy has been accumulated here. That same Power—that Mind—which brought about on the surface of this planet all the intricate combinations and delicate adjustments of those stores of energy, the atoms, till at the end of a thousand million years that marvel, the primordial germ of life, appeared, must presumably be making combinations and adjustments of atoms and groups of atoms on many another planet. Each primordial germ may be quite different from the protoplasmic germ we know here, and from all others. But every one of them would be an accumulation of potential chemical energy. Every one would have the power of response to stimuli, of feeding, of growth, of multiplication, and of development. Each would contain the seed of progress. And from each would eventually spring as immense a variety of life as we have on this planet. This seems, as already shown, to be the very justifiable inference from the facts we have before us—the facts, namely, that the whole universe is interconnected and interrelated, made of the same material throughout, and everywhere subject to the same laws, and that, despite the second law of thermodynamics, the chemical elements on this planet's surface were so worked up during the first thousand million years that chemical compounds of increasing complexity occurred till at last one appeared, at the same time so stable and yet so fluid, that it was

able to grow and reproduce itself. It stands to reason that if this could occur here it could occur elsewhere.

The complexity of the conditions necessary for the appearance of life affords, then, no insuperable objection to the supposition that life may exist on other planets of other stars in the universe. And, once it has appeared, there is no reason to doubt that it would eventually develop into beings as intelligent as ourselves. There would in various parts of the universe exist beings on all the levels of existence up to at least the highest we know here.

To bring the position more vividly before us let us consider the state of the universe 10,000 million years ago. This is no long period astronomically. The sun is five hundred times as old. It has existed for probably 5 million million years. And so have most of the other stars, and many for far longer periods; 10,000 million years ago is, therefore, no impossibly long period to take. But this was long before this or any of the planets of this sun existed. Are we to suppose then that *no* planets anywhere existed and that, therefore, life could not have been in existence? Astronomers do not go so far as that, though some, as we have seen, do say that the existence of stars with a planetary system like our sun must be an exceedingly rare occurrence. Against this view it is, however, contended that planets may have arisen through the fission of a star, which is a very ordinary occurrence. And if the stars are as numerous as the grains of sand on all the seashores of the world it would seem that the

number of planets in the universe may still be considerable.

Moreover, if Jeans is right in his latest suggestion made at Cambridge, in November 1982, that our galaxy of stars revolves round a hub, then it would follow that the stars would be closer to each other near the hub than they are far from it as our sun is. In that case, the near approach of two stars to each other, and the consequent drawing away of filaments from a star to produce planets, need not be such a rare occurrence as had previously been supposed, even in our own system of stars—and our own is only one of millions of nebulæ.

So we can get the planets from the astronomers.* But are any of them fit abodes for life? Is a single one? This question falls in between the astronomer and the biologist. Each is inclined to say it is outside his province. It arises in a kind of no-man's-land of science. Science will, however, sooner or later have to occupy that land. And with the intrepidity of the explorer I venture into it, but with the prudence of the experienced explorer I equip myself beforehand with all that can aid me to carry out my object successfully.

The cautious astronomer, not much interested in planets except of our sun—much less with the question as to whether there is life on them, points out the extraordinary concurrence of conditions that made the emergence of life possible on this planet and gives us little encouragement to hope that such a happy concurrence could ever happen elsewhere. The exactly right temperature alone

* See also chapter I, p. 17.

seems a bar. Life, they point out, can only exist between a very short range of temperature, between say 60° below zero and 125° above. But the temperatures in the universe range between millions of degrees. In the interior of a star the temperature is fifty million degrees centigrade and at the surface of the sun it is 6,000 degrees. And in the depth of space the cold is near absolute zero.

Then water and moisture are required for life. Also a very complicated combination of chemical elements, especially of carbon. Unless there had been the exactly right combination of all these conditions—unless there had been the precisely right temperature, the right pressure, the right electrical conditions, the precisely right amount of moisture, the precisely right combination of carbon, oxygen, hydrogen, and nitrogen, no living protoplasm could have come into being. If this earth had been a few million miles nearer the sun it would have been too hot. If this earth had been a few million miles further away it would have been too cold. If the carbon had been absorbed in the interior of the earth, and none had been left on the surface, there could have been no suitable chemical compound as a basis for life. So it was only by a happy combination of most fortunate circumstances that life arose here. And it would be in the highest degree improbable that such a combination should occur again elsewhere. Thus the astronomical argument runs.

But all this, in my view, is an argument not against but for the appearance of life elsewhere. For we cannot suppose that this happy combina-

tion occurred by chance. As has been already argued, the very fact of the fortunate combination points to the existence of a Mind behind things. And from other considerations we have been led by different routes to the same conclusion. By philosophers of many different types of philosophy it is nowadays taken for granted that there is Mind at the source of things. Instead, then, of supposing that that exceedingly intricate adjustment of many different factors which produced life occurred by chance, we may reasonably assume that it was made by Mind. And if Mind could produce such a combination on this planet it could produce an equally effective combination elsewhere. For the Cosmic Mind is always and everywhere operative, and it would be working on every other existing planet in the universe. So there may be many planets in the universe fit for the abode of one or other of many possible forms of life.

Let us examine this position in more detail. The universe we have assumed is an organic whole actuated by mind. But a whole can only act through its parts. It can only operate through the reciprocal action of the parts upon one another and upon itself.

As an example of such control of the whole through the interaction of the parts let us take the human organism. Then let us apply that example to the universe and see if it enables us to understand how life may have appeared on planets of other stars and developed into intelligent beings.

Let us take an Everest climber. He is organized in a hierarchy of levels of being, each interacting

with the other, each influencing and influenced by the other, all interacting with the whole, and all under the ordering activity and dominant control of the whole—the man himself. To the physico-chemist he exhibits the interplay of atoms of various chemical elements—oxygen, hydrogen, nitrogen, phosphates, etc.—and the organization of these atoms into molecules of various degrees of complexity, and of the molecules into chemical compounds of various degrees of complexity. The physico-chemist would see the Everest climber at the material level. Then the physiologist would see all this, but would see, also, the organization of these atoms, and molecules, and chemical compounds into something still more complex, namely, cells, and these cells into tissues, muscles, bones, nerve fibres, the brain, heart, lungs, and other organs of the body. He would see the Everest climber at the physiological level. Then would come the psychologist, and he would note what his two predecessors had seen, but he would see, also, mental activities. He would observe signs of intelligence, signs of past experiences being recorded in the brain, and of a mind reasoning on those experiences, and profiting by them. He would observe also signs of a will taking action on the decision reached. The psychologist would see the Everest climber at the mental level. Lastly, would come the man of spirit, and he would note all that the others had seen, but he would observe something in addition. He would note that what was driving the Everest climber to climb Everest was a spiritual force—the love of adventure and of high achieve-

ment. He would see the Everest climber at the spiritual level.

Now all these levels co-exist with one another, and interact with one another, and, under the dominant control of the spiritual level, form one whole—the personality of the climber. How they thus interact, how interdependent the various levels are, and how the control is exercised, we can observe as we watch the climber from start to finish. The mind deliberating thinks of the fearful cold, the piercing winds, the hardships to be faced, the risks to be run, the utter exhaustion due to lack of oxygen at great heights; and if it deliberated wisely it would decide to remain at home. And, if that decision were made, the organizations at the physiological and material levels would duly function all the same. But the mental level is under the domination of the spiritual level. Love of high achievements overrides the decision of mere calculating wisdom. And by the spirit of adventure the Everest climber, instead of being allowed to remain at home, is driven to near the summit. But there he suffers the consequences of his seemingly unwise decision. The lower levels exert their influence. There is not sufficient oxygen in the air. The chemical combinations cannot be duly made. As a consequence, the physiological organs, the lungs, the heart, the blood, the brain do not function perfectly; and through their not functioning properly the mind acts sluggishly, the memory lapses, and any calculation is an exertion. And because his mind is so sluggish his spirit faints. So as he nears the summit all the burning enthusiasm which drove

him on the enterprise has diminished to a flicker, and he plods on mechanically, indifferent as to whether he reaches the summit or not. Perhaps he loses his life and it may seem as though it were the lowest level, the material level, which had, in the last resort, prevailed over the higher, the spiritual. But this would be an erroneous conclusion. For the spirit remains. The individual dies. But his spirit survives. And it works on all the more effectively because of the manner of his death—because his death proved the strength of his spirit. After his death his spirit drives climber after climber to the summit till at last it is attained. In the long run it is the spirit that prevails. Also the mind gains in experience and learns how to deal with the situation, the exactly right equipment to take, the best season at which to make the attempt, the proper length of stages, and so on. At the physiological level, too, the cells learn to adapt themselves to the new conditions, and to find ampler ways of gathering in the required oxygen. So it is not, after all, the lower level but the higher which prevails. They all influence and are influenced by each other. They all interact with one another. But they are all under the dominant control of the spiritual level. It is the spirit of the Everest climber that dominates him and controls and guides his whole self.

But how did this spirit of high achievement come to the Everest climber? Clearly he caught it—imbibed it from the atmosphere in which he lived, and because he had both the sensitivity and the initial capacity to receive it and respond to it. Similarly,

he received his mental capacities from his surroundings. At the moment of his birth he had only the barest rudiments of intelligence—nothing that could properly be called mind. And if he had been left to himself he could not have survived at all. It was from his surroundings, from his mother, his nurse, and others who cared for him during his babyhood and infancy, that he received that mental stimulus which, acting upon his inborn capacity to respond, raised him to the mental level of being. Again, it was from their surroundings—from the cells—that atoms and molecules gained the stimulus which raised them to the physiological level. In all cases, it was from the surroundings that the stimulation came which enabled the unit to rise in the scale of being, though the impetus to respond was in itself.

