New science, old questions

Preface

What are we to make of modern advances in science and education? As science develops its dazzling variety of successful specializations, it sometimes seems to leave no room for the broader questions that have traditionally been approached through religion and mysticism. But, as the open-minded enquiry of science is more deeply pursued, it teaches people to think for themselves and to investigate the basis of their own experience. So the old questions are still very much there, though often expressed in a new way.

This short book is one of many new attempts to ask the old questions, in the context of modern science and its democratic spirit of reasoned enquiry into common experience. In particular, the basic approach and the central ideas have been learned from Shrī Ātmānanda, an Advaita Vedānta philosopher who lived in Kerala State, India, 1883-1959.

Part 1 starts with the discoveries of modern physics, and goes on to subjective questions of mind and consciousness. Part 2 starts with the ordinary experience of knowing an object, and goes on to ask about the nature of personality and the impersonal basis of knowledge. Part 3 starts with the functional value of objects, and goes on to questions of desire and happiness.

The first chapter of part 1 tries to describe modern physics in a way that would be accessible to a generally educated reader. But this is only for those who have a particular interest in modern physical science and its theoretical subtleties. For those who do not, this chapter may be skimmed or omitted. The rest of the book proceeds to more directly philosophical questions that have long been asked, implicitly or explicitly, in many different traditions. In the end, these old philosophical questions do not apply exclusively to any specialized field of technology or learning, but to ordinary, common experience.

As science develops our knowledge of the external world, what becomes of more basic questions about the nature of reality and experience? Must these questions remain the exclusive preserve of religious faith and esoteric mysticism? As new scientific conceptions and environmental problems show up more and more subtle complexities in an interconnected world, must we turn the clock back to mystical attitudes and ways of thought? Or can we deepen our scientific enquiry so as to investigate the subjective basis of our own experience? This book asks how the scientific spirit of openminded, reasoned enquiry might be used to ask the same fundamental questions that have traditionally been approached through religion and mysticism.

PART 1

QUESTIONS OF REALITY

That world out there, this self in here,
each is reality, complete:
from which arises everything,
to which all things return again,
in which all seeming things consist,
which stays the same, unchanged, complete.

Peace invocation from the
Brihadāraṇyaka Upanishad
– free interpretation

1. *The physical world*

Can we, who live on nature's dole,
inspect each detail, state its role?
How can we know
through nature's show
what makes the world act as a whole?

1.1 Common sense objects

What is a physical object? From an everyday, common sense point of view, a physical object is 'something out there'. It is not just a sight or a sound or a smell or a taste or a sensation of touch; nor is it just a thought or a feeling. Instead, it is a material 'something', which is somehow made up of physical matter. And the matter that makes up a physical object is located 'out there': in some particular region of space, during the course of a particular period of time.

This common sense view is the starting point of physical science. Using concepts of distance and direction, the science of geometry describes how objects are shaped and how they form configurations in space. Using concepts of speed and velocity, the science of kinematics describes how objects move and how their shapes and configurations change in the course of time. By further including concepts of mass and force, the science of mechanics describes how objects interact with each other, in the mechanical systems of material structure.

Towards the end of the seventeenth century, Sir Isaac Newton put forward his famous system of mechanics, which describes how physical objects interact with each other, on the basis of a few mathematical laws. Essentially, these basic laws do not assume anything other than well-accepted common sense. They merely put common sense into mathematical language, and can thus be used to calculate precise, quantitative results that common sense implies.

In particular, Newton's laws are formulated for point particles of matter, whose size in space is so small that it can be ignored; and then methods of summation and integral calculus are used to calculate the interaction between ordinary objects, whose matter is distributed in regions of varying size and shape. The mathematical calculations can be very complicated and their technical details can be confusing; but their theoretical basis seems clear. Theoretically, Newtonian mechanics is a precise mathematical statement of everyday, common sense ideas about a physical world that is divided into particular objects, by the distribution of matter in space and time.

In practice, over the last three hundred years of continued investigation, Newton's mathematical statement of common sense has turned out to be very effective in describing a great variety of physical phenomena: including the motion of stars in the sky, the orbits of planets about the sun, the equilibrium and movement of ordinary objects on earth, and much of the behaviour of solids and liquids and gases as collections of thermally agitated molecules and atoms.

However, both common sense and Newtonian physics share an inherent problem. If space and time divide the world into separate material objects, then how can different objects be related, across their separation in space and time? In order to answer this question, it is conceived that different objects interact by exerting forces upon each other. But then, what is a force? It is a stimulus that accelerates motion, and it depends upon two rather different things. On the one hand, it depends upon the properties of matter contained in the objects that interact (in particular, it depends on properties of mass, weight, friction, elasticity, strength, electromagnetic charge and so on). On the other hand, it depends upon how these interacting objects are separated in space and time. Thus, force is jointly dependent on matter, space and time. In order to account for this joint dependence, additional laws of force are required: as for example to describe the forces of friction, or the forces of elastic distortion, or the forces of thermal expansion, or the forces of electromagnetism and gravity. What is the basis for such additional laws of force, and how do they relate to the basic laws of mechanics?

The problem is particularly obvious for forces that seem to act across empty space. How is the earth attracted by the sun, when earth and sun are separated by millions of miles of empty space? How do electrically charged objects attract or repel one another, when they are separated by empty space in a vacuum tube from which virtually all the air has been pumped out? To answer such questions, physicists conceive that a material object is surrounded by 'fields of force'. According to this conception, a material object affects the space around it in such a way that other objects experience a force, depending on where they are located in this surrounding space. In other words, a physical object has an effect upon space, beyond the material boundaries of the object. And space in turn affects the objects that are in it. Thus, physical objects can interact at a distance, through fields of force in the intervening medium of space.

In the latter half of the nineteenth century, James Clerk Maxwell set out the classical theory of the electromagnetic field, in which he put together different laws (of attraction, repulsion, electromotive force and induction) that had by then been discovered through experimentation with the phenomena of electricity and magnetism. By putting these laws together, in a unified mathematical description, he was able to show that when an electric or magnetic charge is accelerated, it produces a changing electromagnetic field that travels through space, in much the same way that waves travel through water or air. Thus, it became clear that seemingly empty space is able to transmit waves of variation in the electromagnetic field. Moreover, Maxwell's equations showed that such electromagnetic waves carry energy and momentum from one object to another; and it did not take long to verify experimentally that ordinary, visible light is made up of such waves, in a particular band of frequency that is registered by our eyes.

Maxwell's theory turned out to be a very effective description of electromagnetic phenomena. But it raises disturbing questions about our common sense view of the physical world. How can empty space act as a medium for electromagnetic waves, in the absence of physical matter? How can such disembodied waves carry energy and momentum, through the properties of space alone, without any matter in it? Common sense and Newtonian mechanics both tell us that energy and momentum are characteristics of material objects. How then can energy and momentum travel through empty space, without any material medium to transfer them from one place to another? Clearly, the transmission of light (and other electromagnetic waves) shows us that energy and momentum are in fact transferred and carried by empty space; and hence space itself has properties that our common sense associates only with a material medium. Space, motion and matter are somehow more intimately related than our common sense allows.

1.2 Relative space and time

What are space and time, and how are they related to matter? In our common sense view of the world, we tend to think of matter, space and time as three independent things, each of which exists in its own right. Matter is what objects are made of; objects are related in space so as to make up the world at a given moment of time; and time is the progression of moments through which the world changes and develops.

At first this common sense world seems final and absolute; until we take into account the different ways in which the world can be perceived. Different observers perceive the same world, but they have different ways of perceiving how the world is divided by space and time into particular objects and events. Each observer describes the world from a particular point of view, with its own particular way of measuring space, time and matter. As measured by an observer, space, time and matter are only relative elements in a relative description of the world, which can only be understood in relation to the observer.

Since the same physical reality of the world is described by different observers, the same laws of physics must appear in their different descriptions. Clearly, this is a basic principle upon which the study of physics is founded. However, when this principle is applied to Maxwell's electromagnetic laws, it produces an unexpected conclusion. The trouble arises from the transmission of light and other electromagnetic waves, which travel in vacuum at a speed which is determined by the inherent electromagnetic properties of space.

If we consider different observers who are moving relative to one another, then each observer will perceive space as though it were still and as though other observers were moving through it. For each observer, space is still and light travels through this still space with a speed that is determined solely by the electromagnetic properties of space, irrespective of any motion that may be attributed to the observer from someone else's point of view. Unless there is some good reason to believe that the basic electromagnetic properties of space may differ from observer to observer, it must be concluded that light travels at the same speed relative to different observers, despite their differing motions. In effect, space and the speed of light must be carried along with each observer that perceives them.

This conclusion goes against common sense. It means that if some other observer is travelling away from me towards a beam of approaching light, then the observer will perceive the beam of light to travel towards him no faster than I perceive the beam to travel towards me. No matter how fast an observer travels towards a beam of light (or away from a beam of light), he will not add (or subtract) his speed from the speed of light. Instead, he will always observe that light travels at the same speed.

At the end of the nineteenth century, physicists had not yet learned to think of space in a relative way. They interpreted electromagnetic waves as vibrations in a material medium called 'ether', which filled all space and through which all objects moved. They tried to detect the motion of the earth through space by comparing the speed of light in different directions. As the earth moves through space, the speed of light should be faster when light is travelling against the direction of the earth's motion. Experiment showed that the speed of light is the same in all directions.

This was a very surprising discovery. It showed experimentally that the earth is not travelling through space, judged by the way that the speed of light behaves relative to the earth. We are left with two alternatives. We can conclude that the earth is still, and the sun and planets and stars are all travelling around it. Or, we may conclude that what is true for the earth is also true for the sun, the planets, the stars and for other objects. Relative to any particular object, light travels as though that object does not move in space; and the speed of light is thus unaffected by the way that an observer may move relative to other observers.

In 1905, Albert Einstein published the special theory of relativity, which was based upon the conclusion that the speed of light is the same for all observers, irrespective of their relative motions. As Einstein showed, this conclusion implies some basic alterations in the common sense assumptions of Newtonian mechanics.

First, common sense tells us that though the position of an object is different relative to different observers, the length of the object is the same for all observers. For example, if an object is two centimetres long as correctly measured by one observer, then it should be two centimetres long as correctly measured by any other observer. However, the theory of relativity shows that this is not quite true. According to the calculations of the theory, an object is shorter when measured by an observer who is moving relative to the object. At ordinary speeds of motion, this shortening is too small to be noticed; but it has a more noticeable effect at higher speeds that are comparable to the enormous speed of light (which is about one hundred and eighty six thousand miles per second). Thus, though our everyday, common sense experience tells us otherwise, length and distance are relative measurements that differ from one observer to another.

Second, common sense tells us that the interval of time between two events is the same for all observers. For example, if one event occurs ten minutes before another event for one observer, then the first event should occur ten minutes before the second for all observers (after taking into account the delays that each observer experiences in getting to know about the two events). Again, the theory of relativity shows that this is only approximately true, and the approximation works usefully in practice only in those ordinary circumstances where we consider speeds that are very much slower than light. If the relative speed of different observers is comparable to the speed of light, then their measurements of time are noticeably different. The time that elapses between the same events is noticeably different for such different observers, and it depends upon how these events are perceived to be separated in space. (The spatial distance between events is obviously different for different observers. For example, the doors of a train close and open in the same place, as observed from the train itself. However, for an observer who remains at a railway station, the train doors shut at this station and then open again at the next station, which is many miles away.) Contrary to common sense, the passage of time is a relative measurement that differs from observer to observer, and measurements of time depend upon measurements of space.

Third, common sense tells us that the mass of an object is the same for all observers. If an object contains four kilograms of matter for one observer, then it should contain the same four kilograms of matter for all observers. However, relativity theory shows that the mass of an object increases with its speed, relative to an observer. As an object travels faster it acquires kinetic energy (the energy of movement), and this energy increases the object's mass. Contrary to everyday common sense, mass and energy are not two separate things. Rather, mass is a concentrated form of energy, as described by the famous formula, $E=mc^2$. This means that whenever an object acquires energy, its mass increases by an amount equal to the energy acquired divided by the square of the speed of light. Because the speed of light is so enormous, ordinary increases of energy do not have a noticeable effect on the mass of an object. So common sense does not notice what the theory of relativity uncovers: that mass too is relative, like time and space. Since mass is increased by energy, it is not the same for all observers, but depends upon the relative measurements that each observer makes of time and space.

But then, if space, time, mass and energy are differing measurements made by different observers, what is the common world that contains these different observers? And how is this world perceived in common, through the differing measurements that are made of it? Since space, time and matter depend upon each other, the theory of relativity thinks of them together. Instead of thinking separately about points in space, moments in time and material objects, it thinks about the physical events that different observers perceive in common. As each object travels through space and time, its presence at particular places and times forms a continuous path of events, called the 'space-time path' of the object. The various events that take place in the world are connected by the space-time paths of objects that take part in these events; and the world can thus be described as a collection of events that are connected by the paths of continuing objects in space and time. This connected collection of events is called 'the space-time continuum'. Or, for short, it is often called 'space-time'. In order to specify an event in space-time, each observer has to make four measurements: three to locate the event in space, and one to locate the event in time. Thus, the space-time continuum is said to have 'four dimensions'.

The special theory of relativity is so called because it has a special limitation. It only considers observers whose relative motion is 'uniform' or, in other words, whose relative motion does not accelerate. When different observers accelerate relative to one another, a further complication arises from the relationship between force and acceleration. In 1915, ten years after the special theory, Einstein published the general theory of relativity, which considers accelerating observers and the phenomenon of gravity.

How does an accelerating observer differ from one whose motion is uniform? Different observers have different views of the space-time continuum, but a changeover can be made from one view to another by means of a mathematical transformation. If two different observers do not accelerate relative to each other, then one observer travels with a straight, uniform motion relative to the other, and the resulting transformation between their views of space-time is said to be 'linear'. This means that straight lines in one view also look straight in the other view, and uniform motion in one view also looks uniform in the other view.

However, if two different observers are accelerating relative to one another, then one observer travels with a curved or non-uniform motion relative to the other, and the resulting transformation between their views of space-time is *not* linear: because straight lines in one view do not look straight in the other view, and uniform motion in one view does not look uniform in the other view. It can thus be conceived that accelerated motion brings about a curved transformation in an observer's view of space-time. When two observers are accelerating relative to one another, it will appear to each that the other's view of space-time is distorted: because it makes straight lines look curved and it makes uniform motion look non-uniform.

To this analysis of curved transformations in space-time, Einstein added a principle of equivalence between acceleration and gravity. The law of inertia tells us that objects tend to move with a uniform speed. In other words, objects do not accelerate and they move along straight paths through space-time, unless they are acted upon by external forces. If an observer is accelerating, his acceleration is the same relative to all uniformly moving objects, which have no external forces acting upon them. Hence, all such objects will accelerate equally relative to him. But this tendency of all objects to accelerate equally (in the absence of external forces) is in effect exactly the same as the tendency of all objects to 'fall' with equal acceleration in a gravitational field. As long as gravity is a universal force that makes all objects accelerate equally, the effect caused by an observer's acceleration is exactly the same as though the observer were still and a gravitational field was causing the tendency for all objects to 'fall' with equal acceleration. It makes no difference whether we consider that the observer is accelerating and therefore objects have a tendency to 'fall' with an accelerated motion relative to him, or whether we consider that the observer is still and a gravitational field is making objects tend to 'fall' in this way.

On the one hand, we may look at an observer from some outside point of view and consider that he is accelerating. In this case, we must consider that his view of space-time is curved, and it is this curved view that makes objects appear to travel in a non-uniform way, when actually they are moving along straight paths in space-time. On the other hand, from the observer's own point of view, he is not moving or accelerating and his view of space-time is not curved. If he sees that objects tend to accelerate without any outside forces acting on them, then his point of view must be that space-time itself is curved and the curving of space-time is causing objects to travel in an apparently non-uniform way. Since this apparently non-uniform motion of objects is equivalent to the effect of a gravitational field, the gravitational field may also be described as a curving of space and time.

To understand the phenomenon of gravity, let us consider the gravitational pull of a large object like the earth. In a small region of space, the acceleration caused by gravity is approximately the same everywhere. In this small region, the earth's gravitational field is very nearly equivalent to the effect that would be experienced by an observer who is accelerating upwards in the absence of any gravitational field. For example, in a small region at the earth's surface, all bodies tend to fall with an acceleration that in one second will increase their downward velocity by ten metres per second. This is the same effect that would be experienced by an observer who is accelerating upwards at the same rate in some location of outer space where there is no gravitational field. Thus, in each small region, the earth's gravitational field can be described as locally equivalent to the curving of space-time that is experienced by an appropriately accelerating observer. By putting together such local descriptions of curved space-time in small regions, a gravitational field (like that of the earth) may be described by a complex geometry in which the space-time continuum can be differently curved at different places and times. (This variation of space-time curvature corresponds to the variations of gravitational intensity, as for example the earth's gravitational pull decreases as an astronaut gets further away from the earth.)

Because space-time is curved by gravitational fields, its geometry is complicated, like the geometry of a bumpy surface. In such a complicated geometry, a straight path is defined as the shortest distance between two points; but the complications of curvature can make a straight path behave in an apparently curved way: as for example a bump or a depression in a two dimensional surface can cause a straight path to seemingly bend around the bump or the depression. According to the general theory of relativity, there is actually no such thing as a gravitational force that makes objects deviate from straight paths in space-time. In the absence of non-gravitational forces, all objects have straight paths in four dimensional space-time, though the curvature of space-time makes these straight paths appear as curved or non-uniform motion. An object (like the sun) appears to exert a gravitational force upon surrounding objects (like the planets) only because it affects the geometry of space-time so as to make straight paths appear curved in space and non-uniform in velocity. In short, a gravitational field only seems to work by exerting force upon objects. More accurately, it works by affecting the four dimensional geometry that relates events in space and time.

What is the use of this unfamiliar way of looking at the world? According to the special and general theories of relativity, Newton's laws of mechanics and gravitation are only partial approximations that arise from our common sense consideration of everyday situations: where speeds are much less than the speed of light, where apparently acquired energy is not large enough to make a noticeable contribution to mass, and where gravitational fields are not too large or intense. In such situations, the difference between the results of Newtonian and relativistic calculations is too small to be measured by ordinary experiments. But, wherever the difference between Newtonian and relativistic physics is noticeable and has been investigated by experiment, the theory of relativity has turned out to be the more effective and more accurate description of the physical world. In particular, the special theory of relativity has proved effective in describing the high speed particles and high energies of particle physics; and both the special and general theories have proved effective in describing the universe on a large scale, with its enormous distances and speeds and gravitational fields.

Despite its successes, the theory of relativity has not yet been able to complete its modification of our common sense view of the world. Newtonian physics and common sense conceive the world in two steps. First, matter is conceived to be distributed in space, and a physical object is conceived as a local distribution of matter. Second, the world is conceived to change through its changing distribution of matter, and a physical object is thus conceived to travel and transform in time: By contrast, relativistic physics conceives the world in one step, because it considers space and time together. The world is conceived as a four dimensional continuum of events in space and time, and an object is conceived as a path of events (through which the object 'travels' in space-time). As observed from an object, time is experienced as distance *along* the space-time path of the object, space is experienced as distance *away* from this space-time path, and the inertial and gravitational phenomena of mass are experienced as the curvature of space-time.

Where Newtonian physics divides the world into material objects that interact through force, the theory of relativity divides the world into events that are related to each other by space-time geometry. In principle, a completely relativistic conception should do away with the troublesome Newtonian concepts of force and matter. Whenever we conceive that force makes matter move through space in the course of time, this common sense conception implies that space is a fixed framework of points through which objects move, and time is a universal succession of moments in which the world progresses from one state to another. Relativity requires us to modify such common sense implications by acknowledging that each observer's space is 'fixed' only relative to his own physical instruments and each observer's time is 'universal' only in relation to his own perceptions of the changing world.

But then, what do different observers perceive in common, through their relative perceptions of space and time? According to the theory of relativity, different observers perceive the same events. As an object appears to pass through a continuous succession of positions in relative space and time, an observer perceives a connected path of events; and different observers perceive the same path, made up of the same events. Thus, we can conceive that events are related by the paths of objects in a four dimensional geometry of space and time; and this geometry is the same for all observers, though they may perceive it differently. In theory, if we had a complete mathematical description of this space-time geometry, it would enable us to relate events and to determine the paths of objects directly, without bringing in the concepts of force and matter. In practice, this has not yet been possible, despite considerable efforts by Einstein and others in the course of the twentieth century.

In order to replace the concept of force, a way must be found to represent all the various kinds of force that appear in our physical experience. Not only gravity, but also electromagnetic and other forces must be represented in a 'united field' description of how events are related by the geometry of space-time. The added complication here is that non-gravitational forces do not have the 'universal' character of gravity. Where gravity causes all objects to accelerate equally, non-gravitational forces cause different objects to accelerate differently. This is because non-gravitational forces evidently do not depend upon mass alone, but upon other characteristics of matter, such as electric charge. No satisfactory way has yet been found for representing such other material characteristics and their effects in space-time geometry.

In order to replace the concept of matter, it may be conceived that matter is only an appearance which is produced by the curved geometry of space-time. However, as it stands today, the general theory of relativity has not yet developed a satisfactory description (not even for the gravitational field) of those particular localities where matter appears. As yet, the space-time geometry of the gravitational field can only be sensibly described in the space between material objects, as for example in between the earth and the sun or in between atomic particles. When the field equations of general relativity are applied to those particular localities where matter appears to be situated, the resulting calculations show the presence of unlimitedly high curvatures of space-time, and these unlimitedly high curvatures give rise to mathematical complications. At certain places, the calculations give rise to a situation (called a 'singularity') where space-time is infinitely curved, and where all the laws of physics must therefore break down. It is not clear how such complications should be interpreted, thus making it evident that further considerations may be required, in the immediate vicinity of apparent matter.

Moreover, gravitation predominates over other apparent forces only on large scales of distance, where we consider large objects that are on the whole electromagnetically neutral, because their positive and negative charges tend to cancel each other out. On smaller scales of size, it turns out that electromagnetic and other forces are immensely more powerful than gravity. In fact, at the scale of atoms and their nuclei, gravitation is so much weaker than other forces that it seems to have no noticeable effect on atomic and nuclear phenomena.

Accordingly, in its present form, the general theory of relativity has only been effective in our large scale descriptions of the universe. It has not yet been effectively used in our small scale descriptions about matter and the minute particles from which physical objects appear to be made.

1.3 Uncertain particles

How is an object made up from smaller objects? There are two ways of trying to find an answer to this question. First, we can look physically into an object, through physical instruments and experiments in the external world. Second, we can look mentally into an object, by imagining or conceiving a picture which explains what the object is and how it gives rise to the characteristics and the phenomena that we perceive through our physical instruments. Physical science is founded upon both of these approaches, and each approach depends upon the other. Our experiments depend on what we conceive objects to be, and our conceptions depend on what we observe through our physical instruments and experiments.

How do we look physically into an object? From an everyday, common sense point of view, we can look into an object by digging into it or by breaking it up. However, this common sense method does not apply to objects that are too small or too far for ordinary instruments to dig into or to break up. For our perception of very small or very distant objects, we depend upon light and other radiations that are emitted or transmitted or reflected by these objects. Thus, in order to find out what very small or very distant objects are, we must interpret the radiations that come from these objects into our physical instruments.

At the end of the nineteenth century and in the early twentieth century, physicists thought that there were two, very different kinds of radiation. On the one hand, there were light and electromagnetic waves, which were travelling vibrations in the electric and magnetic fields at different points of space. On the other hand, there were streams of tiny particles, like electrons, which were material components of atoms. This was an obvious division, which seemed at first to be quite clear cut; but it became increasingly confused.