How the various parts communicate with one another has next to be investigated. How does the spirit of adventure communicate its spirit to the mind? It is difficult to say; but we know how the story of the great adventure thrills anyone possessed of a disposition for adventure, and this thrill we may suppose in some manner sets the brain vibrating. How messages are communicated from the brain to the muscles or glands is well known. The brain is connected with the muscles by nerves, and nerves are bundles of exceedingly fine fibres. An impulse of an electrical, or chemical, nature is released and sent along the nerve to the muscle, and movement of a limb may be the result. And on the physico-chemical level we know how, by means of hormones, chemical messages are carried, prob-

ably through the blood, to regulate the growth, and stimulate the energies of the parts.

Thus through the dominating control of the spirit —of his love of high achievement, and through the interaction of the parts, the Everest climber acts as a whole—as a personality.

Now the human organism is, according to the organic view of the universe which we are maintaining, a repetition in microcosm of what the universe is in macrocosm. The human organism would indicate to us on a small scale what the universe is on a big scale. From our study of the Everest climber we would infer, then, that in the universe as a whole there would exist those same spiritual, mental, physiological, and material levels, all interacting with one another and with the whole, and under the dominant control of the highest level, that we have found in him. And, just as there cannot be love of adventure without lovers of adventure, so in the universe as a whole there would not be love without lovers, love of beauty without lovers of beauty, thought without thinkers, or will without willers. On the various levels there would, therefore, be embodiments of the particular quality of each level. And it would be through these agents and instruments that the interaction and control would be effected.

Part would stimulate part in the universe as in the Everest climber. There would in the universe, as in him, be intercommunication of influences on the material, the physiological, the mental, and the spiritual planes. Each part of the universe would send out impulses characteristic of itself to all other

parts. And all would be under the control of the whole. And as air waves influence organisms till they are brought to construct an organ, the ear, by means of which they may respond by hearing sound, so may subsidiary organisms all over the universe be stimulated to construct organs whereby they may the better respond to the influences bearing in upon them.

Thus it would have been that life came to that complex chemical compound which formed the germ-cell from which the Everest climber eventually developed. The atoms of oxygen, hydrogen, nitrogen, etc., would have been combined and interrelated with one another and infused with life under the influence of the mother-body as a whole. Within that body and under the control and guidance of the whole the exact conditions were provided and the exact combination and intricate adjustments made which resulted in the complex chemical compound becoming the living germ-cell. And in like manner, we might suppose that it would be in the womb of mother-universe that the conditions would be provided, the precise groupings and combinations brought about, and the exact adjustments made by which living germ-cells might result on many a planet in different parts of the universe. And we might further suppose that, just as mind came into the Everest climber in his infancy through his being brought up under the influence of surrounding intelligent beings, so would mind come to living beings on these planets through their being brought up under the influence of surrounding intellectual beings in the universe at large—

that influence being communicated from the one to the other as light reaches this earth from the stars and as wireless communications are received here.

In short, as germ-cells are brought into being in the human organisms here, so would we suppose that they are brought into being in that one all-inclusive organism—the whole universe. And as mind is stimulated into existence through the influence of surrounding intelligences here, so would we presume that mind came to those developed germ-cells in other planets through the influence of surrounding intelligences in the universe at large. By responding to the stimuli from the higher levels, beings on the lower levels would gradually become attuned to them.

So we may conjecture that, under many different ranges of temperature, and employing many different combinations of chemical elements, life may have appeared on many planets in many different forms than protoplasm.

Then on each planet on which it appeared life would, from that initial pattern, branch out into multitudinous forms, as life has branched out here from the first speck of protoplasm. Each planet would have, that is to say, its own particular type of architectural unit, or brick, which it would use for building its variety of life-forms. One form of brick would be suitable for the conditions existing on one planet, another form for conditions on another. Here it is protoplasm. In other planets it may take on many different forms.

There seems, then, every probability that millions

of years ago, though life had not appeared here, it was thriving on many another planet in other parts of the universe.

Under the dominant control of the cosmic genius the parts would be constantly acting upon one another. The ordering activity of the whole, through the innumerable parts, great and small, all over the universe interacting with one another, would bring about on many another planet besides this earth the conditions suitable for the emergence of primordial germs of various types of life—here protoplasm, there proto something else. But all with that same characteristic of life, the capacity to grow, and multiply, and develop, and vary. The living beings on one planet would under the dominant control of the Cosmic Genius stimulate the beings on all other planets. Those on a lower level might for long ages be unaware of the stimuli that were impinging upon them. But, at last, under the impact of these stimuli an organ would be developed enabling the recipient to receive and respond to the stimuli, just as our eyes have been developed to receive and respond to the stimulus of light. Through energy in its different forms, including its highest form, namely spiritual influence, being communicated from one part of the universe to all others, however distant they may be, and even though it may take a million years to reach the one from the other, living beings would be continually raised in the scale of beings. As the sensitivity and initiative of the responding agents developed they would become tuned to the higher levels.

These are my grounds for supposing that living

beings exist on planets of other stars than our sun.

Shall we now be bold enough to conjecture what these beings may be like? Their bodily appearance we, of course, cannot picture. It might be anything. But what they really are we can quite easily —and profitably—imagine by the simple process of intensifying what we ourselves are in our most truly real moments. When we see the hazy outline of a new country from the deck of a ship it all seems wrapped in mystery. What is going on inside that violet haze? What kind of inhabitants are at work? we keep on asking ourselves. As we approach the shores of India, or of South Africa, or of a tropical island, these are the thoughts that intrigue us. Then, as the ship draws nearer we observe the little figures in crowds upon the seashore. These tiny specks, then, so minute in comparison with the whole landscape, are the beings who hold the secret of the mystery. We long to see them closer. And when we land the proportion is all altered. These have grown while the landscape has dwindled. They are the factor that counts, while the land in which they dwell is only the framework of the picture.

I have that experience in mind as I approach the shores of a planet—of, say, Altair. What are these Altairians like? On many other planets of other stars I assume there are living beings. But these are probably not much higher than myself. It is different with this planet of Altair, because here are beings far higher than men—beings reputed to be the highest in the whole universe—beings who

in the highest degree embody the Cosmic Spirit of the universe. What are these beings like? I again and again ask myself as I approach nearer the planet.

Equipped with more delicate organs of perception than our eyes and ears we may surmise they would be. They would have windows to the world around them where we have only dense walls of the flesh. Where we have hardy integument they would have the sensitivity of the eyeball. Where we see only colours from red to violet they would see infra-red and ultra-violet. And so fine would be their perception that they would detect the most delicate shades and hues and tints and nuances of each of these colours, so that the whole universe for them would be ablaze with beauty. Sounds, too, they would hear that not even a deer would distinguish, or the ear of the most musical. Their whole range of seeing and hearing would be vastly extended. And their speech and their song would be capable of the finest shades of expression, we might well suppose.

Consummate artists in the art of living we might also suppose them to be—tremulously excitable and intense in their response to the finest impressions, and with an exquisite sense of the rhythm of things.

Their profounder knowledge of the world about them would also enable them to utilize more fully the energy of the universe in all its manifold forms. The energy stored up in the atom they would make available for any use they required, whether of transportation or communication. And the material of the world they would likewise know how to bend

and shape and forge and anneal for their own constructive and instrumental requirements. Complete mastery over matter and energy would be theirs that they might use it for their own spiritual purposes.

But it would be in the intimacy of their communion with the Cosmic Mind that they would chiefly excel. As ardent patriots glow more fervently with the spirit of their country than the average mass of their fellows, so would they burn with the Spirit of the Universe. Afire with that Spirit, they would lead a far more intense and vivid life than ours. They would be more sensitive to every faintest vibration of the universe, as well as conscious of its great rolling rhythms, be more surely discriminative in choosing what stimulus to accept and what to reject, and, having selected, be quicker in their response. By no cumbersome, categorical reasoning would they reach to true knowledge. Straight and swift as an arrow would they speed to the heart of each situation, and by sure intuition pierce clean through knowledge to the finest understanding and wisdom. Nor by any heavy medium would they communicate with one another, but with the methods and language of lovers.

And, being of this highly receptive and responsive nature, they would be capable of the highest raptures of enjoyment, as well as of the most poignant griefs, and of giving clearest expression to what they so passionately felt. With more than the abandon of the lark would they throw their whole beings into the expression of their feelings and fling

themselves upward in the soaring ecstasy of their joy.

Striving they would always be. Their life would be one long strife. For life is strife. Striving to express all the holy love that was welling up in them from the fountain springs of the world. Striving to draw more of it into them. Striving to give more and more of it out, and express it to others. Striving to fill the world to the brim with what they could not contain in themselves any longer.

Yet not all strife would their life be. Alternating with their striving would be deep and fruitful pauses and silences when their souls would be still and at rest. And in those holy moments great peace and contentment would be theirs. All the world for them would be flooded with beauty. Their hearts would beat with the heart of the world. In every object around them they would see the world-heart beating too. Out of this close communion would flow a glory which only they would have the vision to see. And from it they would draw refreshment for still further striving.

But only a few rare souls would be vouchsafed such plenitude of revelation and such intimacy of communion with the Spirit of the World. And they would stand at the very apex of Altairian life. Below them would be many planes of Altairian development, and on each descending level an increasing number of units. In all, there might be hundreds or thousands of millions. And among them there would be great variety. Each one would have his own distinctive individuality which he would preserve with the firmest tenacity. And all

would possess personality, for personality would certainly be among the essential characteristics of the Altairians.

Then each, on whatever level, would go through a course of development from the time of his birth—in this process ascending from lower to higher levels of being. None would be born absolutely perfect. All would have to perfect themselves—striving, struggling, enduring, sacrificing, suffering, in order to fulfil the strong impulse within them, and obey the high call from above. No soft, luxurious, lotus-eating existence would Altairian life be. The joy of their life would come from the very intensity of striving in the pursuit of their goal.

Then Altairians would not be the only living beings on this planet of the Altairian system. We must assume that there would be many other forms of life of lower degree, as there are animals, birds, reptiles, insects, fishes, etc., here; and that, also, there would be that form of life, like plant life, on which the others could feed. But all, from highest to lowest, and in all their multifarious forms, would be built of the same "bricks," as we are from protoplasmic cells, and would spring from the same primordial germ of life which developed in Altair, as all life on this earth sprang from the primordial protoplasmic germ.

And we may presume that, as they would be built on the same general pattern as living beings throughout the universe, they would possess a quivering susceptibility to every influence pouring in upon them; and having a very full knowledge of the physical constitution of the universe, they would

have devised means of communicating with the inhabitants of other planets of other stars throughout the universe, including our sun, and thus be able to exchange ideas and increase their knowledge of the universe.

This, then, as we approached the shores of this planet of Altair, and peered through the dreamy haze in which it was shrouded, would be what we would figure in our minds the Altairians would be like.

But these Altairians would not be the only living beings in the universe. They would be the highest, but there would be others of many different grades in the scale of being. And I would picture the universe as teeming with life of a wellnigh infinite variety of forms the majority of whom would be pursuing their lives as unconscious of the lives of others around them as the bees on the battlefields of Flanders were of the titanic struggle that was going on immediately around them in the Great War. Even we men work out our lives unconscious of and indifferent to what our fellow-men are doing in different parts of this earth. We in London lead an intense and busy life and are full of the importance of it. But what does a Patagonian know or care about it, and, for the matter of that, what do we know or care about the life which the Patagonians lead, and which to them is supremely important? Then there is all the animal life going on about us of which we know but little—the life which bears lead in a Rocky Mountain forest, or wild goats lead on the mountain sides in the Himalaya,

or rhinoceros lead in a river swamp. A few naturalists and sportsmen know a little about these lives, but most of us know nothing and care nothing. It is as little to us as our life is to them. A Cabinet Minister, busy with balancing his Budget, cares nothing for what polar bears are doing, and the polar bears care nothing for him, important as he, quite rightly, is in his own eyes and in the eyes of many millions of his countrymen. Then there is the bird life. The eagle and the vulture soar aloft looking down upon the little specks of human beings far below, but what are we men to them? We can be mere insects in their eyes. And the ducks in St. James's Park: in their courtship, in the life of duck and drake together lazily basking on the green lawn, in their solicitude for their ducklings, what care they for the King of England in his Palace close by—the King to whom 400 million of men pay willing homage—or for the Guards in their bearskins, so full of their grandeur, or for the Lords of the Admiralty sending out wireless messages to the British Fleet on the distant seas, or for the Foreign Secretary doing high business with Ambassadors from every country, or for the Secretary of State for India?

And if we extend this conception to the whole universe we shall see how possible it is that life may be going on around us in many other parts of the universe. We may be as unaware of the very existence of living beings in other planets as herrings are of swallows. Yet that life may be going on all the same. If the Cosmic Spirit is at work now as it has been for millions of millions of

years, there may be the same myriad forms of life in different planets as there are on this earth. We may be as indifferent to their life as bees are to men. But the life may be there.

In some of the planets it may be only as yet in the first primitive stages; in others it may be of a different type but on the same level as the lobster, crabs, and crayfish; in others it may be on the level of the apes; in others of us men; in a few on a level as much above us as we are above the apes; and in the supreme planet it may be as I have imagined the Altairians. Yet, differ though these beings might, they would all, throughout the whole universe, be as interrelated, and interconnected, and interdependent, as are the marvellously varied forms of life upon this single planet. Every form of life, wherever it may occur, will be built up of the same material, namely, energy in its various grades of organization. And the life will be one life, derived from the same original source, and informed by the same Spirit.

In this wise, we may conjecture, is the universe inhabited.

CHAPTER VIII

THE GOVERNANCE OF THE UNIVERSE

So far, we have considered only individual Altairians. Now we have to imagine them in community. And in community not only with themselves but with the inhabitants of other planets throughout the universe, with all living beings, with all other parts of the universe, and with the universe as a whole. And this need not be so impossible or so fanciful a task as it might appear. For, as we have seen, the universe is a tightly interlocked system in which each part is related to all other parts, affecting and affected by them, and all are under the control of the whole and animated by the Spirit of the whole. No two things or beings in the universe are exactly alike. On the other hand, no two things are absolutely unlike. A common spirit will be running through the whole, creating a similarity amid singularity. And the same principle will apply to communities. Communities on Altair may differ from communities here. Yet they will be animated by the same spirit and we may very reasonably and profitably speculate upon their nature, and how they would be related to other communities throughout the universe and to the one supreme community—the community of the whole life of the universe.

We may suppose, then, that in them the sense of

community will be peculiarly strong. *Esprit-de-corps* will be at its most fervent pitch. Whether it be love of family, love of whatever with them would correspond to country, love of Altairianity as a whole, or love of the universe, in every case the passion would be intense. Those flaming with the spirit of the universe would kindle the spark in others. Love would fly from heart to heart. Their power of telepathic communication, their quick intuition, their capacity for reading the hearts and minds and souls of others, and the facilities for rapid transportation from place to place would all favour ardent community life. Groups, and groups of groups, interlocked with one another we can safely assume there would be; for such formation and interconnecting of groups of units is a fundamental characteristic of the universe. Each group would fight hard for the preservation and development of its own individuality. But each would strive just as keenly to associate itself with the groups in a larger community, and in the welfare of that larger whole find the best guarantee for its own richer development.

With these communities, as with individuals, life would be strife—vigorous striving—striving for life and for more abundant life. All—communities and individuals—would be ever striving to reach higher and higher, to live more and more in accordance with the Holy Spirit of the World, to realize there, in this life, the vision which is in the Cosmic Mind. They would be ever striving to have a clearer and clearer idea in their mind of what that vision is and would be urgently striving to

better the world in conformity with it, to better life in their own particular communities, to better life on their own particular planet, and finally to better life in the whole universe—to create homes in which love reigned, to create countries in which love reigned, and to create a whole universal life in which love reigned. They would strive to create a New World Order on the scale of the universe.

But all cannot be on the level of the highest. That is a rule of the universe. The lowest may be on a level. There is sea-level. But the highest is always in peaks. Even then, neither mountains, nor men, nor angels can remain at the highest. The loftiest peaks, in the end, are levelled to the sea. The soaring lark comes back to the earth. For all that, there is this upward thrust from within, or this compelling call from above, to reach up to the heights again and again. The mountain may be levelled, but even as it is being levelled another is rising elsewhere. The lark performs its homely duties on the earth and then once more soars to heaven. And when he finally returns to earth another takes his place. One man succeeds another in reaching the highest peaks of attainment. And among the Altairians it would be the same. They would not all be on the highest level, most would be at sea-level. A few only would be on the peaks, and those only for a time. But there would be among those who had reached highest the same urgent need in their souls, everywhere felt, to help all others upward that they too might enjoy the delights of attainment and know the glory of the vision from the mount.

And of all communities in Altairian life that one of intensest living would be the family. From the universality of attraction and repulsion, we may assume as probable that on the Altairian planet, as here, sex in some form would have developed. Among all levels of life, from the very lowest to the very highest, there would be what answers to the male and the female from the union of whom a new generation would be born, and the perpetuation of the race be thereby achieved.

That would be the closest and most perfect unity of all the communities among the Altairians. It would be inspired direct by the Cosmic Spirit itself. It would be the highest form of unity in the universe. And from that union all community life on the Altairian planet would spring. On the "woman" side would come the offspring which would renew the life of the planet. And from the "man" would arise that ecstasy of desire to bring all others to share in the joy and exaltation of life which direct contact with the Universal Life invariably brings. And from both would flow a living stream of love irresistibly drawing others to them. The rigid exclusiveness of their attitude before union would now be redeemed by the compelling inclusiveness of their subsequent attitude; they would brim over with love for every living being. Only in the happiness of all others would their own be complete. Indeed, without continual refreshment from the whole world their union would become sterile and they themselves dwindle.

And we may well imagine that among these highly cultured Altairians the married man and

woman would form one unit. Between the two there would be such close reciprocity, such constant interplay of stimulation and response, first the "man" stimulating and the "woman" responding, and then the "woman" stimulating and the "man" responding, that it would be hard to think of them as of two sexes, but rather as of one—not as two persons, but as one person, neither being complete without the other. The highest unit among the Altairians would be neither a "man" nor a "woman" but a "man-woman."

And that sense of sacredness—that sense of standing on holy ground—which they would feel in contemplating the culmination of their union, they would feel also in all great gatherings for worshipping the beauty of holiness and stretching their hands upward to the highest. Those who in a pre-eminent degree had a sense of communion with the Cosmic Spirit, who desired to devote their lives to entering more deeply into it, conforming their lives to it, and acting upon it, would form themselves into tightly bound communities for mutual inspiration, and mutual emulation, and for joining together in general worship of the great object of their adoration. They would unite in prayer—in throwing themselves out in imploring supplication that they might be enabled to enter more deeply into the spirit of the universe, and that it might enter more deeply into them.

Then, mutually stimulating and emulating one another, a few in rarest moment would attain the supreme heights. Tuned up to the highest pitch of their being, they would feel themselves in closest

communion with the universal spirit. In the rush of that spirit they would be caught up to the very pinnacle of being. Consummate life would be theirs. They might agonize in the very intensity of their joy, but before it they would be helpless. And Holy, Holy, Holy would they feel the world. Unutterably Holy. Awe-ful, indeed, would be their communion, yet of a sweetness which would sweeten all their lives, and working hiddenly in them for ever after it would unfailingly find its expression; till to them everyone would be drawn, as a bee to the flowers, to sip of their honey.