The problem started with the electromagnetic radiation that an object emits as a result of its temperature. The theory of electromagnetism led to nonsensical predictions which just do not fit the facts. In 1900, Max Planck showed that the theory did lead to the correct predictions provided that a new idea was introduced. This new idea was that electromagnetic radiation is emitted and absorbed in whole units, called ‘quanta’. A quantum is an indivisible unit which cannot be emitted or absorbed in part, but only as a whole. In any emission or absorption of electromagnetic radiation, a whole number of quanta must be involved. Each quantum has a fixed amount of energy, which depends on the frequency of the waves that make up the radiation. The higher the frequency, the larger the energy of the quantum. This is described by the formula, $e=h\nu$, where e is the energy of the quantum, h is a universal constant (called Planck’s constant), and ν (a Greek letter, pronounced ‘nyu’) is the frequency of the radiation.

According to the theory of electromagnetic quanta, light does not shine continuously from a lamp, nor is it absorbed continuously into our eyes. The amount of light emitted or absorbed can only increase in a series of quantum steps. Of course, light quanta are so minute that we do not ordinarily notice the steps, and this gives the false impression of a continuous flow of light. Just as matter seems continuous but is made up of tiny particles, so also the energy of electromagnetic radiation seems continuous but is made up of minute quanta.

During the first quarter of the twentieth century, Einstein developed an exploratory, provisional theory that electromagnetic radiation sometimes behaves as though it consists of waves, and it sometimes behaves as though it consists of moving particles. On the one hand, electromagnetic radiation travels from one place to another as though it is made up of waves, thus giving rise to phenomena like diffraction into a coloured spectrum and wave interference between coincident beams of light. On the other hand, electromagnetic radiation is emitted and absorbed in indivisible quanta of energy. Since mass and energy are equivalent (as Einstein had shown in the theory of relativity), the energy of a quantum gives it a corresponding mass, which is emitted or absorbed with the speed of light; and this involves an emission or absorption of momentum. Thus, quanta behave as though they are particles, with energy, mass, speed and momentum. As electromagnetic energy interacts with material objects, it behaves as though it consists in streams of moving particles. This particle-like behaviour gives rise to phenomena like the radiation spectra of hot bodies (as Planck had shown), like the photo-electric effect (in which light knocks out electrons from the surface of certain metals), or like the scattering of light by electrons, or like the characteristic frequencies of electromagnetic radiation emitted and absorbed by the various chemical elements.

But then, if light sometimes behaves like waves and sometimes like streams of particles, what is it actually? After all, waves and particles are rather different things. To some extent, the question can be answered by thinking of quanta as short bursts of wave radiation that are emitted and absorbed by material objects. But a further question immediately arises. Why does matter emit and absorb radiation only in these particular bursts, with their particular amounts of energy and momentum that cannot be reduced any further? According to the wave theory of electromagnetic radiation, it should be possible to absorb or emit radiation in any quantity, by vibrating an electric or magnetic charge to a corresponding extent. To Einstein and other physicists, it was clear that light cannot be fully described either by conceiving it as waves or by conceiving it as particles. There is something lacking in each conception. Neither tells the whole truth.

In 1923, Louis de Broglie suggested that if electromagnetic radiation can be partly described as waves and partly as particles, then the same should apply to matter as well. In particular, he suggested that electrons and other particles of matter travel through space like small bursts of wave radiation, whose energy and momentum depend on their frequency and wavelength. According to this theory, a stream of electrons moving at a particular speed should travel like a wave motion with a particular frequency and wavelength. Within a few years, this result was experimentally confirmed. When a stream of electrons was passed through nickel crystals, it showed a diffraction pattern that was characteristic of waves with the predicted wavelength. Thus, it was concluded that electromagnetic radiations and streams of particles are not so different as they seem at first. Both of them travel through space like waves, and both interact with other objects in minimum units of energy, called ‘quanta’. (For a particle stream, a quantum is the energy of a single particle. A particle stream interacts through its individual particles, and hence the minimum possible interaction is the interaction of a single particle.) This conclusion has profound implications for our ability to measure the very small objects that we physically observe through radiations and streams of particles.

One problem is that a wave motion is made up of its own internal variations. These internal variations take place in the space of one wavelength and in the time period of one cycle. When a wave motion is used to observe an object, the internal variations of wave motion interfere with our view of what exactly happens inside the space of one wavelength and inside the time period of one cycle. As a result, observations made through a wave motion are liable to be inaccurate by about one wavelength in space and by about the period of one cycle in time. For example, as light from an object is focused by a microscope, the wave motion of light causes a slight fuzziness in the image produced, and this fuzziness represents an uncertainty of about one wavelength in the spatial measurements of the object observed. In order to measure objects more exactly, we must use a wave motion of shorter wavelength and higher frequency (since higher frequency means a shorter time period for each cycle). Shorter wavelength gives greater accuracy for measurements of space, and higher frequency gives greater accuracy for measurements of time.

Moreover, in order to be observed, an object must interact with at least one quantum of the radiation or the particle stream through which the observation takes place. This interaction will disturb the energy and momentum of the observed object, by an amount that corresponds to some unknown part of the energy and momentum of the quantum, as it leaves the object and travels towards the observer. Thus, all measurements of energy or momentum are liable to be inaccurate by the amount of energy or momentum in one quantum. According to the relationships discovered by Planck, Einstein and de Broglie, a higher frequency of wave motion requires a greater energy in each quantum, and a shorter wavelength requires that each quantum should carry a greater momentum. Hence, when radiations or particle streams are used to observe objects, shorter wavelengths give rise to greater uncertainty in measurements of momentum, and higher frequencies give rise to greater uncertainty in measurements of energy.

In sum, essential uncertainties in our measurements of space and time are caused by the wave-like motions through which radiations and particles travel in space and time; and essential uncertainties in our measurements of momentum and energy are caused by the irreducible quanta through which interactions of momentum and energy take place. In 1927, Werner Heisenberg put these uncertainties together, in a conclusion of far reaching consequence. Though shorter wavelengths reduce uncertainty in measurements of space, they increase uncertainty in measurements of momentum. Similarly, higher frequencies reduce uncertainty in measurements of time, but increase uncertainty in measurements of energy. As a result, we cannot avoid a trade off.

The more accurately we measure the position of an object in space, the less certain we can be about its momentum and speed. And the more accurate we are about measuring the position of a moment in time, the less certain we can be about the energy of an object at that moment. Mathematically, the uncertainty of space multiplied by the uncertainty of momentum must always be greater than a certain fixed minimum (which is a little less than one twelfth of Planck's universal constant, h). And the uncertainty of time multiplied by the uncertainty of energy must also be greater than the same fixed minimum. Thus, there is an irreducible minimum of uncertainty in our measurement of physical objects. This is the famous principle of uncertainty, which has come to be regarded as the foundation of quantum mechanics.

At the scale of ordinary objects, quanta are unnoticeably small and so is the minimum uncertainty that they imply. Hence, the uncertainty principle is not noticed; and it seems possible to measure definite positions, times, momenta and energies for ordinary objects. This remains true even for the small objects that can be seen through an optical microscope. But, where we go down to the scales of molecules and atoms and their component particles, the uncertainty principle has a more and more noticeable effect. For an atomic particle, there is no way of avoiding a major element of uncertainty about its position, time, momentum and energy. This raises a conceptual problem. How can we think of something as a particle if we cannot definitely pinpoint its position in space and time and its momentum and energy? And how can it be conceived that an atom is made up of such particles?

The problem of conceiving atomic particles is an old one. The ancient Greek word 'atomos' means 'undivided', which corresponds to the modern idea that particles are integral quanta of undivided energy and momentum. The ancient Indians described a particle by the word 'aṇu', which comes from a verbal root that means 'to sound' or 'to breathe'. Here, a particle was conceived to be more 'fine' or more 'subtle' than the gross objects of everyday common sense: in much the same way that experiences of sound and breath are subtler and more elusive to common sense understanding than gross objects like tables and chairs. Hence, particles have long been conceived to be more subtle than gross common sense allows, and this corresponds to the modern idea that a particle travels like a wave and cannot be definitely pinpointed by physical measurement.

What we call 'atoms' today are the unit physical systems that are responsible for the chemical elements. Hydrogen, oxygen, nitrogen, carbon, sulphur, iron and other chemical elements are each made up from a characteristic kind of atom; and the character of each chemical element arises from its characteristic atoms. In the nineteenth century, it was generally believed that these chemical atoms were indivisible; but, at the end of the century, the discovery of electrons showed that this was not quite true. Electrons were first discovered as streams of negatively charged particles which travel between electrodes in a vacuum tube; and since an electron turned out to be over a thousand times lighter than the smallest atom, it became clear that atoms were not the smallest components of matter. Moreover, it was discovered that radioactive substances also emit streams of particles, including not only electrons but also a positively charged, much heavier kind of particle, called an 'alpha' particle.

In order to find out more about the structure of atoms, Ernest Rutherford and his assistants bombarded very thin gold foils with streams of alpha particles. Most of the alpha particles passed through undeflected, some were noticeably deflected as they passed through, and a few bounced back. Evidently, the alpha particles were being deflected or bounced back by highly concentrated nuclei within the gold foil. In 1911, Rutherford published the conclusion of his experiments. An atom consists in a very dense nucleus of positive electric charge, surrounded by orbiting electrons. Almost all the weight of an atom (over 99.9 per cent) is contained in the nucleus; but the nucleus occupies very little space. In diameter, an atom is rather more than ten thousand times as large as its nucleus. Each atom seems to contain an awful lot of empty apace, in between the nucleus and its orbiting electrons.

Though it seemed well justified by experiment, Rutherford's picture of the atom had a serious problem. According to electromagnetic theory, it was impossible. As an electron orbits round a nucleus, the orbiting motion amounts to an oscillation in space, and this oscillation of a charged electron should give rise to electromagnetic waves. Since electromagnetic waves take energy away, each orbiting electron should lose speed and fall into the nucleus. According to the calculations of electromagnetic theory, this should happen within a fraction of a second. Theoretically, atoms should collapse very rapidly, where in practice they obviously do not.

In 1913, Niels Bohr suggested that classical electromagnetic theory needed to be modified, when applied at the small scale of size that is found within the atom. Bearing in mind Planck's idea that the emission or absorption of light could only increase in a series of irreducible quantum steps, Bohr now applied the same idea to the energy levels of electrons in an atom. Using Planck's constant, he found a mathematically consistent way of specifying a series of possible energy levels, between which an electron must jump. In particular, an electron cannot fall below the lowest energy level of the series, and hence an electron cannot collapse in the way that was predicted by the classical theory of electromagnetism.

Moreover, Bohr's theory was able to explain a phenomenon which had puzzled physicists for some time: that each of the chemical elements emits and absorbs electromagnetic radiation in a characteristic series of sharply defined frequencies. As an electron jumps between energy levels in an atom, it emits or absorbs a quantum of light. The difference between the energy levels is then equal to the energy of the light quantum, and this determines the frequency of the electromagnetic radiation that is emitted or absorbed. Since each atom has its characteristic energy levels, each pair of levels will determine a sharp line of characteristic frequency in the emission and absorption spectrum of that element. Bohr's theory was able to calculate such emission and absorption spectra with an accuracy that was evidently more than mere coincidence.

Bohr's theory of the atom is an example of a theoretical technique called 'quantization'. In order to find new theories at the small scales of atomic particles, physicists try to modify older ways of thinking that have been successful in our experience of the world at a larger scale. Through 'quantization', physical conceptions from larger scales are modified by replacing the continuous variability of their energy and momentum levels. Instead of assuming a continuous variation of energy and momentum, a mathematically consistent way is sought for describing a series of energy and momentum levels that can be discontinuous. In such a 'quantized' description, there can be discontinuous gaps in the series of levels through which energy and momentum are raised and lowered. A physical system may only be described at one of this series of levels, and so they are often called 'allowed' levels. At an allowed level, energy and momentum are determined by essentially the same relationships as in larger scale physical theories. But, instead of varying continuously from one level to another, a physical system can jump in an indivisible quantum leap between levels, as it absorbs or emits energy and momentum by its interaction with other systems.

Through his theory of the atom, Bohr had used the idea of quanta to initiate a new way of describing physical systems. But, for the moment, Bohr had only found a limited formula for describing the quantum levels of a particular physical system: that of a negatively charged electron orbiting round a positively charged atomic nucleus. How could the quantum levels of a physical system be understood and determined on the basis of more general principles? The search was on for a systematic theory of quantum mechanics.

In 1925, Werner Heisenberg proposed that quantum mechanics should be formulated by considering the measurable characteristics of a physical system. Position, time, speed, momentum, mass and energy are examples of such characteristics, which are measured through interaction with an observer. During the course of an interaction, a physical system changes from one level of energy and momentum to another. In ordinary physics, measurements are assumed to be made through negligibly small interactions, where an observed system changes so little that we may ignore its variation away from a single level of energy and momentum. In quantum physics, however, there is a complication. A physical system may change in a discontinuous way, through an indivisible quantum transition between a pair of irreducibly separate levels. Thus, instead of depending upon continuous variation from single levels of energy and momentum, observation in quantum mechanics depends upon transitions between pairs of levels. In order to account for this complication, Heisenberg represented a measurable characteristic by an array of numbers, one number in the array for each pair of levels. On grounds of mathematical consistency and intuition, he formulated rules for adding and multiplying his arrays of numbers, and he went on to show how some simple formulae of the old physics could now be replaced.

Heisenberg's work was immediately taken up by other physicists, in particular by Max Born, Pascual Jordan and Paul Dirac. The arrays that represented observables were recognized as 'matrices', whose mathematics had already been developed. By the end of the year, general principles were formulated for replacing the formulae of larger scale physics, thus laying the foundations for a new system of mechanics, called 'matrix mechanics'.

Very shortly after, in January 1926, Erwin Schrodinger suggested a rather different way of thinking about quantum mechanics. Using de Broglie's idea. that particles travel like waves, Schrodinger formulated a wave equation, in which energy is represented by a mathematical operation that is related to frequency, and momentum is represented by a mathematical operation that is related to wavelength (according to the relationships that Planck, Einstein and de Broglie had discovered, between energy and frequency and between momentum and wavelength). In particular, Schrodinger used his wave equation to describe an electron that is orbiting about the nucleus of an atom. The equation shows that the wave motion of an orbiting electron has a discontinuous series of particular frequencies and wavelengths, rather like the series of harmonic frequencies and wavelengths in an organ pipe or a vibrating string. Just as an organ pipe or a taut string may vibrate with any particular frequency of its harmonic series, so also an electron may orbit an atomic nucleus with any particular frequency of the discontinuous series that is determined by the wave equation of such an orbiting electron.

Since energy is determined by frequency and momentum is determined by wavelength, an electron that moves with a particular frequency and wavelength has a particular energy and momentum. So, corresponding to its discontinuous series of frequencies .and wavelengths, an orbiting electron has a discontinuous series of possible levels of energy and momentum. These energy and momentum levels were the same that Bohr had guessed in his earlier picture of the atom. But now, the energy and momentum levels of an orbiting electron were calculated and explained on the basis of a more fundamental principle: that particles travel like waves. This fundamental principle was the basis of another new system of mechanics, called 'wave mechanics'.

It was soon recognized that matrix mechanics and wave mechanics were different formulations of the same theory. Despite their different starting points, each leads to the other, and their calculations essentially lead to the same results. But how are these highly mathematical formulations to be interpreted? In particular, what are the waves through which particles travel? And how do we measure physical characteristics like position, time, momentum and energy, when these physical characteristics are no longer represented by ordinary numbers, but by arrays of numbers in matrix mechanics or by mathematical operations in the differential equations of wave mechanics?

In June 1926, Max Born proposed that particles travel through waves of probability. In other words, Schrodinger's wave function determines the probability of finding a particle in a particular place at a particular moment of time. As the wave moves in space, the probability of a particle's presence is conveyed from one place to another. Thus, quantum mechanics is essentially concerned with probabilities. When some measurement is made of a physical system, it is not usually known for certain what the result is going to be. Instead, there is a distribution of probabilities among various possible results. Where larger scale physics determines a definite result through a single number, quantum mechanics determines a probability distribution of results, by means of Heisenberg's matrices or Schrodinger's wave equation.

From Heisenberg's uncertainty principle, it is clear that the interference caused by observation is not entirely predictable, and it cannot be ignored. So long as a physical system is not disturbed by any outside interaction, it evolves in a continuous and well-defined way, according to Schrodinger's or Heisenberg's equations of motion. But, when an observer measures the system, it is disturbed by the interactions of measurement, in a way that is not entirely predictable. Just before a measurement is made, the state of the system is determined by the quantum equations of motion, and this gives rise to a probability distribution for a number of possible results of the measurement. Just after the system is measured, it has been thrown into a special stage where a single result of measurement is now definitely known. Thus, an act of measurement changes a physical system: from a general state where the measurement can have many possible results, to a special state where one result is known for certain. And further, this change that results from measurement can only be partially predicted, through a probability distribution. The measurement can result in anyone out of a number of special states, each state corresponding to a possible result of the measurement.

In the descriptions of quantum mechanics, a physical system is not itself uncertain or discontinuous. Uncertainty and discontinuity arise from the act of observation, which has uncertain and discontinuous results. It is accepted, as a basic principle, that there is an inherent limitation in the continuity and certainty of physical measurements. Having accepted this limitation, quantum mechanics goes on to investigate how the world may be described, through physical measurements that have empty gaps in their continuity and fuzzy uncertainties in their definition.

1.4 Fluctuating fields

If matter and energy are made up from uncertain particles, then how can these particles be described to form the physical world, in which matter and energy are distributed in space and time? In particular, how can the principles of quantum mechanics be applied to the distribution of energy in the electromagnetic field (or in other fields of force)? And how can quantum principles be applied to the theory of relativity, where mass is described as a concentrated form of energy, and where mass, energy, space and time are described as interdependent measurements of the space-time continuum? These questions lead to the theory of quantum fields.

In physics, the word ‘field’ is used when some kind of condition is associated with each particular location in space and time. Quite simply, a ‘field’ is a conditioning of space and time. In a field of force, space is conditioned by the property that a certain kind of object experiences a particular force when placed at a particular location in space. In the general theory of relativity, space and time are together conditioned by the property of curvature in space-time geometry, and a gravitational field is thus a geometrical conditioning of space-time.

In quantum theory, each location in space is conditioned by the probability of finding a certain kind of particle there, with a particular energy and momentum. Each kind of particle is associated with its own quantum field. For example, an electron is associated with an electron field, where each location in space is conditioned by the probability of an electron being present. Similarly, a proton is associated with a proton field, a neutron is associated with a neutron field, and so on. But then, what about a quantum of light, which behaves like a particle of electromagnetic energy? Such an electromagnetic particle is called a ‘photon’, and it obviously corresponds to the electromagnetic field. Thus, the electromagnetic field can also be described as a quantum field, where space is conditioned by the probability of a photon being present, with a particular energy and momentum, at any given location.

In the late 1920s, very soon after the new principles of quantum mechanics had been discovered, they were used to show what Planck had guessed in 1900, that the energy of an electromagnetic wave cannot vary continuously. Instead, an electromagnetic wave can only vary its energy through a discontinuous series of allowed levels (depending on the frequency of the wave). Thus, a photon or quantum of light was shown to be an indivisible addition of energy and momentum by which an electromagnetic field can be raised from one possible level of wave motion to another. In short, the electromagnetic field was ‘quantized’, by considering it as a physical system in its own right. And a photon was described not merely as an isolated unit, but as a quantum addition to the energy and momentum of the whole electromagnetic field.

It was not long before this way of thinking was extended to all quantum fields. It is not strictly necessary to think of a quantum field as made up of probable particles, which give rise to probable levels of energy and momentum. We only use this conception because we are used to thinking of matter in terms of particles. A quantum field can also be conceived by associating it more directly (and more abstractly) with its energy and momentum levels. In this more abstract conception of a quantum field, space is described as directly conditioned by the probability distribution of its energy and momentum levels, at each location. And then, a particle can be described as one of those quantum additions by which the energy and momentum of the field can be raised or lowered through its series of possible levels. Just as a photon can be described as a quantum of the electromagnetic field, so also an electron can be described as a quantum of the electron field, a proton can be described as a quantum of the proton field, and each kind of particle can be described as a quantum of its corresponding field.

In sum, a quantum field can be described as a way in which space is conditioned, by probable levels of energy and momentum that are associated with a certain kind of particle; and each such particle can then be described as a quantum step between possible levels of the field. This suggests that it should be possible to raise and lower the level of a quantum field, by creating and destroying particles. Obviously, photons are created and destroyed by emission and absorption, thus raising and lowering the level of the electromagnetic field. Photons only exist when they travel with the speed of light; so it is easy to imagine that photons come into existence as they are set into motion by emission, and they cease to exist as they are brought to rest by absorption. But what about particles like electrons and protons and neutrons, which continue to exist at slow speeds? As such particles travel more slowly, they have less energy and therefore they have less mass (because of the equivalence of mass and energy that Einstein had demonstrated in the theory of relativity). But, no matter how slowly such a particle may be moving, its mass can never be less than a certain minimum, which is called its ‘rest mass’. Clearly, if an electron or proton or neutron is to be created or destroyed, its rest mass must be created or destroyed along with it. How can this be possible?

An answer was provided by Paul Dirac, in the late 1920s and early 1930s, as he developed a way of putting together quantum mechanics and the special theory of relativity. First, Dirac applied the new principles of quantum mechanics to a particle’s equation of motion, as described in the special theory of relativity. The resulting calculations showed that a particle does not only have positive levels of energy that are greater than zero. It can also take negative levels of energy that are less than zero. What could these negative energy levels be? Why doesn’t a particle keep falling lower and lower into these negative levels? Dirac postulated that all the negative energy levels are already filled up in ordinary space; so a article cannot usually fall below its lowest positive energy level, which is the energy that it has by virtue of its rest mass.

Since space is normally filled with particles of negative energy, this is the condition that is physically observed as ‘empty’ space. There are two ways in which this condition can change. On the one hand, there may be additional particles of positive energy, which are observed directly as such. On the other hand, there may be vacancies in the normally filled levels of negative energy. At the location of such a vacancy, space would have more energy than normal, because some normally negative energy is absent; and hence each vacancy must be physically observed as a particle of positive energy. Similarly, if the absent particle has an electric charge, then this charge will be absent from the normal condition of space; and the vacancy will be physically observed as a particle of opposite charge. In effect, for each kind of particle, negative energy vacancies will be physically observed as instances of a corresponding kind of particle, with the same positive energy levels but with an opposite charge.

This corresponding kind of particle, with similar energy and opposite charge, is called an ‘anti-particle’. For example, corresponding to the electron, there is an anti-particle called a ‘positron’. Such a positron corresponds to a vacancy or a ‘hole’ in the normally filled negative energy levels of the electron; and it has the same mass as an electron, but it has a positive charge that is equal and opposite to an electron’s negative charge. Similarly, there is a particle called an 'anti-proton', which is the anti-particle of the proton; and there is a particle called an 'anti-neutron', which is the anti-particle of the neutron. (The photon also has an anti-particle, but in this case the photon and its anti-particle are indistinguishable and therefore they are the same particle.)

Dirac's conception of anti-particles may seem to be a rather far stretch of the imagination; but the positron was first observed in 1932 (a couple of years after Dirac predicted it), and since then anti-particles have become quite commonplace in particle physics. In particular, they show how rest mass can be created and destroyed, and how particles of matter are essentially impermanent elements in the changing transformations of energy and momentum in time and space.