Those of them with a sense of art would work to give the highest possible expression to the living joy that was in them. In music and drama, at least, and in other forms of art unknown to us they would fulfil the need within them to satisfy their own souls by communicating to others the fire within. And they would form themselves into societies for the encouragement of their several arts, to give the greatest of them the means of exhibiting, and communicating to others, the intensity of their delight.

In like manner Those with a special call to discover the deepest truth of things would devote themselves to philosophy and scientific research. They also would form themselves into groups and societies for comparison of notes, for the spread of knowledge and of new discoveries made, for the encouragement of rising members, and for honouring the great leaders of thought and discovery.

Others again would devote themselves to applying the knowledge obtained. They would be the great inventors, and "men" who would learn how

to mould and fashion the material to their requirements, how to harness the energy of the universe to their purpose, and how to obtain from the material world food for the maintenance of their bodies. And these too would associate themselves in bodies for their mutual encouragement.

For the control of their general affairs there would also be organizations to carry out the general will of the various communities, and to work for the good of the whole. They must in some manner be held together, controlled, and directed—governed, in fact. Their presumably strong sense of *esprit-de-corps* would be a help to those who might be responsible for control. On the other hand, the very keenness with which they would reach after the highest, the strength of conviction which beings of such intensity of life would have, and the tenacity with which they would hold to their convictions, might be bars to unity. We know what differences there are amongst religious leaders, leading men of science, the foremost philosophers, and the greatest men of art. There is not a religious leader who has not met with the fiercest opposition. Darwin was outrageously denounced. No two philosophers have ever agreed. And Shelley is not the only poet, nor Millet the only painter, who has had to fight his way through opposition. And as it is here, so presumably it would be, only in an intenser degree, in Altair's planet. There would be the strongest opposition between individuals and groups to one another.

But opposition need not mean division. What united them at bottom and what they were aiming

at above might be keeping them together in spite of their oppositions. The members of an Everest Expedition have the strongest convictions in opposition to one another on many a feature of the expedition. They differ as to the method of attack, the season for climbing, the equipment to take, the food to eat. But they are all agreed in their determination to reach the summit, and they all know that they can only do it by hanging together. So after a point they sink their differences, they dwell on what unites them, and they strike for the summit.

So also may it be with the Altairians. Opposed as they may be to each other on many a subject, in the great purpose of their lives they would be united. In striving for the highest they will be one at heart. The same clear vision would be before the eyes of all. And all would be bound together by the same strong *esprit-de-corps*.

But perhaps they might not be organized on the same tight and rigid lines as we are. Perhaps there might be more fluency. Perhaps whatever organization there might be might only be to give special geniuses a means of making themselves effectively felt. Perhaps in place of stupendous organizations extending over vast territories and functioning for long periods of time there might be flexible, pliable yet strong little bands of leaders and followers—the band being a useful instrument whereby the leader could disseminate his ideas and spread his influence, and the followers catching from close personal contact with a master-spirit inspiration as to the way in which they in their turn might become leaders—

as each ought to aspire to be. This was the way of Jesus and his disciples, and this is the way the Hindus follow to this day.

But we must assume that among these leaders would be one who would by all be recognized as the supreme leader. Like the most leading Altairians, "he" would really be a pair, a "man" and a "woman" so united as to be reciprocal in their activities, so mutually stimulative and responsive as to act as one—as indeed we have an example in General and Mrs. Booth, the great founders of the Salvation Army. What he would be like I have tried to pourtray in the chapter entitled "The World-Leader" in my "Life in the Stars." Here I will only note that I would presume that he would not govern by command and decree so much as by the power which, perhaps insensibly, issued from him. He himself would be super-eminently in accord with the Holy Spirit of the World. That Spirit would be surging through him in greater strength than in any other. His own life would be dominated by that Spirit. And by the power of that Spirit he would dominate the whole. It would be spiritual domination then. And the greatest would bow to it.

But we must not lose sight of one consideration. It would be only after he had attained the height of his power that he would exercise this surpassing influence. He would not always have been thus powerful. He would have had to work his way to that supreme position. Like the rest, he would have been born, come to maturity, trained himself in spiritual things, and doubtless at great cost and sacrifice and through much suffering risen to these

spiritual heights. He would have passed through all the lower grades of spirituality in making his way to the summit. But when he had reached the very zenith of spiritual attainment he would for that time be the supreme embodiment of the Cosmic Spirit. Even then he would not exhaustively express that Spirit of the World. He would not be an absolutely complete manifestation of it. For the Spirit is infinite and never could be fully and finally expressed in any one finite being. But he would be the fullest living manifestation, and it would be through him that for the time being the Spirit would act.

For it must be specially noted that the Cosmic Spirit *can* only act through agents. As we have before remarked, it must embody itself before it can act. Love can only love through lovers. Thought can only think through thinkers. Personality can only act through a person. France can only act through Frenchmen. Do away with lovers and there would be no love. Or with thinkers and there would be no thought. Or with persons and there would be no personality. Or with Frenchmen and there would be no France. Similarly, the Cosmic Spirit must have agents through which to act. It is not a ghost-like phantom. And it is only in, and by, and through, its agents that it exists—as France only exists in, and by, and through, Frenchmen; and I exist only in, and by, and through, the cells of my body.

This World-Leader in Altair would, then, be the highest expression for the time of the Cosmic Spirit. But it would be part of his very being that

he would be aching to raise up not only the Altairians—not only the inhabitants of his own particular planet—but the inhabitants of every other planet throughout the universe. To every single living being he would want to communicate the blessings he himself had known. All he would raise to the full height of their capacity.

By the methods suggested in a previous chapter it is quite conceivable that the power emanating from him and irradiating the Altairians could be transmitted, as light to our knowledge is, over the whole universe. As material light generated in the stars is transmitted far and wide over the world, so also might spiritual light generated by inhabitants of the planets be likewise borne to illuminate every corner of the universe. Speeches are, by means of the radio, broadcast round the earth. And if we are to hold true to the idea of the interconnection of all parts of the universe we might well imagine that spiritual influences from the Altairians might be broadcast round the universe.

Then we would see the truth of the saying that "Every good gift and every perfect gift is from above and cometh down from the Father of light" (St. James i. 17). And we would discover that no blind force or fatal necessity was directing the course of events, but the power of a personality. And, being a loving personality, he would be ordering all things "sweetly" as well as "mightily." The universe would be under the magistracy of love. And the love would issue from neither a Father alone nor a Mother alone, but from the union of the two, from the personality of

Father-Mother acting reciprocally upon one another, the one completing the other.

While that would be the general outline of the picture, can we venture to delineate it in any detail? Can we be bold enough to picture how, for instance, one very simple thing came about—the form and colour of the flowers? By whom, and how, and where, was the pattern of the wild rose designed and coloured? We can only in the very vaguest way speculate on the answer to such questions. But to attempt it is worth while. Some think it is all explained by the theory of evolution. The rose has evolved, like the rest of life, from a simple primordial organism. We are asked to suppose the almost impossible supposition that the form and colour not only of the rose but of every other form of life, including men, lay implicit in that original speck of protoplasm. But, even if it were the case that all the forms of life we see here to-day, and all that they will develop into in the thousands of millions of years ahead of us, lay implicit in that original organism, we would still have to know how this tiny system of atoms from the sun could have gathered into itself the germ of such a wonderful development. And we have already noted that it was not of itself alone, but only through the continual interaction of the universe as a whole with the primordial germ and its descendants, that the development took place. It was from the universe as a whole that the primordial germ derived its disposition to develop. And it was in response to unceasing stimulation from the universe as a whole

through a thousand million years that the development took place.

We know the rose came from something simpler. We can see on a single rose-bush the way in which a minute green bud, with no other colour in it, will develop, stage by stage, into the full-blown rose. But how came the pattern of the full bloom, its beautiful form, its exquisite colouring, its delicate veining, its delicious fragrance, to be there at all? Where did the design come from? And how came that shade of colour and those fine pencillings to be? Naturalists tell us of the theory of Natural Selection, and of the intricate adjustments of flower to insect life, of colour attracting insects, and flowers adapting themselves to the needs of the insects, and insects to the form of the flowers. But none of this goes to the root of the matter. It does not tell us how colour came here at all, or how a new form arose. It presupposes a disposition in the plants to change, and, among other changes, one in the way the insects would like. And what we really want to know is where that disposition comes from and by what agency it is guided so that it eventually results in these beautiful flowers. And we see now that we shall have to look for the source of that disposition and guidance outside the narrow limits of terrestrial surroundings in that larger environment, the whole universe.

And in that wider environment where are we more likely to find it than in the minds of beings like the Altairians, inspired as they would be by the Cosmic Spirit of the Whole? Ideas of form and colour for flowers and patterns embodying these

ideas may have originated in the minds of the Altairians, and the fashions for these patterns spread as fashions spread here, and be transmitted over the universe in a manner analogous to the way in which patterns are transmitted by the hormones in our body, or in the manner of television. Then plants which are already predisposed to receive them would seize them and conform to them.

These speculations about the origin of the form and colour of flowers are only the very vaguest gropings, but gropings, I hope, in the right direction. And they will serve to emphasize the contention that we must seek the origin of design and colour outside this planet and even the solar system.

Returning now from the particular to the general, the sum-impression I would give is that the Altairians in general, and the Altairian Leader in particular, would express for the time being in the highest degree possible the Cosmic Spirit of the universe. That Spirit has to act through agents, and these Altairians would be the agents *par excellence* through whom it would act. The Cosmic Spirit is not unembodied spirit floating about invisible in space, with not even the substance of a ghost. The Cosmic Spirit pervades the whole universe. The universe is its body—its outward embodiment. But it is more particularly and fully manifested in certain of the component parts of its body, the universe, than in other parts, just as I am more particularly manifested in the cells of my brain, or in the germ-cells, than I am in the cells of my thigh-bone, or just as the spirit of France is more fully manifested and incarnated in Foch or

Briand than in a Paris scavenger. Acting, then, as supreme agents and representatives of the Cosmic Spirit, the Altairians, under the guidance and control of their great Leader, would exert a subtle power which, emanating from them, would spread throughout the universe. As they would themselves be dominated by the power of the Cosmic Spirit, so would they, by the power of the same Spirit within them, dominate the rest of the universe. Winged over the world on the pinions of the ether, decrees would go forth from them ordaining the course of events all over the universe. The "fashion," the tone, the temper they would give to the whole universe. The details might be left to individuals, but the spirit in which individuals should act, on pain of rejection if they did not, would be laid down by the "unwritten" laws of the Altairians. And this, I suggest, is the source of that power which "selects"—which preserves those variations which are favourable and which rejects the unfavourable. Those who conform to the Spirit are preserved. Those who fail to conform are rejected. Rejected for the time being only, though. Not finally rejected—not cast out into everlasting fire—but re-formed, re-created, as leaf-mould from fallen leaves goes to form the flowers in the forest. In the end nothing is lost. All is conserved. Everything goes to the making of the highest—and making different "highests"—over and over again.

In such wise, we may suppose, is the universe controlled and directed—and such its seat of government.

CHAPTER IX

THE FUTURE OF THE UNIVERSE

WHAT is to be the end of it all? Many scientists say it is to end in heat-death. There is to be no more heat, no more life—only shuddering cold, and impenetrable darkness, and unavailable energy. But the fundamental flaw in this position we have already seen. It arbitrarily assumes a beginning—and a beginning in which things are wound up to the top. It starts with atoms in, not the least but, the most highly organized start.

What justification have we for assuming any beginning or end to the universe? Is there any example of a beginning or end of anything? What about the scientist himself? When did he begin? He did not begin at his birth, for there was nine months ante-natal growth before that. He did not begin at conception, for the germ-cell had a long history before that event: part of it was part of his parents' parents. And so we can trace the history back and back. We can find no point—not even in the birth of this planet when we can say: "Here and now the scientist began." He had no beginning. So also is it with every other man, with every bird, animal, and plant. And so also is it with the earth itself. We can, for convenience' sake, speak of her beginning at the moment when she parted from the sun. But this was no real beginning. She

obviously existed before that in the sun. Likewise, the sun existed in a nebula, and the nebula in a cloud of atoms. We have no example of any true and definite beginning to any man or any thing. To assume any beginning to the whole universe is therefore not justifiable. Conventionally, and for convenience' sake, we customarily speak of the scientist as having had his beginning on the day of his birth, and at the place of his birth. But there is no strict justification for assuming that he had his "beginning" then. Similarly, though it may be a convenience to scientists to fix some time back, like 200 million million years, as a starting-point for their investigation, there is no ground for supposing that at that or any other date the universe actually had a beginning.

Another flaw in their position is their assumption that at some definite date atoms of the highest complexity came or were brought into being. Here again there is no example anywhere of entities of high complexity coming into being straight away. Where complex forms exist they have always been built up from the less complex. Once more the scientist himself is an example. That very complex organism, himself, is built up of relatively less complex organisms, the cells, and these of less complex organisms, the molecules and atoms.

Or to put the matter in another way. The fundamental concept of the physicists and astronomers is energy. And the total amount of energy in the universe is constant. It can neither be added to nor taken from—neither created nor destroyed. It remains for ever the same in quantity. Let us

compare it to the waters of a lake—say the Lake of Geneva. Now at Geneva is a marvellous fountain. It is one tremendous jet of water. Some powerful agent propels the water high into the air. Every drop of water does not attain the highest height. Most drops fall back long before the highest is reached. It is just a few, and perhaps only one, which reach the very peak. Moreover, there is a kind of rhythmic movement even at the top. At one moment the drops reach the highest possibility of attainment. At the next moment they only reach a little below the highest. Then a new effort is made and the highest possible is again reached. And so the play of the fountain goes on.

Is not this figurative of the universe? Besides the energy is there not a power at work—the power of the Spirit which throws the drops of energy upward? And is there not just as much a conservation of Spirit as there is a conservation of energy? The one for ever interacting with the other in the closest possible relationship? Quite true it may be that the universe would run down—that the water would fall back into the lake—and that all would end in a dead level of ineffectiveness if there were no propelling power also available. But when we have everywhere evidence of the existence of such a power, then that also must be taken into account in forecasting the eventual destiny of the universe.

With our attention engrossed on the physical aspect of things we are prone to regard the universe not so much as a living organism as a vast system

of material entities. The stars we would look on as blazing spheres of heat and light, and nothing more. The appearance of life upon this planet we would look upon as the result of a happy combination, not likely to have occurred elsewhere, or to occur again. We are apt to pin our faith on physical laws, though every blade of grass we see is evidence of a power at work in the universe which can send the atoms of the soil jetting upwards, like the fountain at Geneva, in direct opposition to the law of gravity. Besides the conservation of energy there is a transformation of energy. Energy is built up into higher forms. These higher forms break down again, but are once more built up. And what is conserved is not energy alone, but energy and the power which transforms it. And if our investigations are true the transforming power is the power of mind. And though scientists predict with confidence the end of the universe, they simply assume a beginning. They do not reflect that, possibly, there may be neither beginning nor end but a continuity of action by that same power which they assume first organized the energy at some problematic beginning of things.

Science assumes that some power organized energy into atoms once. But, if that power could do this thing once it could do it again, and may do it perpetually. And when in every living organism, from amœba to man, there is evidence of a winding-up process countering the running-down, surely it is unreasonable to suppose that in the universe as a whole there should not be a winding-up power which would counterbalance the running-down? In

which case there is no need to envisage any end at all.

What, then, would I suggest as to the future of the universe? Whitehead has said that on the newer theory a beginning or an end of nature within time is excluded, and he regards this conclusion as a merit in the theory. I would adopt this conclusion, and I would suggest that there is no need to envisage either a beginning or an end to the universe. I would suggest that the universe existed from everlasting and will exist to everlasting, world without end. It is much the simplest solution of the problem—and the most intelligible.

But I would not imagine a cyclic universe in the sense of a universe going round and round in one vast circle or wheel. Rather would I look upon the universe as a rhythmic process. The universe is rhythmic through and through; and I would say that it is rhythmic in the whole. Let me take an example from the plants. Take one of those plants, like the foxglove, which on a single stalk display all the various stages of development from bud to fully matured flower and then to seed. Seed, and bud, and flower, all being shown together on the same stalk. Here at the top we see a green bud still tightly closed, and not, as yet, showing the slightest sign of any other colour than the green. Just below this bud we see another with the bud on the point of bursting, and just showing the first streak of mauve. The next bud lower shows still more colour and is now rapidly opening. And so the series progresses, the buds opening wider and wider, more

and more colour showing, and the flower shaping itself more and more towards the final form. Then, in about the middle of the stalk, we will find one bloom which is just at perfection of both colour and form. This is the peak event. After that begins the decline. In the flower next below, the petals are just past their prime, and the colour has begun to fade. Below that again the petals have begun to crumple. Below that they begin to fall. And in the lowest they have fallen altogether. The flower has disappeared. But in the process of its disappearance something else has begun to develop. Exactly as the flower began to decline the seed began to appear. And when the flower had finally disappeared a seed-pod had taken its place. Eventually the whole plant decays; stalk, leaves, flowers, seeds, fall to the ground. The physicist in his prophecy that it would "run down" would be perfectly right. But the running-down would not be the end of the story. The physicist, only concerned with physics, would not have taken account of life. In the seeds that fell to the ground would be life. And life, surpassing the laws of physics, would collect particles from the soil, the air, and the sunshine, organize them, and send a new plant shooting up directly against all laws of gravitation. It would form stalk, leaves, buds, flowers. And the whole process would begin over again.

So here in one place and at the same time can be observed the complete rhythm of waxing and waning, and of the waxing of a second process arising out of the very waning of the first.

So also is it with plant life on the earth as a

whole. As wheatfields are being sown here they are being harvested in the Antipodes. As they are ripening here they are being mown there. Always in one part of the earth they are waxing to a peak; and always, at the same time, at another part they are waning to the plain. Everywhere there is rhythm.

Now let us apply this example of rhythmic process to the universe as a whole.

When we were considering Altairian life we thought more in terms of space than of time. We imagined life on a certain planet. Now we have to take time more fully into consideration. The Altairians cannot for millions, and thousands of millions, of years remain at the highest pitch of being. Not even the supreme Altairian can remain for ever there. Under prolonged excitation of the tensest emotions there would come a waning. Otherwise the responsive action would become merely mechanical. The sensitivity of the personality would be dulled and hardened. It would lose its instantaneity of response to stimulation. The power of initiative would dwindle. It would become incapable of rising to occasion after occasion. So, gradually, the power of the personality would wane. The period of intense activity would be followed by a period of lake-like calm.