Since space is filled with particles of negative energy, any one of these particles may rise to a positive level, provided it is given sufficient energy. For example, by absorbing a highly energetic photon, an electron that fills a negative energy state may be knocked into a state of positive energy. In this case, three things will happen. The photon will disappear; a vacancy in the negative energy state will appear to physical observation as a positron; and an electron will appear with positive energy. In effect, an electron and a positron will have been created from the energy of a photon. Moreover, the reverse interaction can also occur. When an electron and a positron come together, the electron falls into the vacancy that is the positron, thus emitting a highly energetic photon. As the vacancy is filled, both electron and positron disappear, thus annihilating one another in a flash of electromagnetic radiation. In general, particles of any kind can be created and destroyed, along with their anti-particles, by absorbing and emitting sufficient concentrations of energy.

Under ordinary circumstances, matter appears to be made up from electrons, protons and neutrons that seem to continue through time, without being created or destroyed. Because mass is a highly concentrated form of energy, it takes an unusually high concentration of energy to create the rest mass of an electron or a proton or a neutron. For example, no ordinary photon has a high enough energy to create an electron and a positron. This requires a very special kind of photon, called a 'gamma ray', with an extraordinarily high frequency. Such unusually high frequency gamma rays are only observed through special high energy experiments, as for example in cosmic ray detectors and in particle accelerators.

Normally, it seems that there are too few gamma rays around to create a noticeable number of electrons and positrons. In general, it seems to be only in very rare and very unusual circumstances that electrons, protons and neutrons are created (along with their anti-particles). And conversely, it seems to be only in very rare and unusual circumstances that electrons, protons and neutrons are destroyed, because there are normally no anti-particles present to collide with them and destroy them. From this point of view, matter appears to be made up of stable particles that are rarely created and destroyed, because unusually high concentrations of energy are required to create them and unusual anti-particles are required to destroy them.

However, when quantum physicists look more closely at the nature of energy and momentum, all appearances of stability begin to break down. A basic problem arises in the way that modern physics describes change and continuity. In order to describe a change, there must be some continuing basis upon which the varying states of change are compared. If the word 'change' is to have a clear meaning, then something must be understood to continue, in order to undergo the change. In modern physics (including Newtonian mechanics, relativity and quantum theory), this continuing basis of change is provided by the conservation of energy and momentum. In any physical interaction, energy and momentum can be exchanged by different objects, but the total energy and momentum remains the same. Thus, energy and momentum provide a continuing basis of underlying stability, and the changes of the physical world can be described as redistributions of energy and momentum.

In quantum physics, a peculiar complication has to be introduced into this fundamental picture. Energy and momentum are conserved only approximately. The reason for this is the uncertainty principle. Suppose that energy is exactly conserved. Then, once having determined the energy of a physical object, we would know that its energy must continue to be exactly the same, as long as it does not interact with anything else. Thus, we could know its energy exactly, no matter how accurately we specify the instant of time at which it has this energy. This would be a violation of the uncertainty principle (which tells us that the more accurately time is measured, the less accurately energy can be known; and the more accurately space is measured, the less accurately momentum can be known).

In order to maintain its reciprocal uncertainty of energy and time, the energy of a physical object must be able to fluctuate randomly (in violation of energy conservation) during small intervals of time. The smaller the interval of time, the larger the fluctuation is likely to be. In fact, energy fluctuations of any given size (no matter how large) are likely, as long as we consider a small enough interval of time. Similarly, in order to maintain the reciprocal uncertainty of momentum and space, the momentum of a physical object must be able to fluctuate randomly (in violation of momentum conservation) within small distances in space. And momentum fluctuations of any size (no matter how large) are likely, within a small enough distance in space.

This is an extraordinary conclusion. It means that energy and momentum are continually being created and destroyed, in small intervals of space and time. And huge amounts of energy and momentum, larger than any limit which can possibly be imagined, must be created and destroyed, as long as we consider small enough intervals of space and time. Moreover, this does not only apply to particles that can be directly observed in states of positive energy. It also applies to the particles of negative energy that are present everywhere, even in what we observe as ‘empty’ space. Thus, ‘empty’ space is also subject to unlimitedly large fluctuations of energy and momentum, in small enough intervals of space and time. Through such short term fluctuations, particles emerge temporarily from their usual negative energy states into states of positive energy, resulting in the creation of pairs of particles and anti-particles. However, within short periods of time, before such particles and anti-particles can travel more than short distances in space, they must mutually destroy each other; as the fluctuations come to an end and the particles fall back into the negative energy vacancies that are called ‘anti-particles’.

What sense can be made of this extraordinary picture of short term energy and momentum fluctuations, which violate basic conservation laws and which fill seemingly empty space with pairs of particles and anti-particles that are continually being created and destroyed? To put this picture in perspective, it must be realized that energy and momentum conservation is violated only within the limits of the uncertainty principle, which no physical observation can be accurate enough to penetrate. In other words, no physical observation can be accurate enough to observe directly the short term fluctuations that violate conservation laws; and nor is it possible to observe directly the pairs of particles and anti-particles that are created and destroyed in the course of these short term fluctuations. Such particles and anti-particles are created in violation of energy and momentum conservation, but then they are destroyed again so quickly and so shortly that they cannot be directly observed. Accordingly, they are called ‘virtual particles’.

Thus, though quantum physics starts out by examining particles as basic units in which matter and energy are observed to occur, this examination leads on to the additional concept of ‘virtual particles’, which violate energy and momentum conservation and which cannot be directly observed. These virtual particles show two things. First, they show that quantum fields are inherently fluctuating, with unpredictable fluctuations that turn out to be more and more violent as time and space are considered more exactly. Second, since quantum physics is obliged to think in terms of virtual particles, this shows that there is something wrong with the original idea that observable particles should be the basic units of a quantum description of physical reality. In itself, the concept of an observable particle is an insufficient basis for describing the physical world. For a more complete description of the physical world, quantum physics has to fall back upon the more complex and subtle conception of inherently fluctuating quantum fields.

Accordingly, quantum physicists now conceive that the physical world is made up of underlying quantum fields. A quantum field is continually fluctuating at every point of space, and hence the energy and momentum levels of the field can never remain at zero anywhere. But, in seemingly empty space, energy and momentum are created and destroyed with such rapidity that they cannot be directly observed; and this is how large areas of space seem empty, though space is everywhere filled with very short lived energy and momentum fluctuations that may be described as ‘virtual particles’. Where the intensity of the quantum field is sufficiently high, energy and momentum can continue for long enough to be directly observed; and this results in the appearance of a physically observable particle. Thus, in quantum field theory, observable particles are conceived as unusually high and persistent concentrations of field intensity, in particular localities of space and time.

What happens when particles are observed to interact? In quantum field theory, particles are conceived to interact through their underlying fields. For example, when an electron emits or absorbs a photon, the act of emission or absorption is conceived as an interaction between the electron field and the electromagnetic field. Energy and momentum are conceived to be given out or taken in by the electron field, thus resulting in the creation or destruction of a photon in the electromagnetic field. But then, how is force carried through the electromagnetic field? How do charged particles exert electromagnetic forces upon each other?

According to quantum field theory, electromagnetic forces are carried by virtual photons. A charged object, like an electron, is continually emitting and absorbing virtual photons. Each time a virtual photon is emitted, its energy is temporarily created in violation of energy conservation; but this energy is very soon destroyed through the subsequent re-absorption of the virtual photon, and thus the violation of energy conservation is too short to be physically observed. As a result, it is not possible to directly observe the virtual photons of light that keep on being emitted and absorbed by a single charged object. However, if we consider a pair of charged objects and their behaviour towards each other, then their emission and absorption of virtual photons does have an observable effect. The reason is that virtual photons emitted by one charged object can be absorbed by another. Thus, by exchanging virtual photons, charged objects can exchange energy and momentum, just as though there were some sort of force acting at a distance between these objects.

For example, consider two electrons. Each electron tends to recoil a little as it emits a virtual particle in the direction of the other electron. This virtual photon travels toward the other electron and is absorbed there, causing the other electron also to recoil a little. Each electron thus tends to recoil away from the other electron, as virtual photons emitted by each electron are absorbed by the other. Enormous numbers of virtual photons are exchanged, thus producing the effect of a repulsive electric force.

Or, to take a slightly more complicated example, consider an electron and a proton. The complication here is that an electron is negatively charged and a proton is positively charged, so that the apparent force between them is a force of attraction. In order to picture this attractive force, it has to be realized that virtual photons do not obey the law of momentum conservation. Thus, when an electron emits a virtual photon from a proton, this virtual photon can change direction so as to go round the electron, travel to the proton, go round the proton and be absorbed on the reverse side of the proton. Conversely, there can be a similar sort of boomerang motion for virtual photons that are emitted by the proton and absorbed by the electron. As enormous numbers of virtual photons are exchanged in this way, the resulting effect is that of an attractive electric force.

What about other forces besides the forces of electricity and magnetism? Quantum physicists now conceive that all apparent forces result from four basic kinds of interaction. Each of these basic kinds of interaction takes place through a particular kind of particle and its underlying quantum field. First, there is the interaction of gravity, which is carried out by particles called ‘gravitons’. Second, there is the electromagnetic interaction, which is carried out by photons. Third, there is the weak nuclear interaction, which is involved in radioactive phenomena and which is carried out by W-particles and Z-particles. And fourth, there is the strong nuclear interaction, which holds the atomic nucleus together and which is carried out by particles called ‘gluons’.

Thus, quantum physicists try to replace the old Newtonian concept of force by a new concept of interaction through quantum fields. Such quantum field interactions can be pictured to take place through the emission, absorption and exchange of quantum particles; but this picture requires some strange modifications of the way in which particles are conceived. Not only is there an inherent uncertainty in the observation of quantum particles, but there are also ‘virtual’ particles which cannot be directly observed at all. These unobservable particles give rise to the appearance of forces that seem to act at a distance, without any intervening medium other than ‘empty’ space. In particular, though electromagnetic forces seem to act across empty space, they are in fact carried by virtual photons. Similarly, weak nuclear forces are carried by virtual W-particles and virtual Z-particles; strong nuclear forces are carried by virtual gluons; and the apparent forces of gravity are carried by virtual gravitons.

What need is there for these complicated and puzzling conceptions of quantum physics? Unless very fine divisions of time and space have to be taken into account, there is no need to consider the complications of quantum discontinuity and uncertainty. On large and medium scales of size, quantum considerations do not modify physical predictions to any noticeable extent. But, as physicists try to take into account what happens in very small intervals of time and space, quantum theory has proved extraordinarily accurate in its prediction of experimental results and it has proved extraordinarily useful in developing new technologies.

In particular, quantum physics has been very effectively used in atomic and molecular chemistry, in the development of nuclear technology, in the development of semiconductors and electronics, in the science of materials and material states, in low temperature physics and superconductor technology, in the development of lasers and their applications, and in a wide range of instrumentation that involves great precision of technical control and great accuracy of measurement in time and space.

However, despite its enormous practical success, quantum physics continues to suffer from serious problems in its conceptual foundations. As quantum theory stands today, it is founded upon the twin principles of quantization and uncertainty. Unfortunately, these principles do not in themselves provide a complete foundation for any theory of the physical world. They only provide a means for modifying physical theories that somehow must be assumed in the first place. The principle of quantization modifies a theory by allowing for discontinuities in physical measurements like energy and momentum; and the principle of uncertainty modifies a theory by replacing definite predictions with probability distributions that must have a stipulated minimum of uncertainty. In effect, these two principles are destructive rather than constructive. Where previous physics is based upon the continuity and stability of energy and momentum, this basic continuity and stability is destroyed, at very small scales of size, by the modifying principles of quantization and uncertainty.

But, if energy and momentum are not stable in small intervals of time and space, then on what basis of continuing stability can change be described? This conceptual problem gives rise to a perplexing technical difficulty in quantum field theory. Since space is filled with positive energy fluctuations (corresponding to the creation and destruction of virtual particles and anti-particles), the total energy in each finite region of space turns out to be infinite. Other calculations give rise to similar infinities, which appear to make nonsense of any attempts at finite calculation. Quantum physicists get round this difficulty through a mathematical procedure called ‘renormalization’, in which different infinities are cancelled out against each other, thus making finite calculations possible. This procedure of renormalization is linked with certain properties of symmetry (and related properties of ‘gauge’ invariance) that quantum field theories are obliged to obey. Hence, mathematical concepts of underlying symmetry (and ‘gauge’ invariance) seem to be emerging as fundamental principles upon which a new physics may be built. But physicists have not yet worked out exactly how this is to be done, nor what it quite means.

In particular, one outstanding problem remains unsolved in quantum physics. There are successful quantum theories of the electromagnetic interaction, and of the weak and strong interactions; but as yet there is no successful theory of quantum gravity. Beneath the technical difficulties of quantizing gravity, there seems to be a basic conceptual problem. As described by the general theory of relativity, gravitational interactions take place through the geometry of the space-time continuum. Thus, any quantization of gravity would seem to require a quantization of the geometrical structure of space-time. This would seem to mean that discontinuities must be introduced not merely in energy and momentum levels, but also in the structure of space-time itself. How can this be reconciled with the fundamental property of connectedness that characterizes the space-time continuum? On the face of it, the relativistic description of gravity, through space-time geometry, seems incompatible with the quantum description of gravity, as an interaction that is mediated by exchanging particulate quanta of energy and momentum.

Through theories of ‘super-symmetry’, ‘super-gravity’ and ‘super-strings’, physicists have recently been attempting to reconcile quantum physics with general relativity. But these new theories are still in the formative stage, where their great richness of mathematical complexity has not yet been resolved into an effective understanding of physical phenomena. They are still in the stage where their own internal complexities need to be reconciled, on the basis of what is already known; and they have yet to be tested by any further knowledge to which they may lead.

Thus, modern physics is not yet quite able to reconcile its large and small scale descriptions of the external world. For large scale descriptions of the universe, the general theory of relativity is mainly used; but, for small scale descriptions of matter and energy, it is quantum theory that is usually found appropriate. No satisfactory way has yet been found of putting together these very different theories of the physical world.

1.5 Putting things together

How can knowledge of particular objects be put together, in an overall knowledge of the world at large? Our knowledge of particular objects divides the world into varying localities of space and time. How can such varying localities be compared and related together? Clearly, in order to put together the varying characteristics of particular objects and particular localities, we need an invariant basis of understanding that is the same for different objects and for different localities and regions in space and time.

In particular, to put together our small and large scale views of the physical world, we need a basis of understanding that is the same at different scales of size. In this respect, quantum physics presents us with an inherent problem. It is inherently founded upon the idea that the laws of larger scale physics must break down at small scales of space and time, as a result of the modifying principles of quantum discontinuity and uncertainty. This tells us how the world is different at small and large scales of size. But it tells nothing about the opposite question that needs to be asked, in order to reconcile the small scale view of quantum theory with the large scale view of general relativity. How is the world the same, no matter how small or how large the scale at which it is viewed?

As it stands today, theoretical physics has largely been developed upon an underlying assumption that the evident complexity of the large scale world must eventually give way to simplicity, at small enough scales of size. In other words, large objects are complex in the sense that they are made up of differentiated components, but if we go on dividing objects into smaller and smaller components we will eventually reach a state where these small components are simple objects with negligible or no internal differentiation. On the basis of this assumption, we develop the methods of differential and integral calculus, whereby a continuous object is described by dividing it into ‘infinitesimal’ localities of negligible internal variation. Moreover, based on this same assumption, we develop particulate conceptions of matter and energy, whereby an object is described as a configuration of elementary particles.

By adopting a particulate conception of matter and energy, quantum physics originates from the assumption that the large scale complexity of the world can eventually be reduced to the small scale simplicity of elementary particles. But, in order to fit the facts, this assumption has to be complicated by the uncertainty principle, which replaces definite measurements by uncertain probability distributions. In turn, these probability distributions lead to the theory of quantum fields, where space and time are conditioned by probable energy and momentum levels which are associated with each kind of elementary particle. Thus, it turns out that elementary particles are not, after all, the basic units of which the world is made. Instead, the world consists of quantum fields, in which observable particles are noticeable concentrations of field intensity.

However, these quantum fields contradict the assumption of eventual simplicity at small scales of size. The uncertainty principle requires large fluctuations of momentum and energy in small intervals of space and time. As smaller and smaller intervals are considered, such fluctuations become unlimitedly more and more violent. Thus, where momentum and energy are concerned, quantum theory seems to show that the world is unlimitedly complex, no matter how far we may try to divide it, through smaller and smaller scales of size.

If the world cannot be reduced to small scale simplicity, this raises questions about the original foundations of quantum theory. Perhaps the uncertainty principle is a statistical substitute for a detailed accounting of small scale complexities within seemingly elementary particles and within seemingly simple localities of space and time. In other words, perhaps the small scale behaviour of the world is made to seem uncertain by unaccounted complexities in small intervals of space and time. Accordingly, some physicists have suggested that the uncertainty principle could arise from 'hidden variables' which have not so far been taken into account.

But then, on what basis could it be possible to describe such unaccounted complexities and hidden variables that might underlie quantum uncertainty? One possible clue may be provided by the quantum conception of physical interactions. In quantum theory, small scale energy and momentum fluctuations are conceived as virtual particles that can be exchanged by different objects, hence enabling an exchange of energy and momentum between different localities in time and space. This suggests that small scale complexities are somehow involved in the interconnection of different localities, as different objects interact across their separation in time and space. Thus, small scale complexities within each particular locality seem somehow involved in the larger scale complexity through which different localities and different objects are related together in the world at large.

Such considerations bring to mind an old philosophical conception that each particular object or each particular locality can be described as a 'microcosm' of the 'macrocosm', or in other words as a small world that mirrors the complexity of the world at large. In order to describe an object completely, its relationships with the rest of the world must also be described; and any complete description of a particular object must therefore take into account the entire world. Even if an object is defined within the confines of a particular locality, such a local description can only be completely exact if it takes into account the effects of the entire world upon that particular locality. Accordingly, a completely exact local description must implicitly reflect the complexity of the entire world.

For an approximate view of local appearance, the detailed effects of the rest of the world can be largely ignored; and thus different local descriptions seem to describe separate objects in separate localities. But, to make a local description more exact, the effects of the outside world have to be taken more and more into account, thus adding to the initial approximation a background of increasingly fine detail. For complete exactness, the entire world must be represented in each local description, through all the relationships between a locally described object and the rest of the world.

In effect, each local description of a particular object is a transformed description of the whole world: with the object explicitly featured in the foreground of attention, and the rest of the world implicitly represented in the background of increasingly fine details that have to be included in the description, as it becomes more and more accurate.

What does this conceptual reasoning suggest for the general theory of relativity, where the world is described through space-time geometry? It suggests three things. First, when closely examined, the space-time geometry of each locality is liable to be highly complicated, no matter how small this locality may be. Second, small scale complexities of local geometry are somehow involved in the interconnection of different localities in the space-time continuum. And third, through its interconnections with other parts of space-time, each particular locality implicitly represents the complexity of the entire universe.

What mathematics could be used to describe such a bewildering picture of space-time geometry, with its interconnection of different localities through an unending small scale complexity that goes on representing the entire universe in smaller and smaller localities of space and time? Evidently, sufficient mathematics has not yet been developed for such a picture; but there are initial hints of development in this direction.

The present mathematics of general relativity seems to allow that different parts of the space-time continuum may be geometrically interconnected by what are called 'worm holes'; and this raises the possibility that further mathematical developments may be able to describe a space-time geometry which is intricately honeycombed by such 'worm hole' interconnections.

Moreover, mathematicians and physicists have recently been considering a new kind of geometry, called 'fractal geometry', which does not make the traditional assumption of eventual simplicity at decreasing scales of size. In particular, fractal geometry has begun to develop a mathematical description of shapes whose complexity is the same at all scales of size. Among such fractal shapes are those which have the property of 'self-similarity', whereby an entire geometrical shape is similar to smaller shapes that it contains within itself (as for example we can conceive the shape of a fern as similar to each of the parts that branch off its stem, and we can further conceive that these parts are each similar in shape to the smaller parts that branch off their stems, and so on ad infinitum).

So far, theoretical physics has mainly conceived of relativity with respect to an observer's location and state of motion, without considering each observer's limited range of attention. Perhaps the principle of relativity could be extended by considering that just as the world is described relative to an observer's particular location and state of motion, so also the world is described relative to the particular locality that occupies an observer's attention. Whichever particular locality may be described, it is a part of the world, and so the whole world is implicitly represented in the description.

Thus, the description of a particular locality can be conceived as a description of the entire world, relative to the locality in which it is observed. If the conception of relativity is extended in this way, then the description of a particular locality must be essentially similar to a macroscopic description of the entire world, since both are relative descriptions of this same world. Accordingly, by extending the principle of relativity to include not only the observer's location and state of motion, but also the locality in which observations are made, space-time geometry could perhaps be described on the basis of a principle of 'self-similarity', whereby the space-time continuum must be essentially similar to each of its localities. Or, as it is put by the physicist David Bohm (in his book, *Wholeness and the implicate order*): '… a total order is contained, in some *implicit* sense, in each region of space and time.'

For example, the principle of self-similarity could perhaps be applied to Einstein's suggestion that matter may be conceived as made up of 'worm hole' interconnections (Einstein-Rosen bridges) between different localities in space-time. In the locality where a worm hole starts, its entrance is like the famous 'black holes' of astrophysics, where all space-time paths go in but nothing comes out. (In fact, astrophysical black holes could be large worm hole entrances that have been formed by the gravitational collapse of massive stars.) In the locality where a worm hole ends, its exit is the converse of a black hole. Such a worm hole exit can be thought of as a 'white hole', where all space-time paths come out but nothing goes in.

Both worm hole entrances and worm hole exits would appear to behave like pieces or particles of matter, because of the mass that they contain. In particular, they would travel along the straightest possible paths in curved space-time and they would have a gravitational effect by contributing towards the curvature of space-time. In effect, a worm hole would appear as two particles in two different localities of space-time, with an interconnection through which matter and energy flow from one particle to the other.

But how could we conceive of the space-time paths that enter a worm hole at one end and exit at the other? We have to conceive of small objects travelling along such paths; and since we are conceiving that objects are made up of worm hole entrances and exits, it is only natural to conceive that the space-time paths in a worm hole consist of smaller worm hole entrances and exits, travelling through space and time. This gives us a 'self-similar' picture that each worm hole has smaller worm holes branching out and joining in at every part of itself, and these smaller worm holes have still smaller worm holes, and so on. In this picture, space-time is 'fractally' honeycombed, by an infinite regression of smaller and smaller worm holes in every locality.

In a way that is similar to quantum field theory, it could be conceived that space is never quite empty, but only appears so when its fractal honeycombing is not noticeable. Where the fractal honeycombing is noticeable, matter appears. And where matter appears, its intricate honeycomb of interconnections makes it appear that energy and momentum are exchanged by the action of force at a distance. And in turn, this appearance of force corresponds to the manifest curvature of the space-time continuum.

Such a picture should have quite enough complexity to account for the apparent discontinuities, uncertainties and fluctuations of quantum theory. The discontinuities would be accounted for by the particulate nature of worm holes. (Worm hole entrances and exits have to be counted discontinuously, in whole numbers.) And quantum uncertainties and fluctuations would be accounted for by the complex flow of matter and energy into a worm hole and out of it, through the smaller worm holes that interconnect it with other parts of space-time. (In particular, the small scale fluctuations of momentum and energy in quantum field theory would not require any violation of conservation laws, but could be explained by a fluctuating flow of momentum and energy through tiny worm hole interconnections between different localities of space-time.)

Of course, the problem is that such a picture is too complicated for current mathematics. The standard methods of differential and integral calculus could not be applied directly to it, because they are based upon eventual simplicity at small scales of size. However, by ignoring variations below a certain scale, differentiable functions could be used as approximations that describe effects which take place above this scale of size. Thus, a series of differentiable functions could be used to give a series of approximations which are more and more accurate, in the sense that they describe effects which take place above smaller and smaller scales of size. This is one of the techniques by which shapes may be described in fractal geometry. There are also other techniques, as for example a discontinuous series of points may progressively fill in a series of more and more detailed appearances of a fractal shape in some finite locality (rather in the way that a picture is printed through a discontinuous series of dots that can give a more and more detailed appearance as more and more dots are used).

Through such techniques and through further developments of fractal geometry, the space-time continuum could perhaps be described by a fractal representation that shows the world to be more and more interconnected as it is examined in more and more detail, taking account of what happens in smaller and smaller intervals of space and time.

In general, the physical sciences have a tendency to be developed upon the analytic approach of dividing a system into separately considered parts. But, for a more complete and exact view of the world, scientists also recognize a need for the complementary approach of considering that a system is a whole and that the parts into which it is divided are different ways of looking at the same whole. Currently, fundamental theories of physics are being developed through cosmological considerations about the evolution of the whole universe (most famously in the ‘big bang’ theory); further physical theories of order and chaos are being developed through synthetic considerations about the complexities of systemic behaviour; biological theories are being developed through synthetic considerations of living organization; and environmental concerns have underlined the inadequacy of partial knowledge about narrow objects, whose conception remains inaccurate and incomplete, for lack of understanding about the wider world.

1.6 Gross and subtle

What is the physical world that our bodies perceive through their five senses? The answer seems to depend on how closely the world is examined. When the perceptions of our unaided senses are interpreted by ordinary common sense, the world appears to be made up of gross objects, like tables and chairs, which our senses seem to perceive. Gross objects are interpreted as separate pieces of matter, located within definite boundaries in space and time.

Upon further examination of the interactions between objects, it appears that the world does not contain only gross objects. It also contains more subtle things called 'forces', which are the pushes and pulls that objects exert upon each other, thus changing one another's movements. Some forces seem to act through direct physical contact, at the common boundary of touching objects. But some forces, like gravity and electromagnetism, show an ability to act at a distance, between objects that do not touch one another. without needing any intervening matter to transmit force from one object to another. Evidently, space is able to transmit force, in a subtle way that our senses cannot directly see.

When the nature of electromagnetism is examined, it turns out that along with electromagnetic force, space can also transmit electromagnetic waves that have energy and momentum. And it further turns out that these electromagnetic waves are responsible for the radiation of visible light and tangible heat and other forms of energy. Thus, in addition to gross objects and the forces they exert through visible contact, the world contains more subtle forces and radiations, which are transmitted unseen through space until they reach the objects where their effects become visible.

When the propagation of light is more closely examined, it turns out that light always travels at the same speed, no matter how fast an observer may be moving towards it or away from it; and this requires a reconsideration of our common sense ideas about the world. Space, time, matter and energy are shown to have no independent existence of their own. Rather, they are relative measurements which depend upon each other and upon the observer who makes these measurements. Through such relative measurements of space, time, matter and energy, an observer has only a relative view of the world, which differs from observer to observer. In order to conceive the common world that contains all different observers, space, time and material objects have to be considered together, and the world has to be conceived through the physical events that different observers perceive in common. Thus, where everyday common sense conceives a world of gross objects that are separated by space and time, this everyday view of the world is replaced by the more subtle conception of a four dimensional continuum of space-time events, which are connected by the paths of objects that appear to travel through space and time.

When the nature of gravity is further examined, it turns out that the effects of gravity are equivalent to the inertial effects of acceleration, and hence a gravitational field is equivalent to a geometrical curvature of four dimensional space-time. This leads to an even more subtle conception of the world as a geometrically curved space-time continuum, with the common sense idea of force replaced by the subtler conception of curvature in space-time geometry. In this conception, the space-time paths of objects are straight, but they appear to be deflected from uniform movement because the space-time continuum is complicated by the curvature of its own geometry, thus producing the appearance of deflecting or accelerating forces.

When objects are examined more and more minutely, at smaller and smaller scales of size, the world goes on appearing to be more and more subtle as it is more closely examined. Through various kinds of microscope, physical objects are shown to be very different from their gross appearance to our unaided senses. What seems smooth to the naked eye turns out to be full of microscopic irregularities; what seems shapeless and irregular can turn out to be finely structured; a seemingly still liquid can turn out to contain enormous numbers of moving microbes and thermally agitated particles; and thus, a microscopic world of extraordinary complexity is shown to underlie the gross world that appears before our unaided senses.

Through experiments with streams of atomic particles (as for example with radioactively emitted particles used to bombard very thin foils), it turns out that matter is not nearly as continuous as it appears when it is perceived through our unaided senses or even through optical microscopes. At the atomic scale (which is rather less than the wavelength of visible light and which is therefore too small for optical microscopes), ordinary matter is shown to contain an enormous proportion of empty space, in between tiny atomic nuclei and the electrons that orbit them. Thus, the apparent continuity of the gross world is replaced by the highly discontinuous picture that matter is concentrated in tiny particles, with an overwhelming proportion of empty space in between.

However, our small scale observations are limited by the nature of light and other radiations that we use to magnify microscopic images and to give us information at small scales of size. When the nature of such radiations is further examined, it turns out that they travel through space like formations of waves, but they interact with matter as though they were streams of particles. In particular, when they are used to make small scale observations, they have wavelengths and frequencies that create fuzzy uncertainties in our observations of space and time; and they also have particulate quanta of momentum and energy that disturb the objects observed, thus giving rise to uncertainties in our observations of momentum and energy. Moreover, the relationship between wavelengths, frequencies and quanta is such that an irreducible minimum of uncertainty is inevitable, when space and momentum or time and energy are observed together. At the atomic and sub-atomic scales of size, it turns out that our common sense conception of definite objects must be replaced by a much more subtle picture of uncertain particles which travel through space in probability waves.

When it is further examined how matter and energy can be made up from uncertain quantum particles, it turns out that such particles are manifestations of fluctuating quantum fields. Each kind of elementary particle manifests a corresponding quantum field; and this underlying quantum field conditions each location in space and time by probable momentum and energy levels that are associated with the manifest particle. Because of the uncertainty principle, momentum and energy levels can never be definitely constant in small intervals of space and time. Instead, in each locality, there must be unlimitedly large momentum and energy fluctuations that cannot be directly observed, because they take place in such small intervals of space and time. Though such fluctuations are not directly observed, they have important effects that can be observed. In particular, they enable apparently separated particles to exchange momentum and energy, thus producing the appearance of electromagnetic and other forces. Hence, through quantum field theory, the gross world of apparent sense objects is replaced by another highly subtle conception, that space is filled with probable levels of momentum and energy which fluctuate randomly within the limits of the uncertainty principle. Where space seems empty, momentum and energy fluctuate away from zero so briefly that they cannot be directly observed; but in certain particular localities momentum and energy do remain observably different from zero, and it is here that particles are manifested.

As the small scale view of quantum theory is examined in relation to the large scale view of general relativity, physicists are looking for a unifying conception that could reconcile the present division between our small and large scale views of the world. Such a unifying conception must be more fundamental than previous theories, in the sense that it must be based on underlying principles that are common to small and large scale phenomena. But it will also be more subtle, in the sense that it will be one stage further removed from the partial appearances that are perceived by our gross senses. These gross senses perceive only partially accurate appearances in limited localities of space and time: thus giving rise to approximate descriptions of seemingly separate localities, into which the world is apparently divided by our gross perceptions. But, when the world is conceived as a whole, the description of a particular locality can be conceived as a local description which represents the observed effects of the entire world in that particular locality. In other words, it may be conceived that local descriptions are different ways of describing a common world, as this same world is differently manifested and observed in different localities.

Accordingly, our small and large scale views could perhaps be reconciled by treating local descriptions as manifesting transformations of a common universe, which is thus differently manifested and differently observed in each particular locality. The more subtle and exact a local description becomes, the more completely it can represent, and take into account, the universe as a whole.

Moreover, as scientists continue to examine how the physical world is structured in systems and how it is organized in living bodies, yet further conceptions are being sought, to understand the underlying principles that are manifested at various levels of physical structure and living organization.

How does physical science proceed from gross perceptions of seemingly separate objects to more subtle conceptions of underlying laws and principles? Clearly, as science proceeds from sense appearances to enquire more and more deeply into underlying principles, this enquiry depends further and further upon the subtle faculty that is called ‘mind’. In the science of physics, the use of mind is developed through mathematical calculations, which become increasingly subtle and increasingly complex as they are used to bridge the increasing gap between more and more fundamental principles and the greater and greater variety of phenomena that they underlie.

But, no matter how subtle and complicated they may become, mathematical calculations do not in themselves constitute an understanding of the world. They merely provide a formal superstructure of deductions that are based upon an understanding of underlying principles. In other words, the formal reasoning of mathematics is only a means through which understanding is tested, by deducing consequences and predictions from already accepted assumptions. Where understanding proves inadequate and basic assumptions are in question, new forms of reason must be based on further understanding; and this further understanding is developed and expressed through the mental faculty called ‘intuition’.

For example, medieval astronomy was based on the assumption that the heavens revolved about a still earth; then scientists like Copernicus, Galileo and Newton developed a further understanding of the solar system through the intuition that the earth and other planets revolve about the sun; and in this century scientists like Einstein have developed a still further understanding of the universe through the intuition that earth and sun and all other bodies move relative to one another. These intuitions changed the way the world was understood and thus led to new, more fundamental conceptions (like Newton’s gravitational mechanics and Einstein’s theories of relativity) that mere mathematical calculations (like Ptolemy's epicycles and the Lorentz transformations) could not by themselves uncover.

Thus, beneath the high technology and the complex, computer-aided calculations of modern physics, underlying physical conceptions depend essentially upon the human mind. As theories get more and more fundamental, they have to fall back upon deeper and subtler levels of intuition: in order to describe more and more basic principles, which are further and further removed from the apparent world that is grossly perceived by our external senses. Through a succession of increasingly subtle conceptions, which use increasingly subtle and complex mathematical calculations to describe the world, modern physics clearly illustrates an old philosophical principle: that more basic knowledge of the external world depends upon deeper intuition.

But this implies some sort of underlying connection between the external world of physical objects and the 'inner' depth of the mind. What could this connection be? Physical science restricts its attention to the world that we perceive through our bodily senses. For a more complete and more exact understanding of experience, we must also take into account the process of mind through which perceptions are interpreted and understood.

2. *Mind*

Our minds know nature bit by bit
but can't quite make the pieces fit.
Each goal we choose
means that we loose
all else that's left outside of it.

2.1 Perceptions

What is a perception? From a physical point of view, the world is perceived by a person's body. Through the electromagnetic transmission of light, or through the material vibrations of sound, or through the gaseous diffusion of odour, or through the chemical effect of flavour, or through the mechanical action of touch, our sense organs are in contact with the physical world; and they convert this contact into electrochemical impulses that our nerves conduct into our brains. Thus, a perception may be physically described as a pattern of nerve impulses that carries information into a living brain.

However, such a physical description leaves something essentially missing. It does not describe perception as it is in our experience. In our experience of perception, we do not see sights as wave or quantum variations in a mathematically described electromagnetic field; we do not hear sounds as material vibrations of so many cycles per second; we do not smell odours or taste flavours as chemical compounds with latinized names and molecular formulae; we do not sense feelings of touch as pressures of so many kilograms per square centimetre or as temperatures of so many degrees centigrade. Nor do we experience perceptions, thoughts and feelings as patterns of electrochemical activity in our nerves and brains.

But then, how is perception experienced? When an object is perceived, it appears in experience; and the word 'perception' is used to describe this appearance. For example, when I see a tree, a sight of the tree appears in my experience; and this appearance of sight is a visual perception of the tree. Similarly, when I hear leaves rustling or when I smell ripening fruit or when I taste the fruit or when I feel the rough bark of a tree, sensations of sound, smell, taste and touch appear in my experience; and these appearances of sensation are sensual perceptions of the leaves, fruit and bark of the tree. Or, when I remember or imagine a tree, a memory or an imagined idea of the tree appears in my experience; and this appearance of memory or imagination is a mental perception of the tree. Thus, in each person's experience, a perception is an appearance through which an object is known.

When a physical object is perceived through a person's bodily senses, physical sensations appear: of sight, sound, smell, taste and touch. But, such physical sensations are not the only perceptions in our experience. We also experience mental sensations and mental perceptions. For example, in the course of a dream, a person experiences mental sensations of imaginary objects that are not perceived in the external world but only in the dreamer's mind. Or, by following a description, a person experiences mental perceptions of described objects that are not physically perceived at the time. Or, as a person thinks and feels, thoughts and feelings appear in experience, as mental perceptions of what is being thought about and felt.

Moreover, the objects that we perceive are not only physical. Besides physical objects, which seem to be particular pieces of the physical world, we also perceive mental objects, which seem to be particular pieces of perception, thought and feeling in the minds of living creatures. For example, consider the imaginary objects perceived in a dream or the fictional objects described in a novel. These imaginary or fictional objects are clearly not physical. Instead, they are figments of imagination in the mind of the dreamer or in the minds of the author and the readers of the novel. And further, consider the perceptions, thoughts and feelings that are expressed in words and sentences and in other forms of communication. As I read a letter from a friend, my friend's perceptions, thoughts and feelings appear in my experience, as mental objects that my mind has perceived through the physical letter. And further still, consider the perceptions, thoughts and feelings that each of us perceives in our own minds. As my mind perceives and thinks and feels, its own perceptions, thoughts and feelings appear in my experience: as manifest pieces of the process of perception, thought and feeling that takes place in my mind.

In general, three different kinds of object appear in our experience. First, there are objects which appear to be purely physical, as for example a rock or a motor car. Second, there are objects which seem to have both physical and mental components, as for example a living creature or a meaningful communication. And third, there are objects which seem to be entirely mental, as for example a thought or a feeling that a person perceives in his or her own mind.

Whatever object is perceived, whether physically or mentally, it appears in experience as a manifest part of some larger existence. When a physical object is perceived, it appears as a manifest part of the physical world. When a partly physical and partly mental object is perceived, it appears as a manifest part of a world that has both physical and mental components. When a mental object is perceived, it appears as a manifest part of the process of perception, thought and feeling in a living creature's mind. Thus, our physical and mental perceptions are essentially partial appearances that imply some larger, more fully complete existence.

The problem is that our physical senses and our minds are essentially limited in their clarity and range of perception. Our physical senses perceive only partially accurate approximations in limited localities of space and time; and our minds perceive only partially determined forms, meanings and qualities in a limited span of attention. We are left with an old and rather familiar question. From the limited and partial perceptions of our physical senses and our minds, bow can we come to a more complete and more exact knowledge of what we perceive?

The most obvious way of trying to develop knowledge is through technology. On the one band, physical instruments and techniques can be developed to examine smaller and smaller objects and to look further and further into the external universe, thus increasing the accuracy and range of physical perception. This is the technological basis of physical science and its spectacular advances in modern times. On the other hand, mental exercises and techniques can be used to cultivate special states of mind in which perception becomes progressively clearer and more complete, thus transcending the usual limitations of ordinary mind and senses. This method of mental technology is often called 'mystical', because of the apparent strangeness of its special states of perception, which it cultivates through techniques of mind control and meditation.

But, no matter how accurately or how far the physical world may seem to be observed, and no matter how clear and complete a state of mind may seem to have been achieved, the appearances of physical and mental perception must still be interpreted, in order to understand what they show. Each physical or mental perception is only a particular appearance, from a particular point of view. Any such appearance must emphasize some parts and some aspects of what is perceived, at the expense of other parts and other aspects that are emphasized from other points of view. For example, when I look at a house from the outside, I see its outer walls and roof, which provide. protection against wind and rain and sun and thieves. But, when I look at this same house from inside, I see inner walls and floors and furniture and other belongings, which give the house its comforts and its character as a home. Moreover, when I view the house as a mechanical structure that will last through the destructive effects of weather and time, I do not emphasize the same things about the house as when I perceive its character as a human home. However I may look at the house, my perceptions have to be interpreted in relation to my particular point of view, which will emphasize some aspects of the house, at the expense of other aspects that are brought into the foreground of attention from other points of view. The relativity of different viewpoints thus gives rise to an essential partiality of perception which no physical or mental techniques can quite remove, no matter how detailed and how broad they may enable our perceptions to be.

Hence, to a greater or lesser degree, physical and mental technologies always leave us with essentially the same problem of partial perception that we commonly experience in the course of our ordinary lives. This problem is managed a familiar way that is shared alike by physical sciences, mental disciplines and ordinary common sense. The appearances of perception are interpreted by thought and feeling, thus leading to an understanding of what it is that these appearances show.

2.2 Thoughts

What is a thought? From a physical point of view, the activity of thought takes place in a person's brain. The brain contains a large number of individual cells, which act upon each other through a highly intricate and subtle network of electrical connections and chemical influences. As the brain cells interact through this electrochemical network, they give rise to a tremendous complexity of patterns of brain activity: into which are received electrochemically coded signals from the sensory organs, and from which are sent out electrochemically coded stimuli and commands that direct the actions of the body. Accordingly, the brain may be described as a complex electrochemical computer that processes sensory information so as to direct the actions of the body. And the activity of thought may thus be described as a computer process by which incoming sensory signals are converted into outgoing stimulation and control of bodily action.

However, such a physical description of thought can only display complex patterns and structures of physical signals and stimuli within a person's body. This leaves unanswered a fundamental question. How do we experience these patterns of physical signals and stimuli, as they are received and processed and formed in our brains? In order to answer this question, it is necessary to consider a person's experience of thought, as perceptions are received and reflected upon, and as explanations and decisions are formed.

When a person thinks about an object, a perception of that object is created by the use of symbols. For example, suppose that I am away from home during the rainy season and I think: 'The garden must be getting lush and green.' Then, a perception of the garden is created by this use of words that I may speak out loud to a companion or that I may say to myself in my mind. And further, suppose that I think of how the trees must look, by picturing them with their newly growing cover of leaves. Then, a perception of these trees is created by using images of the transformed shapes and colours that are brought about by the new leaves. And further still, suppose that I think of the refreshing and cool feelings of relief that the rains bring to my family and friends, as the summer dust and heat are washed away. Then, a perception of these feelings is created by images of clear rain-washed sights and by imagined sensations of refreshing coolness that symbolize what my family and friends are perceived to be feeling. Thus, in each person's experience, a thought is a perception that is created by the use of symbols.

But then, what is a symbol, and how are symbols used to create perceptions? Essentially, a symbol is an immediately perceived object that is interpreted so as to perceive some further existence. For example, a mark or a line on a map is a symbol that is interpreted so as to perceive the location of a town or a road or some other geographical feature. Or, a word or a phrase is a symbol that is interpreted so as to perceive something which the word or phrase is being used to represent. Or, a picture or an image is a symbol that is interpreted so as to perceive something that is being pictured or imagined.

When symbols are connected together so as to form a description, this description can be interpreted so as to perceive a complex object that is made up of component parts. For example, symbols that represent towns, places and roads can be connected together by drawing a map, and the map can be interpreted so as to perceive a geographical region that is made up of these towns, places and roads. Or, nouns can be connected by verbs, prepositions and grammatical relationships in a sentence, and the sentence can be interpreted so as to perceive a complex object or situation that is made up from the component objects which each noun represents. Or, pictures and images that represent parts of an object can be related together in a composite description that is interpreted so as to perceive the object as a whole. Thus, perceptions can be created by connecting symbols together, so as to form descriptions of complex objects and situations that are made up of component parts.

This formation of descriptions is called 'conception', and it provides two ways of interpreting the limited and partial appearances of perception. First, an apparent object may be interpreted by conceiving it as part of some larger object, which is described by connecting symbols that represent the apparent object and other objects to which it is related. For example, when a traveller perceives a town, the apparent town may be interpreted by conceiving it as a particular place in a geographical region, which is described by drawing a map that connects symbols representing the town and other geographical features in the region. Or, an apparent thought or feeling may be interpreted by conceiving it as part of some larger complex of thought or feeling, which is described by connecting words and phrases that represent the apparent thought or feeling and other thoughts or feelings to which it is related.

Second, an apparent object may be interpreted by conceiving it as made up from smaller objects, which are represented by symbols that are connected together so as to form a description of the apparent object. For example, when a traveller perceives a town, the apparent town may be interpreted by conceiving it as made up from streets and buildings, which are represented by symbols that are connected together on a town map. Or, an apparent thought or feeling may be interpreted by conceiving it to be made up from more elementary components of thought and feeling, which are represented by words and phrases (or images and pictures) that are connected together in a verbal (or imagined) description of the apparent thought or feeling.

Hence, through the formation of symbolic descriptions, perceptions are interpreted by conceiving larger wholes and smaller components than are at first perceived. On the one hand, these symbolic interpretations of thought are able to broaden knowledge, by conceiving how perceived objects are related together in larger wholes: thus helping to overcome the narrowness of our physical and mental perceptions. On the other hand, the symbolic interpretations of thought can sharpen knowledge, by conceiving how perceived objects are made up from smaller or subtler components: thus helping to fill in the unperceived gaps that are left in our knowledge by the coarseness of our physical and mental perceptions.

As thought interprets knowledge by forming descriptions that create broader and more detailed perceptions, a further problem arises. Symbolic descriptions can all too easily be incorrectly formed, thus creating false perceptions and mistaken knowledge. For example, a map can all too easily be incorrectly drawn; and a sentence (or an image) can all too easily misrepresent some thought or feeling that it is supposed to describe. How then do we judge the correctness of our conceptions and the interpretations that they make of our initial perceptions?

When descriptions have already been formed, knowledge can be tested and corrected by further examination of objects that are already described through current conception. For example, when the position of a town has been indicated on a map, this indicated position can be tested and corrected by travelling to the town and examining its location in relation to the other geographical features indicated on the map. Or, when a thought or a feeling has been described (whether in language or imagery that has been physically or mentally formed), the description can be tested and corrected by examining how it applies to further perception of this thought or feeling.

But, a basic question is left unanswered by such testing and correction of already assumed conceptions. How are descriptions conceived in the first place? And when current conception turns out to be inadequate, how can more adequate conceptions be found? Clearly, this requires the deeper faculty of mind called ‘intuition’, upon which the conceptions and interpretations of thought are based. And the word ‘intuition’ describes the way in which perceptions are interpreted at the qualitative level of feeling, underlying the symbolic descriptions of thought.

2.3 Feelings

What is a feeling? From a physical point of view, the various feelings that a person experiences are different modes in which the body responds to its circumstances and to its own internal state. As sensory signals are received and processed by the nervous system and the brain, these sensory signals may be converted into bodily responses by adopting various different modes of programming the systems through which the brain and body function. Such different modes of brain function and body response correspond to the feelings that we experience. For example, a feeling of happiness is associated with a corresponding mode of brain and body behaviour, which is quite different from a mode that is associated with a feeling of fear. Or, the desire to please a friend is associated with a corresponding mode of behaviour which is quite different from a mode that is associated with the desire to defeat an opponent.

By considering the functioning of body and brain, physical science can try to explain living behaviour in a way that bypasses our experience of feeling. Unfortunately, such an approach confines us to an indirect view of a person's experience: as seen from outside, by someone who looks upon the person as a physical object. What then is our more direct experience of feeling, as the world is perceived and interpreted through our senses and our minds?