But this would not be the end of things. For, judging the macrocosm to act as the microcosm, we might well suppose that as the supreme Altairian, and subsequently all Altairians, were waning from the zenith the inhabitants of the planet of another star, say Arcturus, would be waxing to

the summit. While there was waning in one planet there would be waxing in another. While the supreme Altairian was waning in his power an Arcturian would be waxing to take his place as World-Leader. And, as he in his turn waned, a Sirian, an inhabitant of a planet of Sirius, would be waxing to take his place. And so it would go on. There would be an everlasting succession of dominant planets with their dominant personalities who, each for the period of his ascendancy, would be the reigning and guiding spirit of the World, by the power of the Cosmic Mind that was in him giving the tone to and guiding the course of events, proximately on his own planet, and ultimately over the entire universe, just as I give the tone and temper and direct the course of events, proximately in my brain cells, and ultimately over my whole body.

There would be a Grand Rhythm of the universe, a rhythmic, wave-like rise and fall. As one planet was rising to the apex of development another would have passed the apex and begun to decline. But always someone, somewhere, would be at the crest of development; and always someone, somewhere, would be in the trough. Yet there would be no monotony. For no two personalities, nor two events, would be exactly the same. In the immensity of the universe there would be infinite variety. Though through the flux and unending change there would always remain the enduring background of the Cosmic Spirit from whence all activity would be derived, and which would remain for ever the same.

From everlasting to everlasting, without beginning and without end, the Grand Rhythm would flow. It would comprise in its flow an infinitude of lesser rhythms all going to constitute the main rhythm. But there would be a succession of peak events, climaxes, culminations. And the point I would now wish to make is that it is these culminations which would give significance to the whole process.

The universe is not like a train which starts from a fixed departure platform and proceeds to a fixed destination—starting from Paris and arriving at Rome. Things do not come to an end—to a finish. They culminate. And it is the culmination which gives point to the whole course of events. Things culminate and subside and culminate again in rhythmic process. But the significance is in the crest. In the light of this culminating experience the reason for every other part of the process is found. Hence the importance of culmination.

Let us return to the foxglove. On the one stalk are the leaves and the buds, the developing flower, the full flower, the fading flower, the seed-pods, and the seeds. But it is the full flower which gives significance to the whole rhythmic process, and which enables us to see the meaning in the activities of all the other parts. All go to serve the culmination —the full-blown flower.

In the case of the foxglove it is this culmination in the flower that gives significance. But in the case of the apple tree it would not be the flower but the fruit that would give the significance; in the

case of wheat the seed; in the case of tea the leaves; and in the case of potatoes the root. In all cases, however, there would be a culmination. And it would be this culmination which would give the significance to the process.

From plant life let us look at human life.

It is not the end of a man's life that is the important thing about it: it is certain climaxes in his life. In exceptional cases, as, for instance, the death of General Gordon at Khartoum, the end of a man's life may make him widely known and may focus attention on him. But the real significance of his life, as in Gordon's, lay in certain climaxes before his death. It is the same in the case of drama. There are climaxes, and a climax, which disclose the artist's purpose and which we would have to understand if we would understand the drama as a whole and find the artist's purpose. As Professor J. W. Harvey, to whom I owe this idea of culmination, shows, "though the import and significance of the play pervade the whole, and though every part may have a value for the whole, yet there are in it moments—or a single moment—of climax, crisis, culmination, in which the significance of the whole is in a unique degree concentrated and focussed." These, he says, are the moments which give the play its point and meaning. To these moments the lesser parts lead up, while from them the lesser parts in turn derive a secondary import. Every lesser part down to the minutest—down even to a comma—has received the anxious attention of the creator of the drama and is necessary to the perfection of the whole. Yet all the

time the lesser parts, even the comma, derive their meaning from the culmination.

Culmination, rather than destination, is, then, the leading feature of the universe. The cosmic process is of the nature of a drama with its dominant moments, climaxes, culminations, which reveal the significance and meaning of the whole. The universe is not on the march to a final destination: it contains within itself rhythmic culminations. From these culminations we can learn the why and wherefore of the whole process. And that why and wherefore pervades every part and instant of the process. In this view there would be neither that depressing running down of the whole universe to a final death of heat, and light, and life, and everything else, except unutilizable energy, which astronomers and physicists predict. Nor, yet again, will all creation move towards that "one far-off divine event" which the poet foresees, when everyone will live happily ever after. Neither heat-death nor heaven will be the end of all things. For there will be no end as there has been no beginning. But there will be a rhythmic waxing and waning. While things are waning to winter in one part of the universe they will be waxing to summer in another. In the winter will lie the seed of the summer. And summer will produce the seed for the winter. And the significance of the whole rhythmic process will be found in the successive culminations—in the crest of the waves—in the peak events.

As in all living organisms, so in the living universe, there will be a winding up as well as a run-

ning down. But the winding up, the running down, and the winding up again—the building up, the breaking down, and the building up again—will go on continually and simultaneously. This seems to be the view most nearly in accordance with the facts of our experience when seen as a whole and not in separation from each other as the various sciences see them. It is the conclusion we must come to when we take life and mind, as well as matter, into consideration; when we reflect that if there is life here there must be life everywhere, if there is life now there must be life always, if there is mind here there must be mind everywhere, if there is mind now there must be mind always. An everlasting rhythmic interplay of mind and energy in successive culminations, each different from the other, but each giving the main significance to the whole, is surely a much truer conception of the universe than the one-way running down picture which science offers.

And the recent conception of an expanding universe need not affect the conclusion. For astronomers do not say that the universe does not contract after expansion. Some think it contracts. Einstein and de Sitter are said to favour a "periodic" universe in which we are now enjoying the expansion phase but in which this tendency may conceivably be reversed. So as likely as not it pulses. There would be a rhythmic pulsation of the universe. We would have a pulsing universe.

Let us review the facts and considerations which forced us to come to this conclusion. We were im-

pressed by the immensity of the universe, and that immensity greatly enlarged and widened our outlook on life. But for our present purposes what was more noteworthy was the intelligibility of the universe. Whether on a great scale or on a microscopic scale, whenever and wherever viewed, the universe was found to be intelligible and reliable. Scientists do not pretend to know all about it. They aver indeed that as yet they know only the veriest fringes. But the more they know the more convinced they are of its ultimate intelligibility. As they proceed they do not come upon greater and greater confusion and chaos, they do not find things jumbled together in higgledy-piggledy fashion. However far, or however deep, they peer they find all working in order so that they can predict, for example, the exact degree to which a ray of light will be "bent" and on observation find their prediction comes true. The grounds for their faith in the intelligibility of the universe are being continually justified, and they remain more than ever convinced of its truth.

Then as they probe deeper into the mysteries of the universe they seem to discern a Great Mind behind all. The mathematician examining its intricate workings concludes that the mind of a great mathematician must have been thinking them out. There is great Thought at the back of things.

And the lover of beauty whether he looks up at the stars or around him at the landscape, or beneath him at the flowers at his feet, and whether he aids his vision with the telescope or the microscope finds beauty everywhere. If there is Mind behind all,

he says, that Mind must have a sense of beauty. The mind of an artist as well as of a mathematician must be at work in the world.

Then as our examination proceeded the irrefragable interdependence of things came into view. Not one single thing was completely on its own. All were tightly interlocked with one another in a closely interrelated system of things. The universe was, in fact, an organism. It was a real "whole" in which all the parts interacted with one another under the control of the whole. And this meant that each part was stamped with the impress of the whole—some in large measure, some in small, but all in some degree. And this again meant that if we examined any one part we would gain an impression of the whole. So in order to get an impression of what the universe as a whole was like we examined that part of it which we know best, namely, our own solar system and its highest products, our highest men. And from that examination we came to the conclusion that the universe as a whole was a living organism, that it possessed personality, and that that personality was actuated by love. And further, considering that there might be in the whole something more than was in any of the parts we believed that holiness would be that quality. That the universe was a living organism animated by mind, possessing personality, actuated by love and distinguished by the quality of holiness, was then our conclusion. The universe was spiritual to the core.

That being so, we surmised that that life and spirituality must be manifesting itself in many

another part of this mighty universe than only on this one insignificant planet. Basing our thoughts on the essential livingness of the universe, rather than on its material aspect, we concluded that long before life appeared here there must have been life elsewhere. That life need not be of the same form as protoplasm. In other parts life may utilize other chemical elements, in other combinations, and so take on another form than protoplasm as the unit of construction. But we supposed that in many different forms, in many different planets, life must exist now, and must have existed thousands of millions of years before this planet was fit to receive it. And as the Great Mind of the universe, the Cosmic Spirit, as we called it, must be always and everywhere operating, and be for ever striving to create and express itself in creatures more and more akin to itself, we concluded that on one planet there must exist beings of the highest possible order; and one, above all, who would embody in himself, in the highest degree, the love and holiness which was characteristic of the universe as a whole. We further supposed that he, by the power of the love and holiness that was in him, would dominate those about him, and through them the whole universe—the power emanating from him being transmitted over the universe as music is transmitted from a broadcasting orchestra. Lastly, we concluded that it was through the anxious care of this love to lift all others to the heights that he had reached, that living beings on this earth, and on all other planets, are inspired with the urgent desire to raise themselves in the scale of being.

But we surmised that this highest being could not remain for ever at the height of his attainment. In time his ability to respond to the stimulus of the Cosmic Spirit would decline, his power of initiative would dwindle, and he would fall back, like the highest drop of water in a fountain. *But only to be* replaced by another. And so, first on the planet of one star, then on the planet of another, beings would be continually arising who would attain to the highest pitch of perfection, and then fall back, while others took their place. There would be a series of culminations—a rising, a falling, and a rising again—a great rhythmic, wave-like, waxing and waning. And to this process there would be neither beginning nor end. There would be the enduring background of the Cosmic Mind; and that background would abide for ever the same. But there would be no monotony. For in the embodiment of the Eternal Mind there would be no repetition: there would be unceasing variety. And in the successive culminations would be found the meaning and significance of the whole of each minutest contributory part.