When a person experiences a feeling about an object, some characteristic quality of that object is perceived and evaluated, in comparison with other objects. For example, when I feel confident about an instrument or a machine, I perceive in it a quality of reliability, which I implicitly evaluate in comparison with other instruments and machines. Or, when I am interested by an idea, this feeling of interest implies a perception that the idea has some special quality of value which makes it worth further attention, more than other ideas that do not interest me as much. Thus, a feeling is a perception of quality, which implies a judgement of comparative value.

Through its judgement of comparative value, feeling is expressed in the choices of action and thought. For example, when I do a job of work, intuitive judgements of feeling are expressed in my choice of instrument and the way that I use it. Or, when I try to understand something that I have observed, intuitive judgements of feeling are expressed in my choice of ideas and the way that I use them to interpret the observation. More generally, at the qualitative level of feeling, perceived appearances are interpreted by intuitive judgements of value, which motivate the choices of thought and action.

But then, what are the qualities perceived by feeling, and how are they compared and evaluated? In order to compare the qualities of different objects, there must be some common principle which provides a basis for the comparison. For example, when one physical object is heavier or lighter than another, then this comparison is based upon the principle of weight, which both objects share in common. Or, when one idea is found more meaningful than another, then this comparison is based upon a principle of meaning that both ideas share in common. Thus, implicit in the feelings through which we discern the comparative qualities and value of different objects, there is an understanding of common principles that underlie the apparent differences between objects.

What is this understanding of common principles, which enables us to compare and evaluate different objects, so that we can make meaningful choices which express purpose and intelligence? As we experience the world, our partial perceptions bring into our minds a variety of changing appearances, to which are added the symbolic appearances created by thought and the qualitative appearances discerned by feeling. Beneath this complexity of varying appearances, how can we understand the common principles of underlying reality that we seem to know through our differing perceptions, thoughts and feelings?

3. *Consciousness*

Our minds themselves are nature's bits.
What can we know with these small wits?
Are minds so wise
that they surmise
the basis on which each mind sits?

3.1 Objective and subjective enquiry

What underlying reality is shown by the varying appearances of perception, thought and feeling in our minds? There are two ways of approaching this question: objectively and subjectively.

The objective approach is to look for reality in a universe of objects that we perceive and interpret through our bodies, senses and minds. In particular, modern physical science looks for reality in a world of physical objects that we perceive through our bodily senses. Here, the appearances of mind are considered to express the underlying reality of a person's physical brain; and the appearances of perception, thought and feeling are considered to express the underlying reality of electrochemical events in the brain. By this approach, mental appearances are reduced to physical brain events that are connected to the world outside by the transmission and processing of sensory signals.

But, what is the underlying reality of brain events and the physical world of which they are a part? As this reality is more and more deeply probed by modern physics, it turns out to be more and more subtle: in the sense that it is further and further removed from the gross appearances of ordinary sense perception and common sense interpretation. We look for reality in the physical world because the reality of material objects seems at first to be more tangible and more easily perceptible than the subtle seeming realities of mind. However, as physics probes deeper and deeper, the reality of physical matter, space and time has turned out to be so intangible and so difficult to perceive that physicists are obliged to keep digging the ground from under their own feet, as they go on questioning the underlying assumptions and intuitions upon which are founded our perceptions and interpretations of the world. And one leading physicist, Roger Penrose (in his book, *The emperor's new mind*), has now suggested turning to mental phenomena of insight and creativity, in order to perceive clues about the basic laws of the physical universe. Thus, the objective approach leads back to subjective questions; and it is not nearly as clear and self-sufficient as it first seems.

The subjective approach is more direct. Instead of turning from mental appearances to physical objects and then looking for reality in the external world, it enquires directly into the common principles that underlie the variation of mental appearances. In other words, it asks what common principles of reality underlie the apparent variations of consciousness. In this subjective approach, the appearances of perception, thought and feeling are considered to express the underlying reality of consciousness. Instead of enquiring outwards, through external senses, into the nature of the external world, the mind enquires inward, through philosophical reflection, into the nature of subjective experience.

3.2 Levels of appearance

What do our minds uncover, as they investigate the nature of reality? Through the limited capabilities of our bodies, senses and minds, we perceive only partial and approximate appearances of reality. Upon further investigation, we recognize common principles that are differently shown by different appearances; and we are thus able to put appearances together, as varying perceptions of the same thing. By putting appearances together, our perceptions become less partial and more accurate; and we uncover a deeper level of appearance, which underlies the more superficial level that was previously perceived. In the course of continued investigation, a successive penetration of appearances leads to a progression of deeper and deeper levels: which become progressively more impartial and exact, but also progressively harder and harder for our limited minds to perceive and penetrate.

In the objective enquiry of modern physics, there is just such a progression of deeper levels.

By using mathematical theory and mathematically controlled instrumentation to put together our common sense perceptions of the physical world, it turns out that our everyday world of gross sense objects is a partial and approximate appearance of Newton's mechanically ordered universe of separate matter, space and time. By putting together mechanical and electromagnetic phenomena, it turns out that Newton's mechanical universe is a partial and approximate appearance of Einstein's special relativistic universe in which physical events are connected together in a uniform continuum of space-time. When mechanical and electromagnetic phenomena are further put together with the phenomena of gravity, it turns out that the special relativistic universe is a partial and approximate appearance of a general relativistic universe in which the space-time continuum is non-uniformly curved and gravity is a curvature of space-time, instead of the force that it appears to be.

When mechanical phenomena at ordinary scales of size are put together with atomic phenomena, it turns out that Newton's mechanical universe is a partial and approximate appearance of a strange world of quantum particles, whose location in space and time and whose momentum and energy are essentially indefinite and uncertain. When atomic phenomena are further put together with the phenomena of electromagnetic and other fields of force, it turns out that the quantum particle world and the special relativistic universe are both partial and approximate appearances of an even stranger quantum field universe, where all of space is filled with tremendously violent small scale fluctuations which take place so rapidly that they cannot be directly observed, except in those particular locations where they give rise to the appearance of material particles. Currently, physicists are trying to put small scale quantum phenomena together with the large scale phenomena of gravity, in order to find more fundamental principles and laws that will unite the apparently different universes of quantum field theory and general relativity.

If, instead of enquiring objectively into the physical world, a subjective enquiry is made into the nature of experience, a similar progression of levels appears.

At first it seems that we experience an external world of gross objects which are perceived by our bodily senses. However, this gross external world is only a part of our experience. We also experience imaginary perceptions (as for example in dreams and illusions), where the sight, sound, smell, taste or physical feel of an object appears, but the object itself is not actually present. Such imaginary perceptions tell us that the sensation or sensual appearance of an object is not the same thing as the object which appears to be perceived. If we bear this in mind when considering our sense perceptions of gross external objects (like tables and chairs), then it becomes evident that such objects are never directly perceived, but are only perceived through sensations. Thus, where at first it seems that we experience gross objects ‘out there’ in an external world, it turns out from a broader and more exact consideration that we experience only sensations. When the phenomena of sense perception and imagination are considered together, it turns out that our experience of the gross, external world is only a partial and inexact appearance of our experience of sensations.

But again, sensations are only a part of our experience. We also experience thoughts and feelings, through which sensations are interpreted to have meaning. When sensations are considered together with thoughts and feelings, it becomes evident that sensations are never experienced independently of meaning; and, as a result of this meaning, each sensation is experienced as a perception through which some object or form or representation or quality appears in the mind. Thus it turns out that our experience of sensations is only a partial and inexact appearance of our mental experience of perception, thought and feeling.

What is the experience of our minds, as perceptions, thoughts and feelings appear and disappear in consciousness? On the face of it, mental experience seems highly variable. In the first place, consciousness seems to vary from person to person, since different people have different minds, with different perceptions, thoughts and feelings. And, in the second place, each person’s consciousness seems to vary from moment to moment, as different perceptions, thoughts and feelings appear at different moments of time.

However, a more careful examination shows that beneath the apparent variations of consciousness, there is an underlying continuity which is essential to our experience. Though appearances keep changing in a person’s mind, they are evidently connected together in what seems to be a continuing ‘stream’ or ‘flow’ of consciousness. In the course of experience, knowledge is accumulated by connecting different perceptions, thoughts and feelings that appear at different moments of time. This requires a common basis of understanding, which continues through experience, beneath the differing appearances that come and go in our minds. Moreover, as different people communicate with each other, their differing perceptions, thoughts and feelings are connected so as to convey knowledge, on the basis of a common understanding that is shared by their different minds.

Thus, we do not only experience the varying perceptions, thoughts and feelings that keep succeeding one another in our minds. We also experience continuity and understanding. As the variations of mental experience are more and more closely examined, they reveal continuities of understanding which extend further and further into individual and collective experience. When these continuities are taken into account, it turns out that our varying perceptions, thoughts and feelings are superficial appearances of underlying assumptions, inferences and attitudes at deeper levels of understanding – which continue through a person’s experience and are shared in common by different people. In other words, our experience of perceptions, thoughts and feelings is a partial and inexact appearance of our experience at deeper levels of continuity and understanding in our minds.

3.3 Non-duality

What really is consciousness, beneath its varying appearances in our experience? The essential nature of consciousness is that it knows. It is the subjective principle by which each person knows experience. When something is thought to 'be conscious' or to 'have consciousness', it means that this something knows experience.

In particular, when consciousness is associated with a person's body, it appears that the body knows physical objects; and consciousness appears to consist in the physical perceptions of the body. However, when experience is more closely examined, it turns out that the body does not really know anything in itself. It is only a physical object which interacts with other physical objects. Its apparent consciousness is not really consciousness at all, but only physical interaction. The body appears to be conscious only because its physical interactions transmit perception of external objects to our five senses. In other words, the body is a physical instrument through which our senses know the sight, sound, smell, taste and physical feel of outside objects. Hence, instead of associating consciousness with the body, it may more accurately be associated with the senses; and it then appears to be made up of sensations.

Upon further examination, it turns out that like the body, the senses also cannot know anything in themselves. Instead, they merely bring sensations to the mind; and thus they are external instruments through which the mind knows perceptions of the outside world. Hence, instead of associating consciousness with the senses, it may more accurately be associated with the mind. And then, it appears to consist in a stream of changing perceptions, thoughts and feelings, as the limited perceptions and interpretations of the mind are turned from one object to another in the course of mental experience.

When experience is still more closely examined, it turns out that even the mind does not really know anything in itself. Instead, it only acts, through perception, thought and feeling, so as to form appearances that are illuminated by consciousness. In other words, the mind is merely an instrument through which the physical, sensual and mental world appears before consciousness.

As consciousness is thus dissociated from body, senses and mind, its underlying nature becomes more evident. It is the knowing principle that continues through each person's experience, illuminating all the changing appearances that come and go, in the limited span of physical, sensual and mental attention.

When consciousness is associated with body, senses and mind, it appears to change from moment to moment in each person's experience, and it appears to differ from person to person. However, these changes and differences are only variations of appearance, which arise from personal variations of body, senses and mind. Beneath these apparent variations of personality, the knowing principle of consciousness continues throughout each person's experience and it is shared in common by different people. It is the continuing, impersonal basis of knowledge, which enables different perceptions, thoughts and feelings to be put together, as people learn from their own experience and communicate with others.

But, if consciousness is thus a continuing, impersonal principle that illuminates appearances in each person's experience, then what reality do these appearances show? The answer is simple. An appearance has no existence apart from consciousness. If an appearance is taken away from consciousness, it vanishes immediately. Hence, each appearance is contained in consciousness and it cannot consist in anything other than consciousness. In this sense, all the varying appearances in our experience may be considered as transformations of consciousness. As consciousness illuminates appearances, it knows only itself. The entire reality that all appearances show is nothing other than consciousness.

At first sight, this conclusion seems so absurd that it is usually rejected out of hand, despite the obvious and simple reasoning that leads to it. How could the whole reality of the entire universe be nothing other than each particular person's consciousness? Clearly, this is impossible if consciousness is taken to consist in the limited activities of body, senses and mind. Such limited activities are evidently not the whole of reality, but only a small and incomplete part of the world. Hence, when consciousness is attributed to body, senses and mind, it seems to know an external world in which it is a limited and separate part.

However, as experience is more and more closely examined, consciousness turns out to be less and less limited than it initially appears, and the apparent duality between consciousness and reality breaks down. On the one hand, a subjective enquiry into the mind shows deeper and deeper levels of understanding that comprehend less and less limited areas of experience, with greater and greater exactness. On the other hand, in an objective enquiry into the external world, the mind has to fall further and further back upon these deeper levels of understanding, in order to know the world more completely and more accurately.

The further we look into the objective universe, the deeper we have to fall back towards the basis of understanding in our minds. Ultimately, subjective and objective enquiry must reach the same reality; because they both start from the same appearances, and both seek reality as that which is shared in common and which remains invariant, beneath the differences and variations of appearance.

Both consciousness and reality are present throughout all the varying appearances of experience. Consciousness is that which knows each appearance, and reality is that which the appearance shows. Since consciousness and reality are thus always present together throughout experience, neither has any existence apart from the other, and there is no way of distinguishing them.

Though we say that consciousness is 'in here' and reality is 'out there', this is only a manner of speech that refers to our different ways of approaching them. In truth, there is no duality between consciousness and reality. They are one and the same thing, which is sometimes approached by looking back into the basis of the mind, and sometimes by looking out into the underlying nature of the objective world.

PART 2

QUESTIONS OF KNOWLEDGE

To follow knowledge like a sinking star,
Beyond the utmost bound of human thought.

From Alfred Lord Tennyson: Ulysses

1. *Knowing an object*

1.1 Attention

How is an object known?

In each person's experience, objects appear when attention is turned towards them. As attention turns to an object, it appears in experience and it is known by understanding this appearance. For example, when I look at a chair, the chair appears in my experience as a sensation of sight, and I know the chair by understanding what this visual appearance shows. Or, when I think of a chair, a thought of the chair appears in my experience, and I know the chair by understanding what this mental appearance shows.

When an object appears in experience, various things about the object are known by understanding them; and these various understood things are brought to bear upon the attention that is paid to the object. For example, suppose that my attention turns to a chair in the living room of my home, either by looking at it or by thinking about it. In my understanding of the sight or the thought of the chair, there are many things that I know about the chair. For instance, I know where the chair is, what objects are near it or far from it, how it is used, who likes it or dislikes it, and so on. And, to the extent that I understand these various things, they come to bear upon the attention that I give to the chair. In particular, if I understand that the chair is used by someone who dislikes the cushions being left in a mess, then this is one of the things that go into my attention towards the chair. Thus, an object is known as a focus of attention, which comes together by understanding various things that are known about the object.

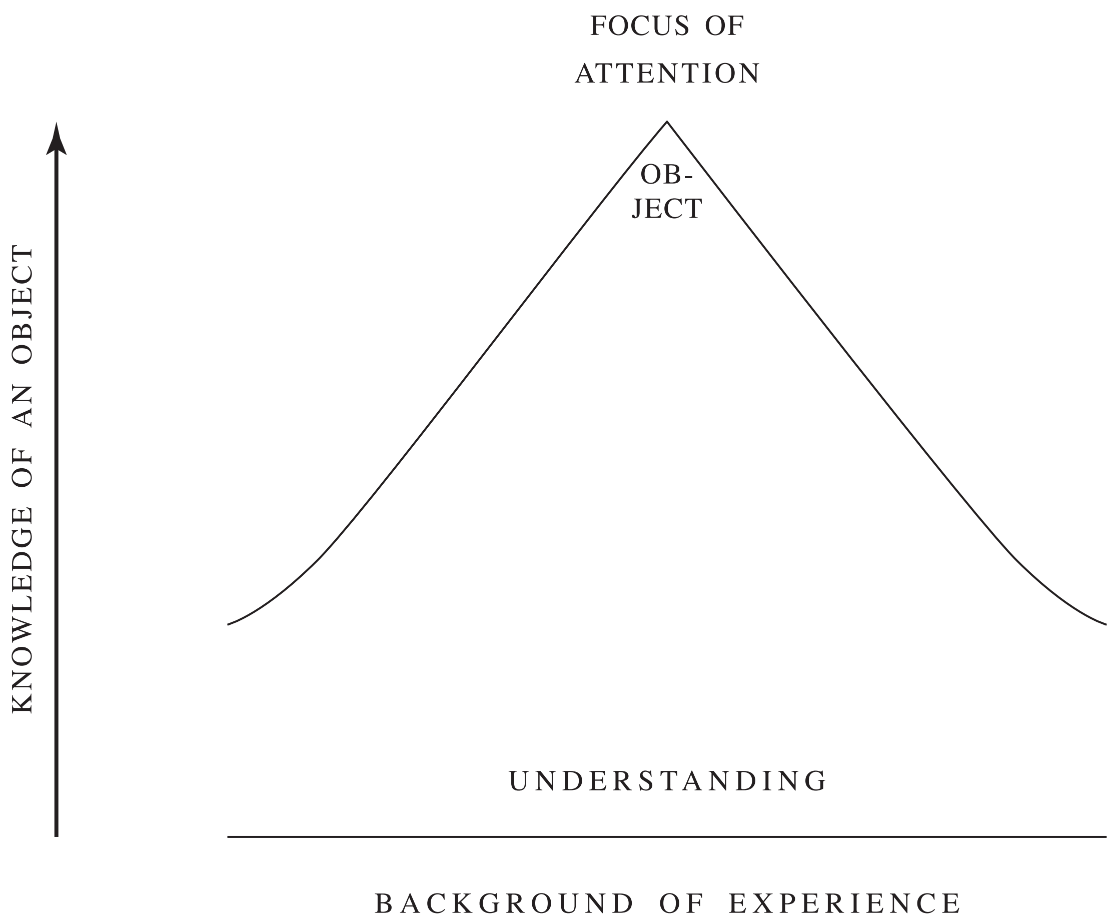
When attention is focused on an object, it is related to other objects through understanding. For example, when my attention is focused on a chair, I understand where it is and how it is used in relation to other objects, I understand what happens when other objects are put on it or dropped on it, and I understand what happens when it presses or scrapes or bangs against other objects. Thus, in knowing the chair at the focus of my attention, I relate it to other objects which I understand at the background of my experience.

All knowledge of particular objects is based upon such an understanding of background experience. As we enquire further and further into our understanding of any particular object, we discover a wider and wider area of experience that is understood in knowing the object. Finally, knowledge of an object is based on everything that is understood at the background of experience.

In sum, an object is known as a focus of attention, by drawing knowledge together from understanding at the background of experience.

This can be illustrated by the diagram in figure 1.1 (overleaf).

Figure 1.1



1.2 Action

How does attention turn towards an object?

First, some kind of action is required to bring the mind into contact with the object, so that it may be perceived.

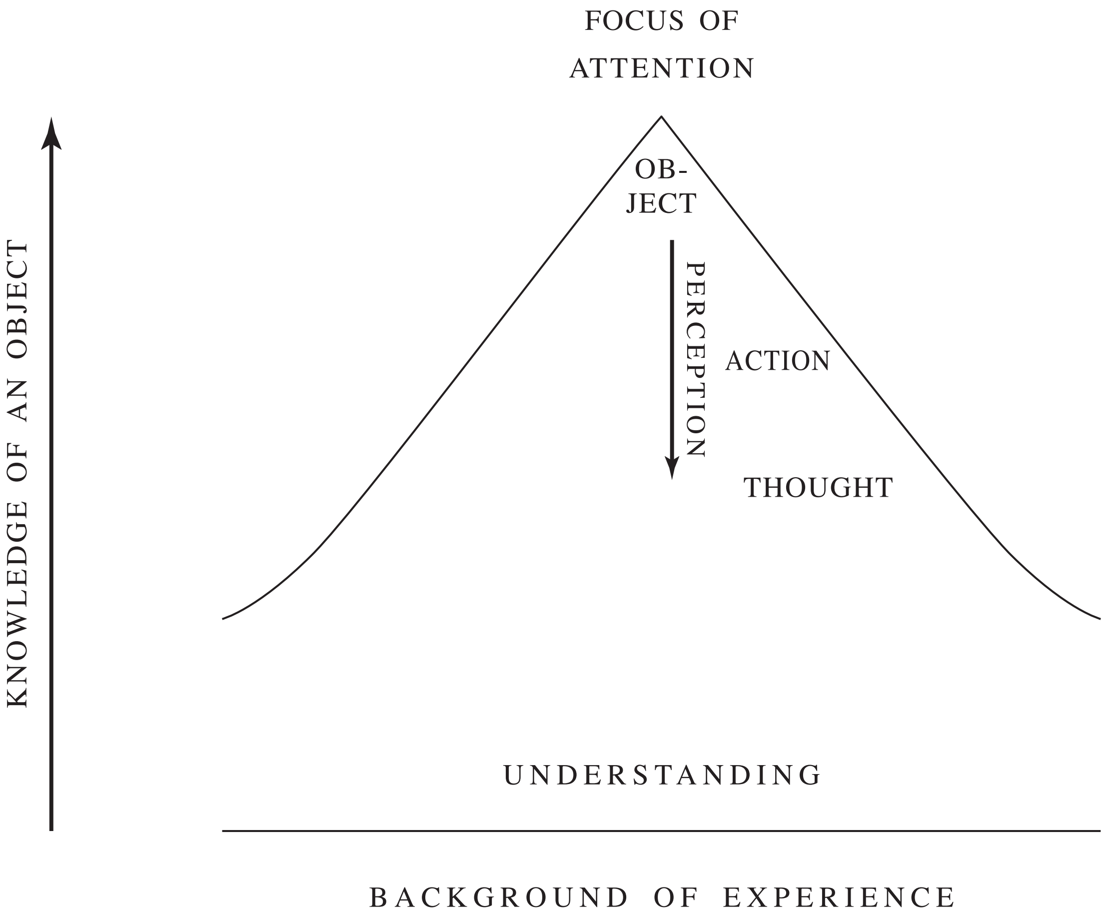
Physical action brings our bodies and their five senses into contact with physical objects, thus enabling sense perception. For example, the physical action of turning my head and eyes brings my sense of sight into contact with a chair, and this enables me to see the chair.

Mental action brings our minds into contact with sense perceptions and mental objects, thus bringing perception of physical and mental objects into thought. For example, when my eyes are physically turned towards a chair, a further mental action is required to turn my attention to the sight of the chair, in order to bring this sense perception into my thoughts. Or, when my mind remembers or imagines a chair, the mental action of remembering or imagining brings a perception of the remembered or imagined chair into my thoughts.

In sum, attention turns toward an object through action, which brings perception of the object into thought.

This can be illustrated by adding to our previous diagram, as in figure 1.2.

Figure 1.2

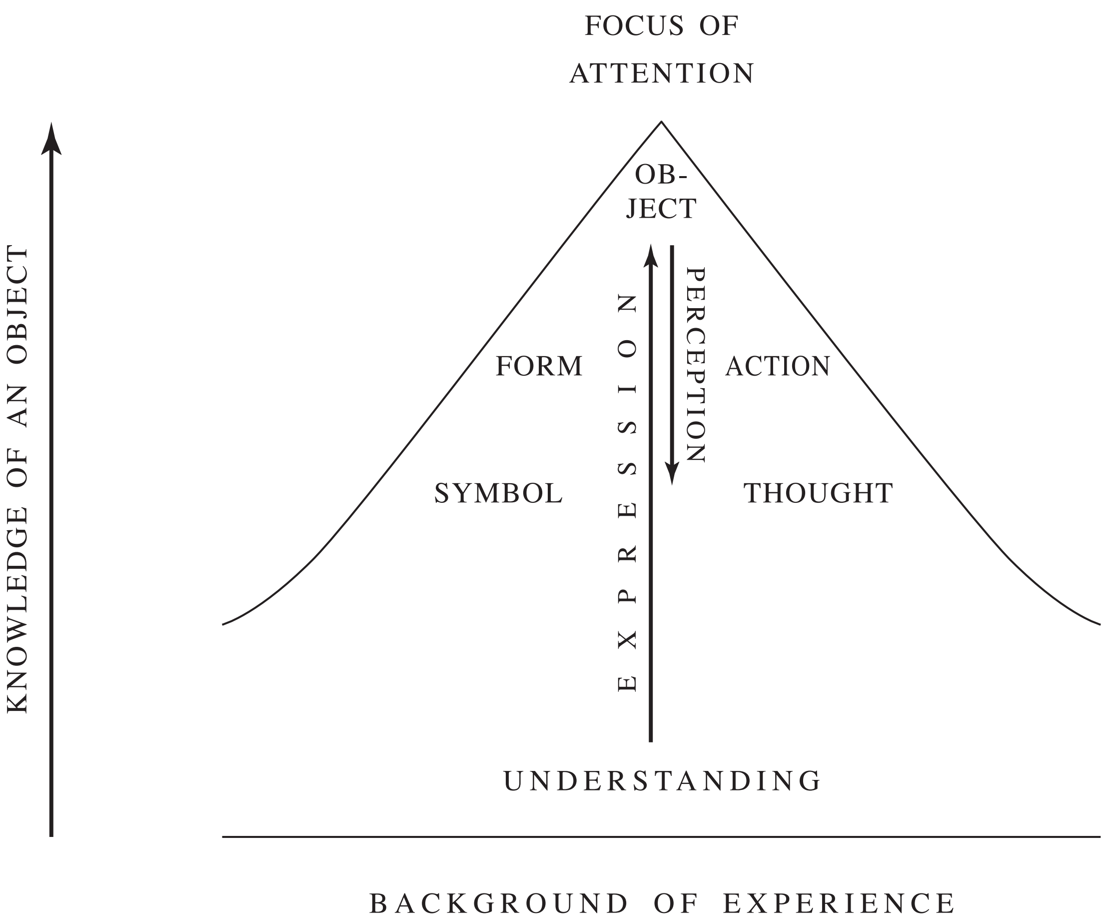


1.3 Thought

How is attention focused on an object when perception has come into thought? An object can be perceived in various ways: through various sights, sounds, odours, flavours and sensations, and through various descriptions, inferences, memories, enjoyments, discomforts and other experiences. When such different perceptions of an object have come into our thoughts, how do we put these different perceptions together, so as to think of the object as a single entity?

We think of an object by using a name or a symbol to represent the object in our minds. For example one can think of a chair by bringing the word ‘chair’ to mind, or by bringing to mind some symbolic image that represents the chair. Symbols are used to express understanding: by forming descriptions that represent relationships between perceived objects, and by forming prescriptions that regulate actions toward intended objects. For example, a geographer can express understanding of a terrain by drawing a map that represents the spatial relationships between various objects and locations in the terrain. Or, an engineer can express understanding of a required bridge by making a blue-print, with dimensional plans and material specifications that regulate the building of the bridge. By thus expressing understanding, a descriptive form (as for example a map) helps action to find its way from object to object, and a

Figure 1.3



prescriptive form (as for example an engineer's blue-print) helps action to achieve an intended object.

In sum, thought focuses attention through names and symbols, which express understanding by their use in forms that guide and regulate action.

This can be illustrated by adding to our ongoing diagram, as in figure 1.3.

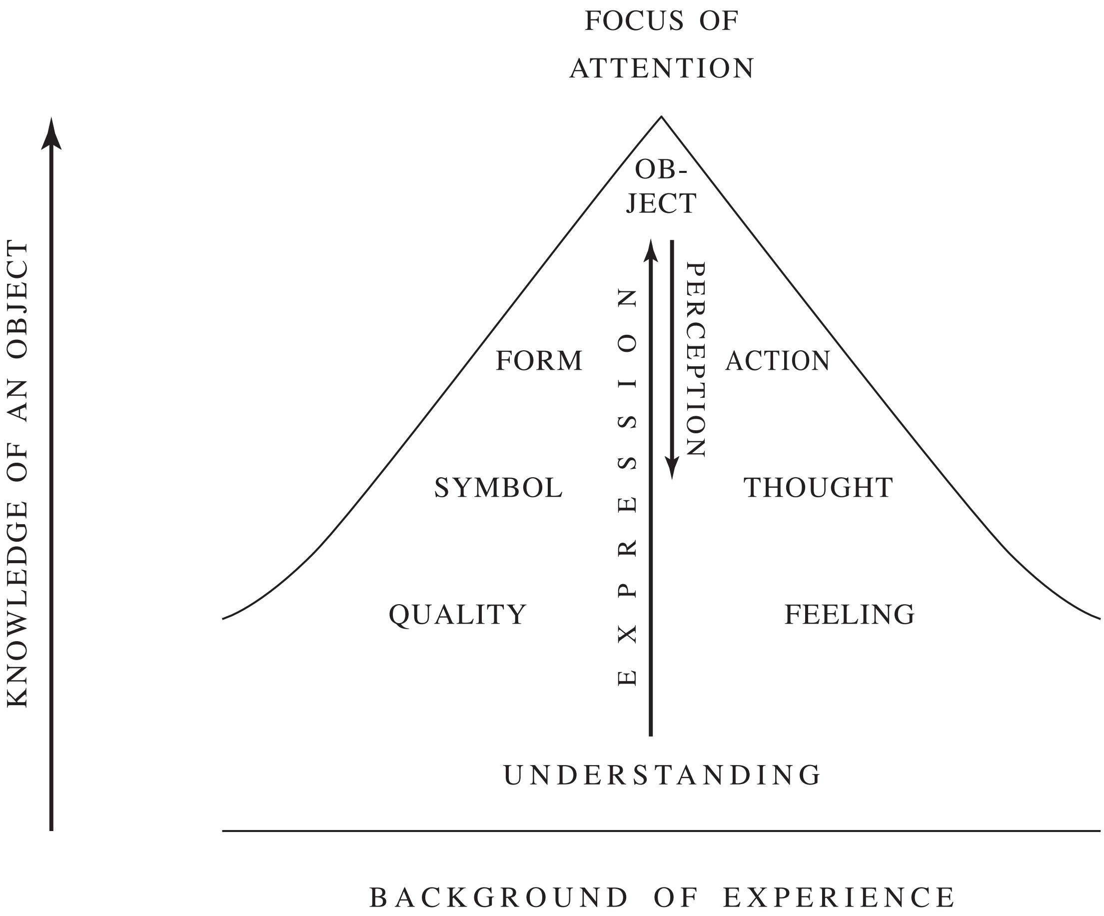
1.4 Feeling

How is understanding expressed in the symbols of thought and the forms of action?

Understanding is expressed through what we call 'feeling', which recognizes qualities of value in symbols and forms, thus motivating thought and action. For example, when my senses perceive the form of a chair through my actions in looking at it and sitting on it, my feelings recognize valued qualities of beauty or ugliness and comfort or discomfort in the form of the chair. And further, if the owner of the chair describes its history and its sentimental associations for him, then my feelings recognize qualities of value in his words. Thus, in the form of the chair and in its owner's words, my feelings recognize qualities of value which implicitly express my understanding of the chair and its owner. And this recognition of value will naturally affect the motivation of my thoughts and actions towards the chair.

In sum, feeling motivates thought and action through qualities of value, thus expressing an understanding of experience.

Figure 1.4



This can be illustrated by adding to our diagram, as in figure 1.4.

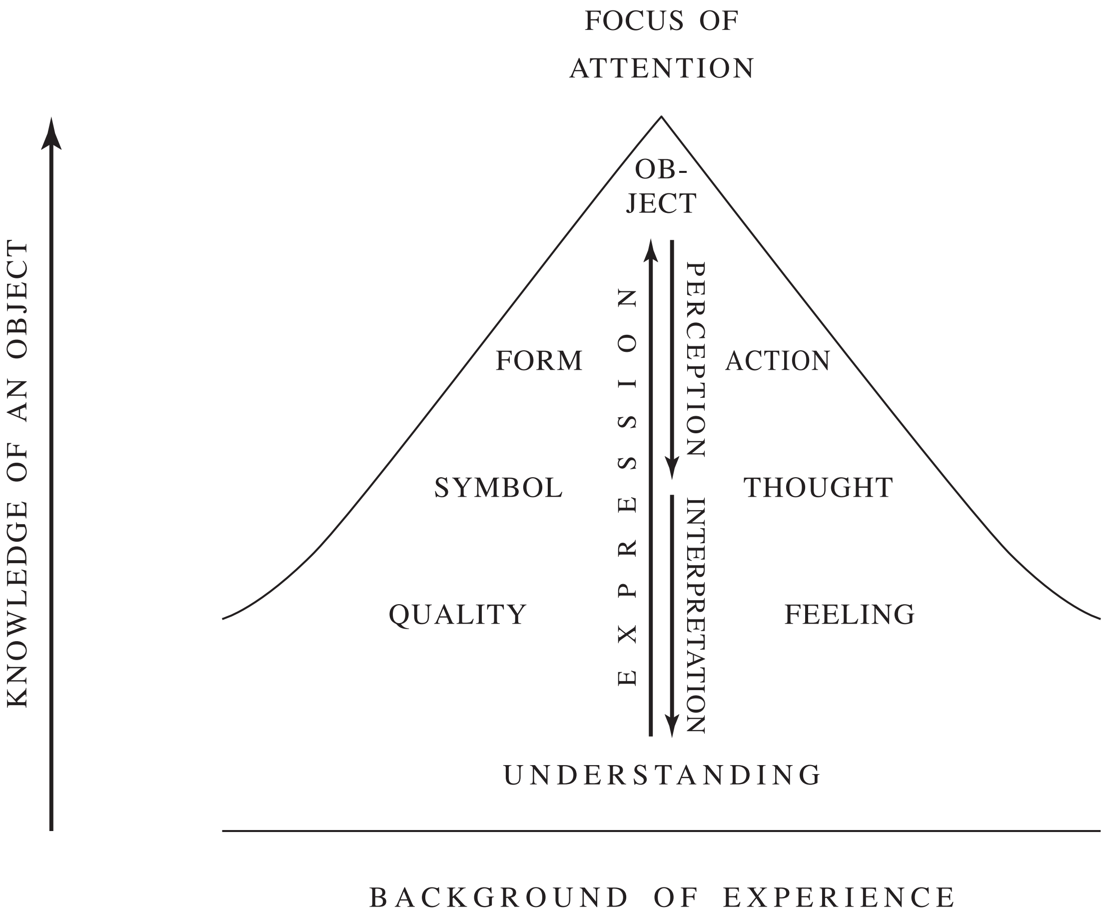
1.5 Understanding

How is experience understood? As a person's actions bring body and mind into contact with physical and mental objects, a variety of perceptions come into the mind. How are these perceptions understood?

Perceptions are understood by interpreting them, through thought and feeling. For example, suppose that my family is deciding whether to buy a house that is up for sale. They visit the house and inspect it, and various thoughts and feelings arise in response to what we have seen. On the one hand, we think about how the house is laid out, how we would use it, whether it would suit our purposes, whether it is well built, how much repair and maintenance it would need, and so on. On the other hand, as we visit the house and think about it, feelings arise in us about how the house looks, the sort of style and atmosphere it has, whether its surroundings are pleasant, what sort of people live in the neighbourhood, whether the house and its location are what we want, whether it is worth the trouble of shifting from our present home, and so on.

As we think about the house, and as feelings arise towards it, we interpret our perceptions of the house and add to our understanding of it. Thus, we progress from one state of understanding to another, and each new state of understanding becomes the

Figure 1.5



basis of further feelings, thoughts and actions towards the house. During the period of time that we take to decide upon buying the house, we progress through various states of understanding; and when our decision is finally made, it expresses the state of understanding we have reached at that time.

Thus, experience is progressively understood through a repeated cycle of expression, perception and interpretation. At any particular time, action, thought and feeling express a current state of understanding. Action leads to perception, and perception is interpreted by thought and feeling, thus leading to a further state of understanding. This further state of understanding is expressed in further feelings, thoughts and actions, leading to further perceptions and interpretations, and adding again to understanding.

In sum, perception is taken into understanding by interpretation, through thought and feeling. Expression, perception and interpretation thus form a repeating cycle that progressively adds to a person's understanding of experience.

This can be illustrated by adding again to our diagram, as in figure 1.5.

1.6 Levels of experience

How is knowledge tested by experience? Each person knows objects through his or her own mind, which receives perceptions and interprets them through thought and feeling. Such interpretations may be incorrect, because they may be based on suppositions that turn out to be untrue.

For example, as my family and I are deciding to buy a house, we may be deceived by a dishonest seller, who leads us to believe that the structure is strong enough to build extra rooms on top, when in fact he has carefully concealed cracks in the wall that show the structure to be in weak condition. By relying on the false supposition that the seller is being reasonably honest, we may misinterpret what he shows us of the house, and we may come to a misunderstanding that distorts our knowledge of the house. Thus, knowledge of objects may be distorted by misinterpretation and misunderstanding in people's minds. How is knowledge tested so as to remove false suppositions and to correct misunderstanding?

Knowledge is tested at different levels of experience: in particular at the five levels of attention, action, thought, feeling and understanding.

- At the level of *attention*, knowledge is tested by directing attention to particular objects, in order to examine whether these objects are in fact what they are supposed to be.

  For example, by directing attention to the load-bearing walls of a house, a prospective buyer can look for tell-tale signs, like plastered-over cracks, that show the walls to be weaker than the seller is trying to make out.

- At the level of *action*, knowledge is tested by trying out descriptive and prescriptive forms, in order to find out whether these forms do in fact guide and regulate action towards the objectives that they are supposed to achieve.

  For example, knowledge of a terrain can be tested by travelling around the terrain with a map, in order to see whether the map correctly enables a traveller to find his way about the terrain. Or, knowledge of a proposed bridge can be tested by executing a design of the bridge in a small scale model, in order to see whether the bridge will take the loads and strains that it is supposed to.

- At the level of *thought*, knowledge is tested by considering the significance of perceived appearances and symbolic representations, in order to determine whether these appearances and representations do in fact signify what they are supposed to.

  For example, an allegation made in a court of law is tested by considering the significance of legal evidence and representation, in order to determine whether this evidence and representation does in fact signify what the allegation supposes. Similarly, a statement made in a scientific discipline is tested by considering the significance of observed phenomena and their representations in scientific language, in order to determine whether these phenomena and their scientific representations do in fact signify what the statement supposes.

- At the level of *feeling*, knowledge is tested by responding emotionally to valued objects and symbols, thus enabling a recognition of whether these objects and symbols have the qualities of value that they are supposed to.

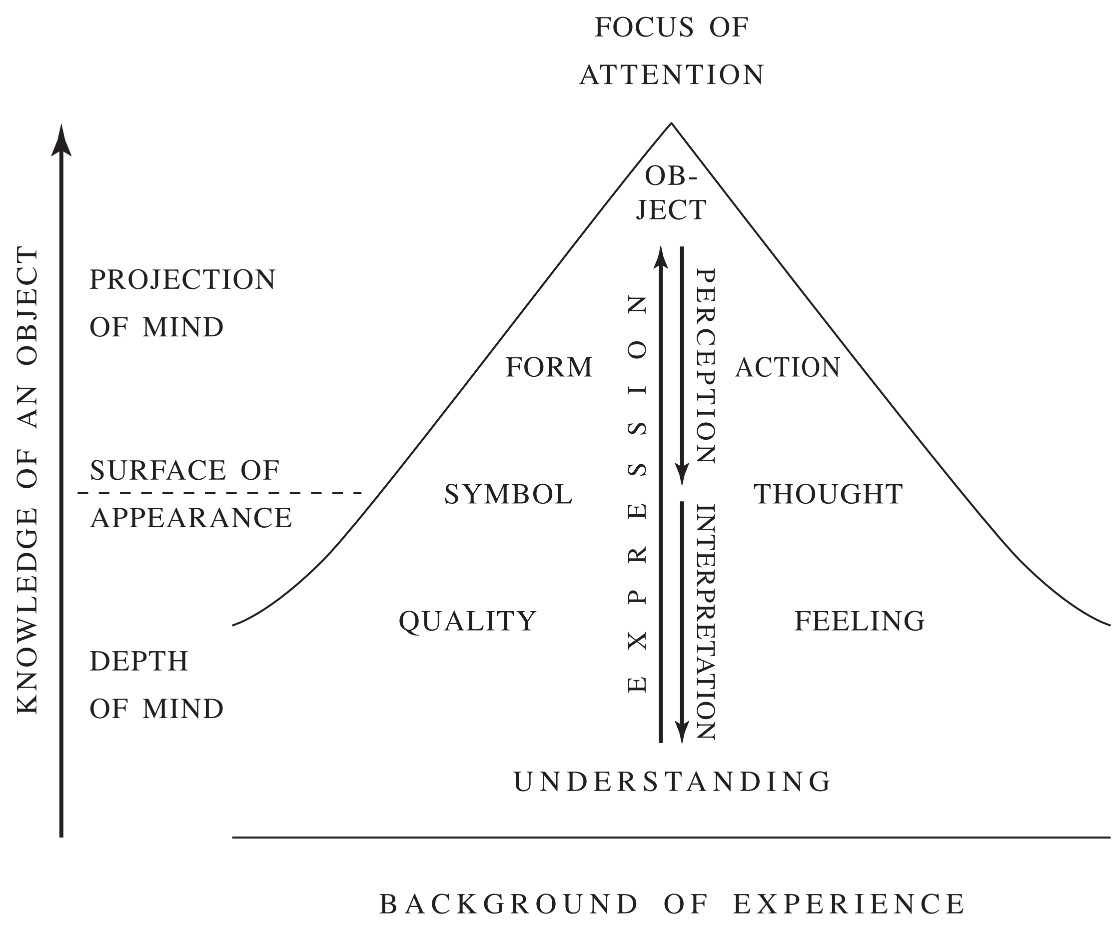
  For example, if a country is famous for its striking landscapes and for the special character of its people, this reputation can be tested by visiting the country and responding emotionally to it, thus enabling a recognition of whether it does have the valued qualities of landscape and character that it is supposed to. Or, if a novel tells a story about double-dealing and ambition in political life, the knowledge expressed in the novel can be tested by reading the novel and responding emotionally to its fictional events and characters, thus enabling a recognition of whether these events and characters do correctly portray the qualities of double-dealing and ambition that they are supposed to.

- At the level of *understanding*, knowledge is tested by trying to comprehend various phenomena that appear in experience, thus leading to a realization of whether these phenomena can be interpreted as they are supposed to be, on the basis of current understanding.

  For example, as physicists study phenomena of mass, energy, electricity, magnetism, atomic structure and so on, the knowledge of physics is tested by trying to comprehend these various phenomena; thus leading to a realization of whether they can be interpreted on the basis of current understanding, or whether current conceptions of the physical universe have to be changed so as to bring about a further understanding. Similarly, as any person perceives a variety of physical and mental appearances in the course of experience, knowledge of the physical and mental world is tested by trying to comprehend these perceptions.

  If a perception can be interpreted on the basis of current understanding, then such an interpreted perception is accumulated into currently accepted knowledge, and current understanding is reinforced. However, if a perception cannot be interpreted as current understanding supposes, then such an incomprehensible perception leads to a process of re-thinking and re-evaluation that changes the way in which experience is understood, as an attempt is made to remove false suppositions and to clarify knowledge. By thus testing understanding over and over again,

Figure 1.6



knowledge can be progressively accumulated and clarified, in the course of continued experience.

In sum, objects are known through the mind, at five different levels of experience: attention, action, thought, feeling and understanding.

Attention and *action* towards an object are a projection of the mind's feelings and thoughts: as attention goes out to an object through forms of action, and brings perception of that object back into thought.

Thought is the surface of mental appearance: where perceptions appear, and where objects and relationships are represented by apparent symbols.

Feeling and *understanding* are the depth of the mind: into which interpretation is absorbed, and from which meaning and value are expressed in the motivation of thought and action.

This can be illustrated by a last addition to our diagram, as in figure 1.6.

Note: on a possible correspondence with brain function

For those who are interested in brain studies, a somewhat tentative and paradoxical correspondence may be suggested between the above levels of experience and the organization of the human brain.

Attention	The brain stem (at the top of the spinal cord), which arouses attention in response to particular stimuli.
Action	The limbic system (above and around the brain stem, but still very much in the interior of the brain), which controls bodily state and inclination to action.
Thought	The cerebral cortex (the convoluted surface of the brain), which organizes information corresponding to the descriptions and prescriptions of thought.
Feeling	The division of cerebral hemispheres (left and right), which corresponds to the distinction of analytic reasoning from the intuitive judgement of feeling.
Understanding	The co-ordination of brain activities, which puts particular functions together and enables learning in the course of experience.

(This correspondence has been suggested by Robert Ornstein's analysis of brain function, in his book, *The psychology of consciousness*, 2nd revised edition, Penguin Books, 1986.)

2. *The world*

2.1 Physical and mental objects

What is the world, in which objects are perceived?

In each person's experience, the world is known through body and mind. Through the perceptions of body and mind, attention turns towards particular objects, which then appear in experience. Thus, the world appears to contain a variety of particular objects, to which attention turns at particular moments of time.

Physical objects appear in experience through the sense perceptions of a person's body. For example a slice of toast appears in my experience when I see it through my eyes, or when I hear it being crunched as it is eaten, or when I smell it being done in a toaster, or when I taste it in my mouth, or when I feel its warmth and texture as I pick it up with my fingers.

Mental objects appear in experience through the perceptions of a person's mind. On the one hand, a person's mind can look directly at itself, so as to perceive its own thoughts and feelings. On the other hand, the mind can interpret physical objects and actions so as to perceive thoughts and feelings that are expressed in these objects and actions. For example, if I am an executive returning home from a long business trip, particular thoughts of my family and feelings of affection may appear in my experience, as my mind turns to its own anticipation of returning home. Or, a fellow executive's thoughts of family and feelings of affection may appear in my experience, when I interpret my fellow executive's words and expressions, as we are returning home together.

When an object appears in experience, it is understood as a part of the world, existing at a particular location to which attention has turned. A physical object is understood as a piece of physical matter, existing within particular boundaries in physical space and time. For example, a slice of toast is a piece of toasted bread, existing within the rectangular boundaries of the slice during the period of time after the slice has been toasted and before it has been eaten.

A mental object is understood as a particular thought or feeling, existing in the mind of a living creature at a particular moment of time. For example, a thought of family or a feeling of affection exists in a person's mind at a particular moment when that person is thinking of family or is feeling affectionate.

Thus, a physical object is understood by taking it to be a piece of physical existence, located in physical space and time. And similarly, a thought or a feeling is understood by taking it to be a piece of mental existence, located in the process of thinking and feeling that takes place in the mind of a living creature.

In sum, as attention turns towards particular objects of body and mind, the world appears to contain a variety of physical and mental objects. Each object is understood as a piece of existence in the world, appearing in experience as attention turns towards it, at some particular moment of time.

Physical objects, perceived through the senses of the body, are understood as pieces of physical matter, located in physical space and time. Mental objects, perceived through the mind, are understood as particular thoughts and feelings, which are pieces of mental existence, located in the minds of living creatures.

Figure 2.1

Level of experience	*Appearance of the world*	*Understanding of appearance*
Attention	Objects (physical and mental)	Particular pieces of existence, to which attention turns at particular moments

This can be illustrated by starting a table, as in figure 2.1.

2.2 Form

How is the world formed, from the particular objects that it is perceived to contain?

As action takes attention from one object to another, relationships between different objects are observed. For example, by walking from house to house and from street to street in a village, relationships of distance and direction are observed between different houses and streets. Or, by the mental action of considering one idea after another in a scientific explanation, relationships of logical connection and consequence are observed between different ideas.