It comes to this, then, that we belong to, are brought forth by and from, always remain part of, are ceaselessly being operated upon by, and as ceaselessly operate upon, a universe which is common to us all, and about which we should, therefore, have a common view. And this universe is not a vast machine of which we are merely insignificant cogwheels driven by blind force. It is a living universe, or we could not have been brought

forth by it. And it is a spiritual universe, or we would not be animated by spirit. We cannot contemplate it as a whole without being impressed by its Power and its Majesty. And we cannot examine it in detail without being struck by its Intelligence and Beauty. The manner of our birth shows that it is driven by the power of Creative Love. And taking it in the whole we regard Holiness as its supreme and all-inclusive character.

The universe is a Living Universe animated by Mind, inspired by Creative Love, and dominated by the power of a Holy Spirit.

And as this dominant and all-pervasive Spirit is always and everywhere operative, we surmise that now, and always in the past, and always in the future, it is, and must have been, and always will be, manifested in a multitudinous variety of forms, in differing degrees, on numerous planets throughout the universe. And we further surmise that now, and always in the past, and always in the future, it is, and always has been, and always will be, manifested on one planet in eminent degree, and in one individual on that planet in supreme degree, so that he is, for the time being, the Leader of the Universe.

And, as the universe is an interconnected system, we assume that the communities on the different planets interact with one another, and with the whole, and so form one vast community of the entire universe. But we, also, assume that the inhabitants of the supreme planet do not always retain their eminence. Their capacity for manifesting the Cosmic Spirit spends itself in time, and the in-

habitants of another planet attain the position of eminence. Throughout the universe there is a waxing to culmination and a waning to the level. But always somewhere there would be someone who would in supreme degree manifest the Spirit of the Universe and be Its agent in setting the tone to the whole.

So the universe would be without beginning and without end, rolling on for ever in one Grand Essential Rhythm of an inconceivable complexity of lesser and lesser subsidiary rhythms—rhythm within rhythm. And it will come to culmination after culmination in endless succession—each different from the other, and each being a culmination of an infinite number of lesser culminations.

And through all, as the ground of all, as the inspiration of all, will abide unchanging and eternal the Holy Spirit whose body is the universe we see with our eyes, and of whom we are responsible agents.

Grand indeed is the conception of the universe we owe to astronomy. But grander, far, will that conception be when we have endowed it with the life which is its due.

CHAPTER X

IMPLICATIONS

WHAT does all this mean for us men? What does the conclusion that the universe is a living universe, dominated by mind and inspired by love, that we live in a world vibrating with not only rays of heat and light from the sun, but also of life and love from the universe at large, in a world not ultimately governed by physical laws, and condemned by them to death, nor ruled by fate or caprice, and therefore fitful, uncertain, and irregular, but in a world wherein the laws of righteousness and love ultimately determine the course of events—what does this conclusion mean for us inhabitants of a minor planet of a very ordinary star?

It means, firstly, that men can trust the universe, have confidence that at rock-bottom it is something solid that they can lay hold of, and not just some unsubstantial thing that will finally let them down by dissolving away, through darkness and cold, into mere unutilizable energy.

It means, next, that men will have to abandon their insular outlook, and realize that the environment which is influencing them and to whose influence they have to respond is the entire universe —and nothing less.

It means further that, as men are born out of this living universe, and, therefore, inherit its essential

disposition, they must possess an innate urge towards the better and lovelier things in life, and an instinctive call to reject whatever of evil there may be in their environment, and to absorb greedily and respond eagerly to whatever is most conducive to the good.

Finally, it means that, instead of resigning themselves to a dismal fate, or at best beating themselves up to making the best of a bad job, as they would have to if they believed that darkness and cold was the final fate of the universe, they will be able to go forward with joy in their hearts, and with the glint of far more than hope in their eyes —with the radiance of happy assurance that what they are working for will, whether by themselves or others, be inevitably achieved, and, once achieved, everlastingly prevail.

Convinced of these things men will set about cultivating and strengthening their innate disposition, making themselves more sensitively responsive to their starry environment, more discriminating in their choice of what influences they shall reject and what they shall whole-heartedly respond to. They will deliberately and persistently attune themselves to the main tone and temper of the universe and align themselves with the main thrust of its development. And by so doing they will gradually develop organs of the soul as delicately sensitive to external spiritual impressions as the bodily eye is to material impressions, and as finely selective as the memory is as to what should be retained and what rejected. And just as men train themselves to perceive and appreciate the finest shades of beauty in nature and

art so will they educate themselves to appreciate the most delicate hues in the beauty of holiness—the summation and surpassing of all we know of love and beauty, of purity and truth.

Contemplating the beauty of the world, meditating serenely on its value to mankind, and earnestly praying that love of beauty may graceu all their lives; contemplating the great truths of existence, meditating intently on them and earnestly praying that, through love of truth, sincerity may ever mark their activities; contemplating the great love in the world, meditating deeply on it and praying long and often that it may sweeten all they do; contemplating, above all, the beauty of holiness, meditating profoundly on its sublimity, and praying with their whole souls that it may hallow every deed, men will become more and more that on which they so devoutly and continually concentrate their attention, what they so unceasingly have at heart, and what they will come to admire to the point of adoration and worship. As they persevere, year by year, century by century, they will become more loving, more graceful, and more sincere in their lives; and having a deeper reverence for the holiness of the world their lives will become more holy. And as societies of men come to value holiness more, and to realize its value more acutely, it will become more easy for holy men to arise. And with the rise of holy men higher levels of spirituality will be more readily attainable.

And with the passage of the centuries richer types of individuals will appear with more individuality and fuller personality. They will lead lives of

ever-heightening intensity. Now they will throw themselves with terrific power of concentration into the thing of consequence for the occasion. Then they will relax in utter abandon and allow their experience to settle and form as cream in their mind, in due time to be skimmed off by others for their own delectation. And so heightened would their intelligence have become that it would rise to intuition and they would customarily see a thing as a whole and not in abstraction. And from the completeness and instantaneity of such vision would come an intensity of rapture which would suffuse itself through all about them. So would they infuse into life a new quality—a higher and higher spirituality. Its intensity would be continually being heightened. Men's outlook on life would be continually transformed. Their conception of the most perfect would be continually rising. Opposition of the most violent kind would doubtless develop on account of the very intensity of their living. But stronger still would be the call for harmony. And under the urgency to meet that call the opposites would only be made to serve by their contrast to bring out the richness of variety in the life that was developing about them—a life of ever-richening colour and sweetening fragrance, and brightening light, and the more to be appreciated because of the storm and battle, the pangs of motherhood, the agony of failures, and the stress of success through which it had been brought about, and which alone would sustain it.

And these men would be realists as well as idealists—and idealists as well as realists. The con-

sistent realist has to be an idealist at heart, and the true idealist must be a realist in action. No starker realist than Lenin ever lived; yet his whole life was actuated by an ideal: the ideal of a New World Order which would be classless because all would be workers on the same level. Whether it was a good ideal or not, Lenin achieved the accomplishment of it in Russia because he made it his own. That was the secret. By studying it through and through, inside and out, clearing it in his mind till he held it there with the sharpest exactitude, it came in time to possess his whole being, and he was driven to pursue it with unswerving pertinacity and arrow-like directness of purpose. He claimed to be, and was, a realist of the most real type. And he loathed and denounced all idealism. Yet few have been greater idealists. And thus will it be with the great leaders in the future.

And the ideal they will have in their minds will also be of a World Order. But it will be neither New nor Old. It will be of an Eternal World Order. It will be a Spiritual World Order in which things of spiritual value will pervade and dominate the material and dictate the conditions under which material activities may take place. As an example, when love of humanity will lay down that the manufacture of goods must be so carried on that those human beings employed in their manufacture shall work under humane conditions. Economic laws will not be interfered with. They will operate in full measure. But they will be forced to operate within the limits imposed by a higher World Order. And men will find that through being forced to act

within those limits they are actually able to obtain even better results. That industry conducted under humane conditions will profit thereby. And so it will be in other spheres of activity. All will benefit by being under the ultimate domination of the spirit.

This Eternal, Transcendental, Spiritual World Order is the ideal which men will have in their mind. It is more familiar to us as the ideal of the Kingdom of Heaven, brought into the world and made effective by Christ. This ideal men will study through and through. They will sharpen its edges till it stands out clear as a steeple set against the dawn. They will examine its details till they know how each fits in with the other. They will subject it to the closest scrutiny and severest criticism. They will ponder over it, absorb it, make it their own, till they are absolutely possessed by it and would not be able, even if they wished, to prevent its breaking forth from them in practical work for its realization. So the greatest will always be both idealists and realists. And the more thoroughly idealist they are, the more efficiently realist will they be.

And the ideal will ever be expanding, deepening, heightening. The "World Order" will be for something much wider than the earth. It will include the whole universe. And it will look deeper than into the hearts of men: it will look into the heart of the universe. And it will aim higher than the highest aspirations of men: it will aim at what the Cosmic Mind only could conceive as possible of achievement.

Fundamental in this ideal will be the sanctification of that creative love which, as we have shown in a previous chapter, is common to all living creatures, from the lowest animalculæ to the animals, the birds, the butterflies, and to the very highest men, to which each one of us owes his very existence, and which springs sweet and pure from the fountain source of the world.

The universality of this creative spirit of love is beginning to be recognized. But its sanctity is what will be more decidedly stressed in the ideal of the future. And because it is common not only to the whole human race but to all life it will not, therefore, be disparaged or belittled. Rather will its holiness be more deeply recognized as having sprung from the Divine springs which fertilize the world. Especially will the feeling of shame with which it is now so blightingly associated be for ever blasted out of existence. With no sense of shame but with bared feet as on holy ground, and with shunned eyes as in the presence of something too unutterably holy for them to gaze upon, will men approach this most sacred thing in life.