When different objects are perceived together, as parts of a larger object, then their relationships are also perceived together, as a form that relates different parts into a single whole. For example, by climbing a mountain and looking down at a village from a height, the relationships between houses and streets are perceived together, as a form that relates different houses and streets into a single village. Or, by mentally stepping back from an explanation, to see it in overall perspective, its various logical relationships are perceived together, as a form that relates different ideas into a single explanation of a particular class of phenomena.

Thus, as action takes attention from one object to another, different objects are observed to be related together, as parts of larger, more complex objects that they form.

When an object is observed to be made up of parts, then the form of that object is understood as the relationship between its parts. For example, when a tree is observed to be made up of roots, trunk, branches, fruits and flowers, then the form of the tree is understood as the relationship between these parts. Or, when the idea of a family is observed to be made up of concepts like wife, husband, daughter, son, grandmother, grandfather and so on, then the form of this idea is understood as the way in which these concepts are related, so as to form the idea of a family in people's minds.

When some sort of action is observed to produce a change in the relationship of parts that forms an object, then the object is understood to go through a change of form. For example, by growing or shedding branches, leaves, fruits and flowers a tree undergoes various transformations in the course of years and seasons. Or, as new ways of thinking develop so as to change the conceptual relationships by which people relate family members in their minds, the idea of a family is transformed in the course of social change.

Figure 2.2

Level of experience	*Appearance of the world*	*Understanding of appearance*
Attention	Objects (physical and mental)	Particular pieces of existence, to which attention turns at particular moments
Action	Forms	Relationships between parts, observed and transformed through action

In sum, as the world is observed in the course of action, it appears to contain a variety of forms. Each form is understood as a relationship of parts, observed and transformed through action.

This can be illustrated by adding to our table, as in figure 2.2.

2.3 Meaning

How is the world interpreted, through the objects and relationships that are observed in it?

By thinking about objects and relationships, they are interpreted to have meaning, through which they are understood to represent some further existence in the world.

For example, by thinking about symbols and their relationships on the map of a village, they are understood to represent houses and streets and spatial relationships in the village.

Or, by thinking about words and their relationships in a sentence, they are understood on the one hand to represent objects and relationships that the sentence describes or prescribes, and on the other hand they are understood to represent ideas and conceptual relationships that the sentence expresses.

Or, by thinking about ideas in a person's mind, they are understood on the one hand to represent objects and relationships observed in the world outside the mind, and on the other hand they are understood to represent feeling and understanding expressed from within the mind.

Or, by thinking about a person's actions, they are understood to represent feelings and intentions that these actions express.

Or, by thinking about the form and relationships of an object, they are understood to represent characteristics like shape, colour, size and weight, which are present in varying ways in different objects.

Or, by thinking about observed phenomena, they are understood to represent underlying principles and laws.

In sum, as the world is interpreted by thought, it appears to contain a variety of meanings, which are understood as representations of further existence in the world.

This can be illustrated by adding to our ongoing table, as in figure 2.3.

Figure 2.3

Level of experience	*Appearance of the world*	*Understanding of appearance*
Attention	Objects (physical and mental)	Particular pieces of existence, to which attention turns at particular moments
Action	Forms	Relationships between parts, observed and transformed through action
Thought	Meanings	Representations of further existence, interpreted by thought

2.4 Quality

What are the characteristics of the world, represented in the forms and relationships of various objects?

As a person observes objects and their relationships in the world, intuitive feelings arise about the characteristics of objects. Through these intuitive feelings, objects are recognized to be big or small, long or short, fat or thin, strong or weak, heavy or light, hard or soft, rough or smooth, sharp or blunt, corrosive or inert, destructive or protective, compatible or incompatible, united or divided, balanced or unbalanced, pure or mixed, clear or opaque, bright or dark, open or closed, and so on.

By thinking about such intuitively recognized characteristics, they are understood to be represented in the forms and relationships of objects. For example, the length of a physical object can be represented in its form as the furthest distance between its boundaries. The width of an object can then be represented as the distance between boundaries when this distance is taken at right angles to the length of the object. And the fatness or thinness of the object can be represented as the ratio between its width and its length.

Or, the weight of a physical object can be represented in its relationships of gravitational equilibrium and dynamic interaction with other objects. In particular, the weight of a parcel can be represented by the position of a needle on a dial, when the parcel comes to rest on a spring balance. And the weight of a moving object can be represented by how little it is deflected, when it collides with other objects.

Or, the coherence of a scientific theory can be represented in its form by the logical manner in which it relates its component ideas. Or, the openness and flexibility of an idea can be represented in its relationship with other ideas, whereby it takes in other ideas and adapts in response to them.

As characteristics are recognized by intuition, and as their formal representations are interpreted by thought, the characteristics of different objects are compared and evaluated by emotional judgements of feeling.

Figure 2.4

Level of experience	*Appearance of the world*	*Understanding of appearance*
Attention	Objects (physical and mental)	Particular pieces of existence, to which attention turns at particular moments
Action	Forms	Relationships between parts, observed and transformed through action
Thought	Meanings	Representations of further existence, interpreted by thought
Feeling	Qualities	Characteristics of comparative value, judged by feeling

For example, when a shopper is deciding whether to buy a jug that is on display at a store, the qualities of the jug are judged by evaluating its shape, colour, texture, weight and balance, in comparison with other jugs that the shopper has seen and used.

Or, when a person recommends a novel to a friend, the qualities of the novel are judged by evaluating characteristics like style, pace, suspense, tragedy, romance, humour, liveliness, perceptiveness, honesty and so on. And these characteristics of a novel are evaluated in comparison with other novels that the person has come across before.

Thus, through emotional judgements of feeling, characteristics are compared and are understood to have value; as qualities that are useful or useless, beneficial or harmful, revealing or obscuring, illuminating or misleading, relevant or irrelevant, interesting or boring, desirable or undesirable, and so on.

In sum, as the world is intuitively recognized and emotionally judged by feeling, it appears to contain a variety of qualities, which are understood as characteristics of comparative value, represented in the forms and relationships or objects.

This can be illustrated by adding again to our table, as in figure 2.4.

2.5 Continuity

How are characteristics compared?

Characteristics are compared on the basis of underlying principles, which different objects are understood to share in common.

For example, the various lengths of different objects are compared on the basis of underlying principles of size and shape, which different objects are understood to share in common.

Or, the various weights of different objects are compared on the basis of underlying principles of mass, gravity and inertia, which different physical objects are understood to share in common.

Or, various degrees and types of coherence found in different scientific theories are compared on the basis of underlying principles of logical coherence, which different theories are understood to share in common.

Or, the openness and flexibility of different democratic ideas is compared on the basis of underlying principles of openness and flexibility, which different democratic ideas share in common.

As common principles are understood in different objects, they appear to form an underlying basis of existence which continues from one object to another and which thus enables understanding to continue from past experience into the future.

For example, as common principles of size, mass, force and speed are understood in different physical objects, these principles appear to be related through laws of statics and dynamics, and thus they appear to form an underlying basis of existence that governs the equilibrium and movement of physical objects. As different objects are perceived, they are understood to manifest the same underlying principles of size, mass, force and speed, related together by the same laws of statics and dynamics.

Hence, these principles and laws continue from one physical object to another; and once they have been understood from objects perceived in the past, this understanding continues to apply to the same principles and laws underlying the equilibrium and movement of further objects perceived in the future.

Or, as common principles of logical reasoning are understood in various explanations and theories, these common principles appear to form an underlying basis of logical reason, which continues from one explanation or theory to another. When

Figure 2.5

Level of experience	*Appearance of the world*	*Understanding of appearance*
Attention	Objects (physical and mental)	Particular pieces of existence, to which attention turns at particular moments
Action	Forms	Relationships between parts, observed and transformed through action
Thought	Meanings	Representations of further existence, interpreted by thought
Feeling	Qualities	Characteristics of comparative value, judged by feeling
Under-standing	Continuity	Common principles, understood in different objects

such continuing principles of reason have been understood from explanations and theories that have been followed in the past, then this understanding learned from past experience can continue into the future, enabling new explanations and new theories to be followed in the future.

Or, as common principles of psychology are understood in various actions, thoughts and feelings, these common psychological principles appear to form an underlying basis of action, thought and feeling. When such psychological principles have been understood from actions, thoughts and feelings perceived in the past, then this understanding can continue into the future, by recognizing the same principles in new actions, thoughts and feelings.

In sum, as the world is comprehended by understanding, it appears to manifest an underlying basis of continuity, consisting of common principles that are understood in different objects.

This can be illustrated by adding to our table, as in figure 2.5.

2.6 Levels of existence

How is the world known, from the particular objects that are perceived in it? In the course of experience, a person perceives particular objects, and thus gets to know the world. What is this knowledge of the world, which a person builds up from the perception of particular objects?

Let us consider how the world is known at different levels of experience:

- At the level of *attention*, the world is perceived to be divided into pieces of existence; and objects are thus perceived to exist as different pieces of the world. At this level, a person perceives particular objects: like a slice of toast, or a thought of family, or a feeling of affection.

- At the level of *action*, the world is observed to be formed through relationships between pieces of existence; and forms are thus observed to exist as relationships between component parts. At this level, a person combines perceptions of different objects, so as to observe the formation of larger and more complex objects.

  For example, perceptions of different houses and streets are combined so as to observe the form of a village or a town or a city. Or, perceptions of roots, trunk, branches, leaves, fruits and flowers are combined to observe the form of a tree. Or, perceptions of component concepts are combined to observe the form of an idea; and perceptions of component ideas are combined so as to observe the form of an explanation or a theory.

- At the level of *thought*, the world is interpreted to be represented by meaningful objects and their relationships in symbolic forms; and meanings are thus interpreted to exist as representations of further existence in the world. At this level, a person interprets observation of perceived objects and relationships, so as to perceive further objects and relationships that are not directly perceived by the limited capabilities of body and mind.

  For example, observation of a map is interpreted so as to perceive a represented territory. Or, observation of a sentence is interpreted so as to perceive described objects and expressed ideas. Or, observations of actions and ideas are interpreted so as to perceive feelings and understanding and qualities of character. Or, observations of various phenomena are interpreted so as to perceive underlying principles and laws.

- At the level of *feeling*, the world is recognized to be qualified by characteristics with varying degrees of comparative value; and qualities are thus judged to exist as characteristics of compared value, represented in the forms and relationships of objects. At this level, a person judges the interpretation of objects and relationships, so as to compare and evaluate their qualities.

  For example, in order to choose which jug to buy, a shopper interprets observations of various different jugs and then judges this interpretation so as to compare and evaluate the qualities of the jugs on display. Or, in recommending a novel to a friend, a reader interprets the novel and judges this interpretation so as to evaluate the qualities of the novel.

- At the level of *understanding*, the existence of the world is comprehended to continue from one object to another, on the basis of common principles that underlie the differences between objects. At this level, a person comprehends underlying principles of existence, on which the comparison and evaluation of different objects is based.

  For example, physical objects in states of equilibrium and motion are compared and their functions are evaluated on the basis of underlying principles like size, shape, strength, mass, force and speed. Or, explanations and theories are compared and evaluated on the basis of underlying principles of logical reason. Or, actions, thoughts and feelings are compared and evaluated on the basis of underlying principles of ethics and psychology.

  By comprehending such underlying principles that are common to past and fu-

Figure 2.6

Level of experience	*Appearance of the world*	*Understanding of appearance*	*Level of existence*
Attention	Objects (physical and mental)	Particular pieces of existence, to which attention turns at particular moments	Existence divided into objects of senses and mind
Action	Forms	Relationships between parts, observed and transformed through action	Existence formed from component parts
Thought	Meanings	Representations of further existence, interpreted by thought	Existence represented by symbolic forms
Feeling	Qualities	Characteristics of comparative value, judged by feeling	Existence qualified by comparative characteristics
Under-standing	Continuity	Common principles, understood in different objects	Existence continuing from one object to another

ture objects, understanding continues through time: thus providing a continuing basis upon which objects are compared and evaluated, as perceptions of different objects are put together into a knowledge of the world.

In sum, the world is known by experiencing it at five different levels of existence. *Objects* exist at the level where existence is perceived to be divided into pieces. *Forms* exist at the level where existence is observed to be formed from component parts. *Meanings* exist at the level where existence is interpreted to be represented by symbolic form. *Qualities* exist at the level where existence is judged to be qualified by comparative characteristics. *Continuity* exists at the level where existence is understood to continue from one object to another, through common principles underlying different objects.

This can be illustrated by a last addition to our table, as in figure 2.6.

Note: on the traditional 'five elements'

For those who are interested in traditional conceptions of the world, the above levels of existence can be seen to correspond with the traditional elements: 'earth', 'water', 'fire', 'air' and 'ether'.

- *'Earth'* may be interpreted as a cosmic symbol for an element of solidity in the world, whereby existence can be divided into separately identified pieces: as earth or clay can be divided into particular lumps of separately identified size and shape and location. The traditional element 'earth' can thus be seen to correspond with the existence of objects.
- *'Water'* may be interpreted as a cosmic symbol for an element of fluidity in the world, whereby existence is formed and transformed through functioning relationships between component parts: as bodies of water are formed and transformed through fluid movements between component bits of water. The traditional element 'water' can thus be seen to correspond with the existence of forms.
- *'Fire'* may be interpreted as a cosmic symbol for an element of illumination in the world, whereby meaningful objects and forms throw light on further existence: as fire throws light on things other than itself. The traditional element 'fire' can thus be seen to correspond with the existence of meanings.
- *'Air'* may be interpreted as a cosmic symbol for an element of transparent tangibility in the world, whereby existence is conditioned by relative qualities that convey meaning and perception: as air is a transparent medium of atmospheric qualities that convey meaningful images and sounds and smells. The traditional element 'air' can thus be seen to correspond with the existence of qualities.
- *'Ether'* may be interpreted as a cosmic symbol for an element of pervasiveness in the world, whereby common principles pervade the different objects that they underlie: as ether was conceived to pervade different objects in the traditional cosmos. The traditional element 'ether' can thus be seen to correspond with the existence of continuity in the world.

In the Vedānta tradition of Indian philosophy, the five elements are conceived to correspond with five 'koshas' or covering layers of personality.

- The outermost layer, corresponding to the element ‘earth’, is called the ‘annamaya kosha’, meaning literally the ‘covering of food’. This outermost layer may be interpreted as a person’s *body*: which is perceived as an object or piece of existence, and which in turn perceives other objects or pieces of existence.
- Proceeding inwards, the second layer corresponds to the element ‘water’ and is called the ‘prāṇamaya kosha’, meaning literally the ‘vital covering’. This second layer may be interpreted as *practical mind*: which is perceived to form actions that intend change towards prescribed goals, and which in turn perceives the changing forms of the world through various actions and observations.
- The third layer, corresponding to the element ‘fire’, is called the ‘manomaya kosha’, meaning literally the ‘mental covering’. This third layer may be interpreted as *intellect*: which is perceived to represent the world by the symbolic formulation of descriptions and prescriptions, and which in turn perceives the meaning of representations and observations through interpretation and reflection.
- The fourth layer, corresponding to the element ‘air’, is called the ‘vijnyānamaya kosha’, meaning literally the ‘covering of discernment’. This fourth layer may be interpreted as a person’s sensibility or *emotional mind*: which is perceived to qualify existence through the judgement of value, and which in turn perceives qualities through feeling and intuition.
- The innermost layer, corresponding to the element ‘ether’, is called the ‘ānandamaya kosha’, meaning literally the covering of happiness’. Here, the word ‘ānanda’ or ‘happiness’ is associated with the happiness of deep sleep, where there is no consciousness of apparent objects. This innermost layer may be interpreted as *understanding*: which is perceived to co-ordinate different actions, perceptions, thoughts and feelings on the basis of continuing knowledge, and which in turn perceives common principles underlying the differences of apparent objects.

All these five layers of personality are conceived to depend upon a final core of unconditioned consciousness, which is each person’s true self. This interpretation of the five koshas is elaborated in the following chapter; except for the question of self, which is left to chapter 6.

3. *Personality*

3.1 Body and senses

What are the capabilities of personality, through which each person knows the world?

Each person's body and mind are instruments of knowledge. On the one hand, a person's body and mind act so as to express a person's knowledge of the world. On the other hand, they act so as to enable perception and interpretation, thus bringing knowledge of the world into a person's experience.

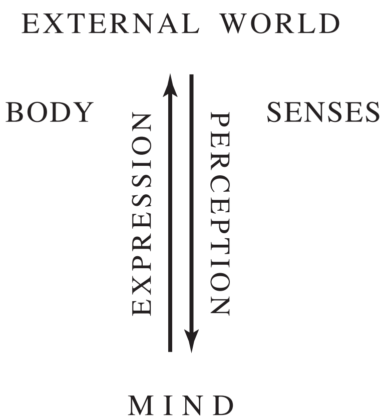
In particular, the body is a physical instrument of knowledge. As a physical object among other physical objects in the world, the body acts towards physical objects, and physical objects act upon it.

When a person's body acts towards physical objects, these actions are interpreted to have meaning, and thus they express thoughts and feelings in the mind. For example, when I put a slice of bread into a toaster, this action may express a thought that it is time to eat, and it may express a feeling of hunger or greed or a feeling of affection towards someone for whom I am making the toast. When a physical object acts or reacts upon a person's body, then perceptions of that object are transmitted to the mind. This transmission of perceptions from body to mind takes place through the senses of sight, sound, smell, taste and touch.

For example, when a slice of toast reflects light into my eyes, my sense of sight transmits a visual image of the toast towards my mind. Or, when a slice of toast reacts to being heated by giving off gases that diffuse through the air into my nostrils, then my sense of smell transmits an odour of toast towards my mind. Or, when the toast reacts chemically on my tongue as it is being eaten, my sense of taste transmits a flavour of toast towards my mind. Or, when the toast reacts mechanically and thermally on the skin of my fingers as I pick it up, my sense of touch transmits sensations of texture, weight and temperature towards my mind.

In sum, the body has physical and sensual capabilities that mediate between the mind and the external world of physical objects. On the one hand, the body acts towards physical objects so as to express thoughts and feelings from the mind. On the other hand, the body has senses which transmit perceptions from physical objects towards the mind.

Figure 3.1



Physical and sensual capabilities of body

This can be illustrated by starting a diagram, as in figure 3.1.

3.2 Practical mind: will and observation

How are thoughts and feelings expressed, and how does the mind receive perceptions in the course of action?

Thoughts and feelings are expressed through a capability called 'will' or 'intention'. Through this capability of will, physical and mental actions are directed so as to achieve intended objects. For example, when I feel hungry and think it is time to have breakfast, this feeling and thought are expressed by my will, which directs my body to go to the kitchen, to put slices of bread in the toaster, to get something to drink and to lay the table for breakfast. Or, if I am feeling affectionate towards my family and if I think that we should go on a holiday together, then this feeling and thought are expressed as my will, and its resulting intentions direct my mind to imagine what kind of holiday the different members of my family would like.

The mind receives perceptions through a capability called 'observation'. Through this capability of observation, the mind pays attention to different objects and relationships in the course of action, thus bringing perception of objects and relationships into thought. For example, as a person travels about a city, the city is observed by paying attention to different buildings and streets and the relationships by which they form the city. Or, as a person follows an explanation, the explanation is observed by paying attention to its ideas and their logical relationships, thus bringing into thought perceptions of these ideas and these logical relationships and the explanation that they form.

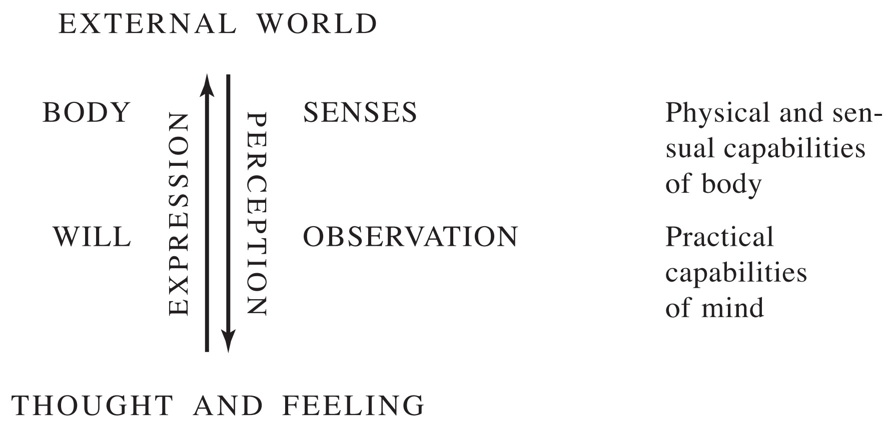
In sum, will and observation are practical capabilities of mind which direct action and which pay attention to objects and their relationships. By directing action, the capability of will expresses thoughts and feelings in the actions of a person's mind and body. By paying attention to objects and their relationships, the capability of observation brings perception of objects and relationships into thought.

This can be illustrated by adding to our diagram, as in figure 3.2.

3.3 Intellect: formulation and reflection

How are feelings expressed and how are perceptions interpreted in the course of thought?

Figure 3.2

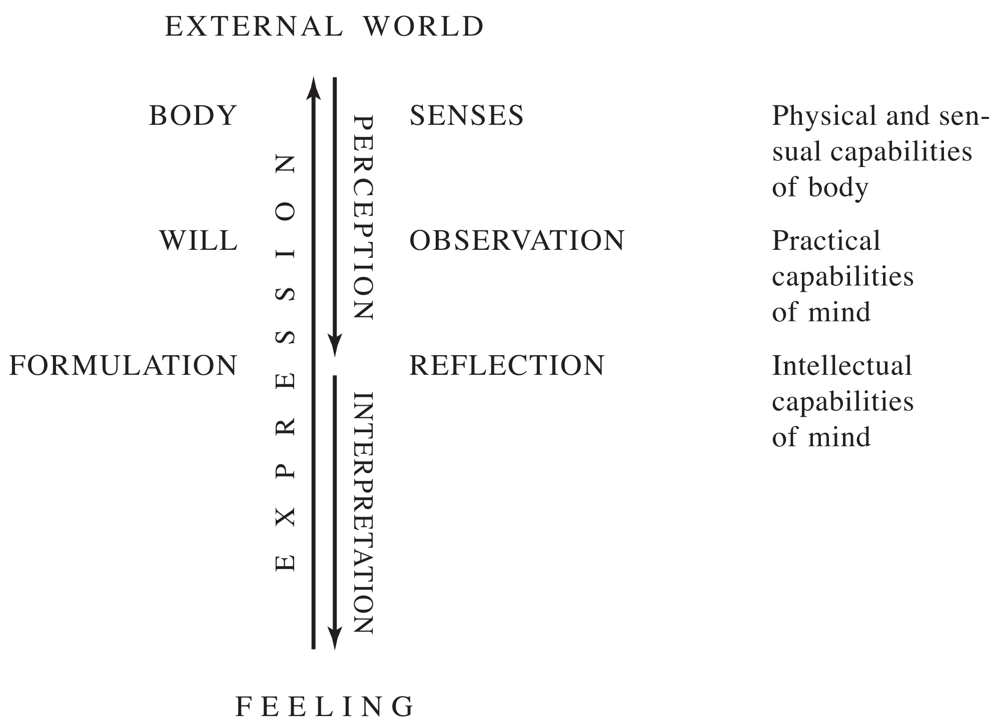


Feelings are expressed through a faculty that may be called ‘formulation’. Through this capability, the mind forms descriptions and prescriptions that represent observations and intentions. As descriptions and prescriptions are formed, and as they are used to guide and regulate action, they express feelings about what is described or prescribed.