In this ideal World Order the approach to each other would be most delicately tentative at first. With that infinite fineness of perception which the race will be developing in future, each, we might suppose, would feel his way to the other with such sensitivity of approach that the two would instinctively recoil from each other before irrevocably uniting if either harboured the slightest doubt. It would only be when both felt compellingly drawn to one another, so that no power on earth could

keep them apart, that they would unite in the final intimacy. Then reciprocally stimulating and responding to each other, even they would be unable to say which was giving and which was receiving. And in that moment they would become one, to remain one for ever. Then, if the selection had been right, and the approach well timed, and the union not of the body only, or of the soul only, but of the whole being of each, they would in their ecstasy feel wafted up to height upon height till they touched the very summit of existence—the high and holy place from whence issues all that lifts the world upward. In this climax of their union, when each with his capacity for love at its extreme had stimulated the other to fulfil himself to the utmost stretch, and had given himself out to the last iota of giving, all previous exclusiveness would be abandoned, and in their ecstasy they would feel at one with all creation. When they went out into the world they would delight in all they saw. In every beauty they would see a richer glory; in every love a sweeter sweetness. Their love for each other would expand till it filled the whole world. They would know of a surety that what they had experienced was of a value beyond all compute. And then it would be that a recognition of the unspeakable holiness of what was uniting them would break in upon them, and make them long to let all others know that there, right at hand, for every one to follow, was the very way—the sacred way—to the Holy of Holies of the universe.

And when their union, at first so seclusive and afterwards so all-embracive, had thus reached its

highest perfection, they would have also reached the very climax of their lives. There, indeed, they could not long remain. The air would be too rare. From the culmination would surely follow a waning to the level of ordinary life. But neither there would they long remain. Surely enough their union would rise again in another form. Having waxed to its apex, it would wane to the level, as the lark, after soaring, returns to its nest on the ground. But then it would wax again. It would wax in the form of parental love, and especially of mother-love for her child—that reaching-forward love, that love which would sacrifice all for the future, that love which does indeed yearn with a terrible yearning for return—to be loved even as she loves—but which would sacrifice even that for the good of her child. Common it is—and among birds and animals and even insects, as well as among men. But nothing is purer and sweeter. The familiarity with it need not breed contempt. More likely is it that the race of the future would look upon it as another of the most precious things in life to be jealously guarded among them.

And the parents emulating each other's finest qualities, ever striving to live up to what they had once known, prizing their treasure above all else in the world, would fear to do aught that would soil it. Aware that the slightest defect in health of body, or of mind, or of soul would detract from its perfection, they would be eager to keep themselves at the highest pitch of efficiency in each of the three. They would take pride in keeping themselves at the very top of their capacities, that not

be perceived he would know he could not have seen. Nor known all the joy. New discoveries he knew could be made. Fresh splendours he knew must await him. And he would ache to behold them.

So, just as he himself had been set forward by others, would he set others forward. Together they would ascend the holy hill of vision. All would be staked on the venture. Any faintness of heart would be fanned into flame by the ardour of comrades. Each would give courage to others as they forged their way upward. The dizziest heights would confront them. Perhaps only one would survive till the summit. But from there he would look out on all the splendours of earth and glories of the heavens. Then, his supreme ambition achieved, he would relax every fibre. And in the earned relaxation peace would settle on his soul. Through every pore he would absorb the beauties around him. The sweetest ecstasies of lovers and the sublimest raptures of mystics would combine and surpass themselves in him. Transfigured beyond man's conception, he would lay there entranced—and would wish to remain there for ever.

But return he must to the common life of mankind. He would rejoin his comrades. In the world as they descended the mount and again saw life at close hand they would find cruelty and barbarity, the coarse, the vulgar, the brutish, pain, sorrow, poverty, sickness, and starvation. All this that had been hidden in haze at the summit would now be glaring starkly before them. They could not ignore it. Nor would they. Their vision would merely make it more palpably obvious. But the sight of

it would only spur them to action. The contrast with their vision would but induce them to work for the redemption of all. And with the glow of the heights in their hearts they would straightway press forward to transform the world and redeem it of evil. Firmly convinced in their minds that in all men there burns a spark of divinity, they would seek to set it alight and be sure that, once it was burning, it would in a moment consume all the evil. Cruelty would become utterly abhorrent—the vulgar impossible. Pain they would learn to endure. Sorrow would only sweeten their joy. And into the heart of those stricken with poverty they would impart a new courage to better their lot, and strong faith that, though poverty be theirs, it may yet be the means of attaining the highest the world has to offer, being, indeed, what the greatest have always actively sought for themselves and by vows have bound themselves to.

Thus in the course of thousands of years the whole *tempo* of life will be raised. There will be sharper intensity of living, more vivid personalities, profounder feeling, more concentrated thought, tougher wills. Intelligence will be needed to construe the precise meaning and significance of intuitions, but it will be more on sure intuition than on heavy categorical reasoning that men will rely in the swifter life of the future. And, instead of suppressing and crushing the emotions till they eventually atrophy, men will wisely control them. Hitherto, we have paid excessive attention to the intellect. We have thought that the development

of life was in the direction of the bigger brain rather than of the finer soul. So education has been mainly on intellectual lines. And to the soul comparatively little attention has been paid. The men of the future who hold in the dominating spirituality of the universe will want to change this. They will like to be bodily athletes, to have all the grace of form and the joyous fitness of the bodily athlete. They will like to be intellectual athletes with the fibre of their intellect taut as a bowstring to speed the arrow of their thought straight and true to the target. But, above all, they will like to be spiritual athletes with their emotions trained to bear the most appalling strain, and yet free on occasion to fuse both intellect and will and jet out the whole in one flame of love on its object.

And there is time enough ahead of men for the practical realization of the highest ideal we could possibly conceive. So enormous is the period of time before us inhabitants of this planet that we can see no limits to what we might become. It is not yet 2,000 years since Christ lived. Civilization has barely existed for 6,000 years. The most primitive men appeared only about a million years ago. And it is but 1,000 million years since life in its simplest form first appeared upon the earth. Yet we have ahead of us not 2,000 years, nor 6,000 years, nor a million years, nor even 1,000 million years. But far more. Not a single 1,000 million years, but 10,000 million, perhaps 100,000 million years. The sun's heat will be steadily diminishing all the time, and the earth will be circling round the sun in an increasingly widening circle, so that the temperature

on this earth will be gradually diminishing, and the time will inevitably come when the inhabitants may be no longer able to adjust themselves to the increasing cold. But that will not be for thousands of millions of years hence. So there is scope enough for development.

And judging by what has occurred in the past, the development will be increasingly rapid. In a former chapter, tracing the development of life since it first arose, we have seen how in the earlier stages immense periods passed before any marked change was observable, but that as we approached the higher stages the rate rapidly increased. In the last ten million years the progress has been as great as the progress in the previous hundred million years. The development from reptiles to birds, from apes to men, and amongst men from prehistoric monsters to the European, Indian, or Chinese of to-day, has been enormously more rapid than the very slow rate at which the earliest protozoa made their way upward. And if this rate continues to accelerate in the future, or even keeps as at present, almost anything is conceivable in regard to the inhabitants of this earth a thousand million years hence.

Then this also has to be considered: that the past has shown that from time to time certain "jumps" such as have previously been noticed occur. Suddenly, out of the combination of two gases water appears. Again, from a combination of chemical elements life appears. Reptiles crawling on the ground develop into birds flying in the air. Apes climbing in the trees develop into men. There

may be similar "jumps" in development in the future. Under those "deeply penetrating environmental changes" (the "environment" being the whole universe) there may be striking into the soul of the race spiritual stimuli which will so excite the inmost urgings that a point will be reached when men can contain themselves no longer, a crisis will have come, and, of a sudden, they will burst forth into something new and unexpected, as in the "newnesses" just referred to. Something of the kind occurs in conversions. And what occurs then on a small scale may, in the course of human development, occur on a big. There may be a sudden rise. As reptiles developed into birds, *homo sapiens* may develop into *homo mysticus*. Judging from the experience of the past, such a "jump" is more than likely to occur in the millions of years before the race.

So we may expect in the future that "newnesses" among men will appear. The Cosmic Spirit is ever at work and ever taking the initiative. From the surrounding spiritual sphere in which this earth is immersed will come spiritual stimuli which, working on specially sensitive men, will cause them very actively to respond. And to these men will be revealed a higher state of being. They will thereupon communicate this revelation to the rest of humanity, and through their agency humanity will be raised to higher levels, as it has already been raised above what is called "brute" creation—we men of the present day being the "brutes" to the men of the future.

And while men would thus be developing their

spiritual life, they would also be achieving an increasing dominance over matter. The energy stored in the atoms they would have learned how to tap and use for their own ends. Matter itself they would have learned to shape in machines and instruments to serve their increasing needs. From the soil, from the animals and plants, they would have learned how most readily to acquire a sufficiency of food. And from the invisible radiant energy continually beating upon them they would have learned increasingly easy means of communicating with one another at whatever the distance.

And it may be that, through this same radiant energy which pervades the whole universe, men would find means of communicating with the inhabitants of other planets all over the universe. Thus would this earth become linked up with the rest of the world. As it is already connected by light with the stars, so would it also be spiritually joined with the inhabitants thereof. Living on an island, we inhabitants of this earth may be. And so far this island may only be connected with other islands throughout the universe as islands here are by the sea. But the time may come when by radio there may be communication between the inhabitants of the various islands throughout the universe, as by these means we communicate from island to island all over the earth.

Then men on this planet may come more effectively under the influence of higher beings elsewhere. From them they may receive knowledge and inspiration which in the course of thousands of millions of years ahead may enable them to rise to the

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