For example, a map expresses intuitive feelings of spatial relationship and orientation; and it is on the basis of these spatial intuitions that the map is used. Or, when a book describes a country and its people, the description expresses feelings about the country and its people; and it is these expressed feelings that give the book its interest and value. Or, when engineering drawings and specifications prescribe a bridge (no matter how automated the technology that will put the drawings and specifications into effect), the prescription expresses intuitive feelings about bridge construction in the designing engineers’ minds, and it expresses feelings about the value of the bridge in the minds of those who asked for the bridge to be designed. Or, as a physical or mental exercise is prescribed, the prescription expresses feelings about the value of the exercise and about its intended development of body or mind.

Perceptions are interpreted through a capability that is called ‘reflection’. Through this capability, the mind considers thoughts and feelings about what perceptions represent. In doing this, the mind reflects back into itself, instead of going out through external action towards objects outside the mind. By reflecting back again and again from its perceptions of an object, the mind is able to consider and reconsider its own thoughts and feelings about the object; and perceptions are thus interpreted through a reflective process of consideration and reconsideration that takes place in the course of thought. For example, perceptions of physical phenomena are interpreted by considering and reconsidering what these phenomena show. Or, perceptions of a person’s behaviour are interpreted by considering and reconsidering thoughts and feelings about the person’s character.

Figure 3.3



In sum, formulation and reflection are intellectual capabilities of mind, which express feeling and interpret perception. As a person's intellect formulates descriptions and prescriptions, feelings are expressed about what is described or prescribed. And, as the intellect reflects upon perceptions, these perceptions are interpreted through a process of considering and reconsidering thoughts and feelings about what has been perceived.

This can be illustrated by adding to our ongoing diagram, as in figure 3.3.

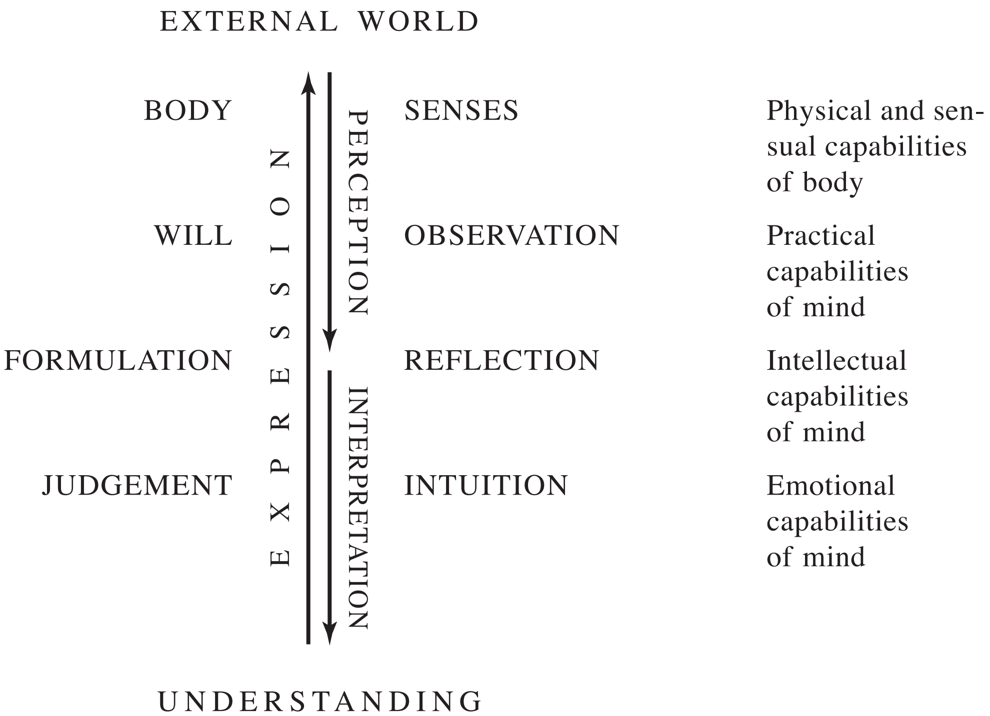
3.4 Emotional mind: judgement and intuition

How is understanding expressed and how are interpretations understood, in the course of feeling?

Understanding is expressed through a capability that is called 'judgement'. Through this capability, the mind judges the use and value of objects, thus motivating action and thought in their response to observed objects and in their choice of intended objects.

For example, when going round a series of bends, a motor car driver judges the use of the steering wheel and responds to its turning action as it is used to keep the car on the road. Or, when crossing a busy street, a pedestrian responds to oncoming vehicles through a judgement of their potential danger. Or, when given a present, a person's emotional response is a spontaneous way of judging the desirability of the gift and the value of the intention behind it. Or, when planning a bridge, judgements are made of the use and value of the intended bridge, and it is through these judgements that choices are made of whether to build and where to build and how big to build and what design to use and how much money to spend. Or, when choosing a holiday, a family is motivated by judgements of whether it will be enjoyable or interesting or whether it has status value or whether it will bring valued contact with friends or

Figure 3.4



relatives. Or, when buying a wedding present for a special friend, a person chooses the gift by judging its value as an expression of particular affection.

Interpretations are understood through a capability that is called ‘intuition’. Through this capability, the mind recognizes characteristics and qualities that are represented by perceptions and interpretations.

For example, when a carpenter perceives a new tool and interprets the features of its design, characteristics of the tool (like sharpness and rigidity) and qualities of the tool (like efficiency and durability) are recognized by the carpenter’s intuition, which thus brings perception and interpretation of the tool into understanding. Or, interpretations of a person’s behaviour are understood by intuitively recognizing qualities of character that are represented by this behaviour.

In sum, judgement and intuition are emotional capabilities of mind, which judge value and recognize quality. Through judgements of the value and use of objects, understanding is expressed in emotional choices and responses that motivate thought and action. Through intuitions that recognize represented qualities, perception and interpretation are brought into understanding.

This can be illustrated by adding again to our diagram, as in figure 3.4.

3.5 Understanding: co-ordination and comprehension

How is knowledge expressed and how does it assimilate perception and interpretation, in the course of understanding?

Knowledge is expressed through a capability that is called ‘co-ordination’. Through this capability, various actions, perceptions, thoughts and feelings are co-ordinated by understanding them at the background of experience, while attention is focused on some particular object that is being achieved or perceived.

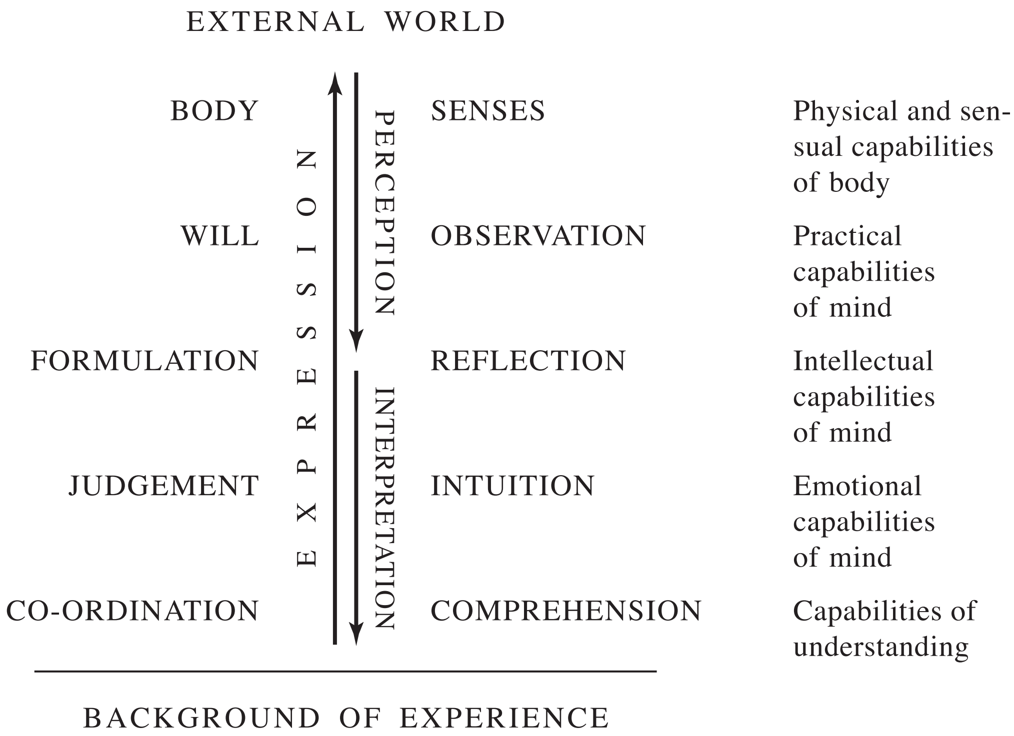
For example, as I drive a motor car, I co-ordinate various movements of the steering wheel, gears, clutch, brake and switches. Together with these physical actions, I also co-ordinate various perceptions of my own vehicle, of other vehicles and pedestrians, and of signs, signals, turnings and obstructions on the road. And together with these actions and perceptions, I co-ordinate various thoughts about traffic rules and behaviour and the best route to take, and various feelings about safety and consideration for other drivers and the urgency of getting to my destination on time.

All this co-ordination expresses my knowledge of driving. Through my understanding of how to drive, the various actions, perceptions, thoughts and feelings of driving are co-ordinated at the background of my experience, while my attention is focused on particular objects like a car that has come dangerously close, or a turning that I have to take, or some work that I have to do when I reach my destination, or some subject that I am discussing with a friend who is in the car.

Perception and interpretation are assimilated into knowledge through a capability that is called ‘comprehension’. Through this capability, underlying principles are comprehended by understanding them at the background of experience, while attention is focused on the perception and interpretation of an apparent object.

For example, while attention is focused on interpreting the observation of a particular phenomenon, this observation and interpretation is assimilated into knowledge by comprehending in it underlying principles which the phenomenon shares in common with other phenomena. Or, while attention is focused on interpreting a perception of some particular action of a person’s behaviour, this perception and

Figure 3.5



interpretation is assimilated by comprehending in it underlying principles of that person's character and of human nature in general.

In sum, co-ordination and comprehension are capabilities of understanding which express and assimilate knowledge. Knowledge is expressed in the co-ordination of different feelings, thoughts, perceptions and actions at the background of experience, while attention is focused on particular objects. Knowledge is assimilated by interpreting perceptions of particular objects, so as to comprehend underlying principles at the background of experience.

This can be illustrated by adding to our diagram, as in figure 3.5.

3.6 Consciousness

How is experience known? At different moments of time, various physical and mental objects appear in a person's experience. How is a person aware of these various appearances, which come and go in the course of experience?

As the world is known through different capabilities of personality, experience is known at different levels of awareness.

- Through body and senses, a person is aware of physical objects that interact with the body and of sense perceptions that result from this interaction.
- Through practical capabilities of mind, a person is aware of actions and relationships, which are intended by will and perceived by observation.
- Through intellectual capabilities of mind, a person is aware of thoughts and meanings, which are represented by descriptive or prescriptive formulation and which are interpreted by reflection.

- Through emotional capabilities of mind, a person is aware of feelings and qualities, which are evaluated by judgement and recognized by intuition.
- Through understanding, a person is aware of basic principles and continuity, which are expressed through co-ordination and interpreted through comprehension.

At each of these different levels of awareness, a person is aware of changing appearances, which come and go in a person's experience, as attention turns from one physical or mental object to another.

For example, a piece of toast appears in my experience as I look at it or taste it, and then it disappears from my experience as my attention turns elsewhere.

Or, as I try to find my way in a part of town that I do not know, my attention turns to relationships between unfamiliar streets and places, and these relationships thus appear in my experience. Then, as I find my way and go on to other activities, my attention turns away from relationships between unfamiliar streets and places, and these relationships no longer appear in my experience.

Or, as I think about a book that I have read, the meaning of the book appears in my experience. Then, as I think of other things or go on to do something else, the meaning of the book no longer appears in my experience.

Or, as I feel touched by something that a friend has done for me, my attention turns towards the qualities of my friend's character. Then, as my emotional response subsides, my attention becomes occupied by other things, and my friend's qualities of character no longer appear in my experience.

Or, as I try to understand a particular phenomenon, my attention turns towards underlying principles, which thus appear in my experience. Then, as I comprehend these principles, they no longer appear in my experience: because I understand them at the background of my experience, leaving my attention free to turn towards the phenomena that they underlie.

As appearances change in a person's experience, awareness seems to change as well, because awareness of one appearance seems to be different from awareness of another appearance. In particular, awareness of one object seems to be different from awareness of another object; awareness of one perception seems to be different from awareness of another perception; awareness of one action seems to be different from awareness of other actions; awareness of one relationship seems to be different from awareness of other relationships; awareness of one thought or meaning seems to be different from awareness of other thoughts or meanings; and similarly, there seem to be different awarenesses of different feelings, qualities, principles and continuities.

Is there anything in common between these apparently changing awarenesses that come and go in a person's experience? Yes there is. It is called 'consciousness'. In the course of a person's experience, as awareness of one appearance succeeds awareness of other appearances, consciousness continues at the background of experience; and this continuing consciousness knows the different appearances of physical and mental objects that come and go at the focus of attention. On the basis of this continuing consciousness, a person is able to compare and to relate the different physical and mental objects that appear at different moments of time.

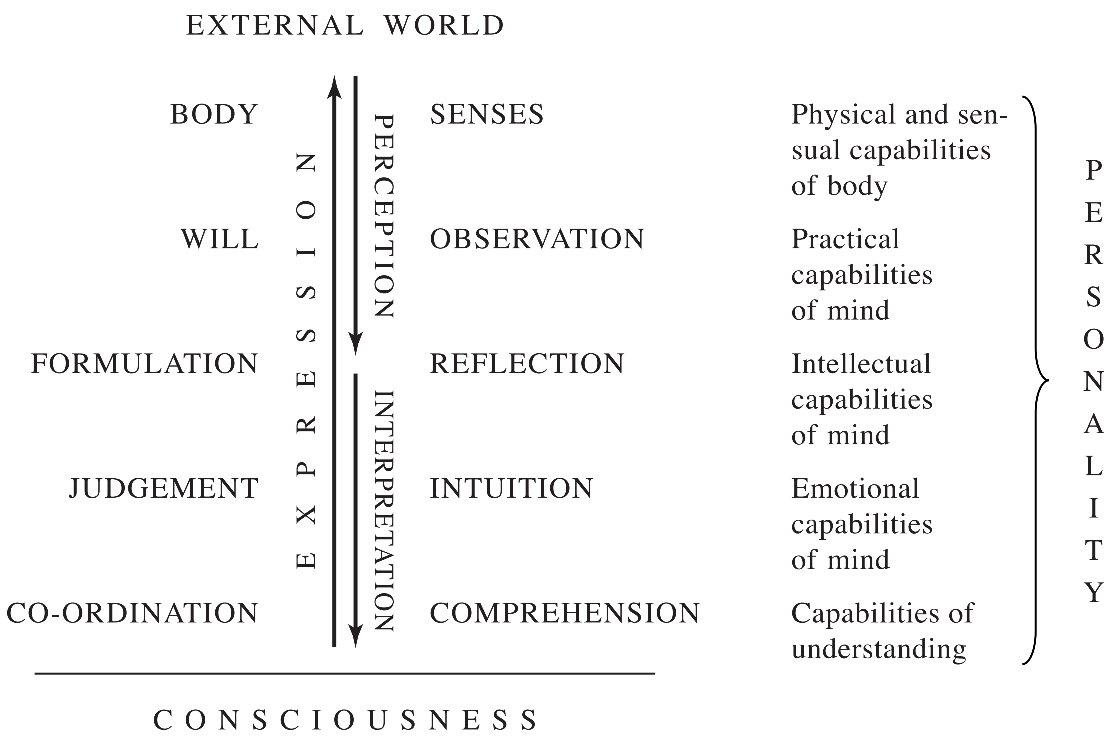
For example, suppose that I eat two slices of toast for breakfast: the first one hot and crisp, and the second one a little cold and leathery. My awareness of the cold and leathery toast seems different from my awareness of the hot and crisp piece of toast that I have eaten a few minutes earlier; but, as one awareness succeeds the other, consciousness continues at the background of my experience; and this continuing consciousness knows the different appearances of the two pieces of toast. On the basis of this continuing consciousness, I am able to compare the relative freshness and staleness of the two slices of toast, and I am able to relate them as having been made from the same loaf of bread just before I sat down to breakfast.

Or, suppose that I am enjoying a pleasant evening with my family, when news arrives that someone of whom we are very fond has met with a serious accident. Our awareness of distress at the terrible news seems very different from our previous awareness of enjoying a pleasant evening. But, as one awareness succeeds the other, consciousness continues at the background of our experience; and this continuing awareness knows the different appearances of enjoyment and distress in our experience. On the basis of this continuing awareness, our distress at the tragic news stands out in sharp contrast with our previous enjoyment, and we relate our enjoyment and distress as contrasting feelings in the same complex of human affections.

As consciousness continues at the background of experience, knowledge is understood in it: thus enabling knowledge to be expressed from consciousness and assimilated into consciousness. On the one hand, a person's feelings, thoughts and actions express knowledge that is understood in consciousness. As for example, the feelings, thoughts and actions of driving a motor car express a knowledge of driving that is understood in the consciousness of the driver. On the other hand, perceptions and interpretations are assimilated into knowledge that is understood in consciousness. As for example, observations and interpretations of particular phenomena are assimilated into knowledge of underlying principles, which is understood in the consciousness of those who observe and interpret these phenomena.

Thus, whenever knowledge is understood at the background of experience, it may also be described as understood in consciousness. In other words, *consciousness is the background of experience*, from which knowledge is expressed and into which

Figure 3.6



knowledge is assimilated.

In sum, consciousness is the continuing basis of a person's awareness, underlying the changing appearances of awareness in the course of experience.

As consciousness continues in experience, it knows the changing appearances of the world, through mental and physical capabilities of personality. Thus, personality is a medium through which the world is known by consciousness. Through this medium, knowledge from consciousness is expressed in the world, and knowledge of the world is assimilated into consciousness.

This can be illustrated by modifying our previous diagram, as in figure 3.6.

Note: on the 'unconscious'

What has here been called 'understanding' is often described by terms such as 'the unconscious' or 'unconscious mind' or 'unconscious knowledge' or 'unconscious experience'. In what sense is understanding 'unconscious'? Whenever any knowledge or feeling or thought or action is understood at the background of experience, then this knowledge or feeling or thought or action does not appear as an object of attention, and there is no apparent awareness of it at that moment of time in a person's experience. Hence, understood knowledge and understood feeling and understood thought and understood action are all 'unconscious', if we take the word 'consciousness' to refer to the apparent awareness of mental or physical objects at the focus of a person's attention.

A different approach has been taken in figure 3.6 and in the discussion accompanying it. The word 'consciousness' has not been used to describe the *changing appearance* of awareness, as a person is aware of different appearances at different moments of time. Instead, the word 'consciousness' has been used to describe the *continuing basis* of awareness by which different appearances are known, as they come and go in the course of a person's experience. On the basis of this continuing awareness, different appearances are compared and related in the course of time, and hence common principles are understood in them. From this point of view, understanding is a deeper level of awareness, by which a person sees through different appearances and is aware of underlying principles and continuities.

When a person is apparently aware of a physical or mental object, underlying principles are understood in this apparent awareness. At this point of time, a person is not aware of these underlying principles as objects that appear at the focus of attention. At some other point of time, when a person enquires into these underlying principles, they may then appear as objects of attention; but then they are questioned and considered, rather than understood. When a principle is understood in a person's apparent awareness of some particular object, then this principle is not an apparent object and there is no apparent awareness of it as an object of attention. But there is a deeper awareness of it, at the background of experience; and the word 'understanding' is used to describe this deeper awareness.

Thus, far from being more 'unconscious' than apparent awareness, understanding is a deeper level of awareness at which consciousness knows experience.

In the discussion that follows, the same approach will be continued, and the words 'consciousness', 'awareness' and 'understanding' will continue to be used in the same way.

4. Culture

4.1 Production

What is culture, through which knowledge is expressed in society and passed on from one person to another?

As people live together in society, they produce a variety of goods, information and services. Food is produced from crops and animals; houses and buildings are constructed for shelter; tools and machines are manufactured to help carry out required tasks; prescriptions are formulated to instruct action; descriptions are presented so as to represent facts and perceptions; idioms and works of art are created to express value; laws and codes of conduct are established to regulate acceptable behaviour; services are organized to satisfy people's needs and wishes; and explanations and interpretations are articulated in order to clarify understanding.

This activity of production develops the environment in which it takes place, and it also expresses knowledge for those who live in the environment or who otherwise observe it. For example, the cultivation of food develops a farming environment, which expresses agricultural knowledge. The construction of houses and buildings develops a settlement or a village or an urban environment, which expresses a knowledge of settled life or of village or urban civilization. The manufacture of tools and machines develops an industrial environment, which expresses engineering knowledge. The formulation of prescriptions develops a technological environment, which expresses technical and codified knowledge. The presentation of descriptions develops an information environment, which expresses represented knowledge from beyond the immediately visible surroundings. The creation of idioms and works of art develops an emotional environment, which expresses a knowledge of cultivated sensibility. The establishment of laws and codes of conduct develops a legal and ethical environment, which expresses a knowledge of social order and morality. The organization of services develops an environment of assistance and care, which expresses a knowledge of management and psychology. The articulation of explanations and interpretations develops an environment of common understanding, which expresses a knowledge of underlying principles.

As people share or exchange their products, the knowledge expressed in these products is passed on from person to person, and it is thus transmitted and learned in society. For example, by sharing food with others, people also share knowledge of what to eat and how to eat it. By inviting guests to their homes, people share knowledge of how homes can be organized and lived in. By acquiring tools and machines and trying them out, people learn to carry out the tasks for which the tools or machines are designed. By following prescriptions, people learn how to achieve the results prescribed. By hearing or reading descriptions, people learn about what is described. By appreciating idiomatic expressions and works of art, people learn about feelings and value. By following laws and codes of conduct, people learn discipline and ethics. By receiving and doing services, people learn about human needs and wishes. By listening to explanations and interpretations, and by replying to them in discussions, people learn to understand basic principles.

Figure 4.1

Level of culture	*Expression of knowledge*	*Transmission and learning*
Production	Development of environment	Sharing and exchange of goods, information and services

In sum, through the productive activities of society, knowledge is expressed in the development of environment. And, by sharing and exchanging the goods, information and services that people produce, knowledge is transmitted and learned in society.

This can be illustrated by starting a table, as in figure 4.1.

4.2 Usage

How do people use their environment and its products, so as to achieve desired results?

In order to achieve results, suitable actions are set in motion and directed in a controlled manner, through the use of instruments and techniques.

For example, in order to make furniture, pieces of wood are cut and shaped to size by sawing, planing, chiselling and machining; then the shaped pieces are assembled according to design by gluing, nailing, screwing and dowelling; and finally the surface is finished according to taste by sanding and varnishing.

Or, in order to reach a given destination, a driver starts a car, controls its motion through the accelerator, steering wheel and brakes, and finds the way by remembering the right turnings or by reading a map and looking at signposts.

Or, in order to cure a disease, a doctor initiates and directs a process of healing, through the use of medicines, surgery and nursing.

Or, in order to reach a specially focused state of mind, a person in meditation may turn attention again and again to a prescribed object of contemplation; so that this process of repeated attention may control the mind to remain more and more steadily focused upon the object and its meaning, until a state is reached where attention does not move from object to object, but remains steadily focused upon the meaning o the contemplated object.

Or, in order to enforce a client's rights, a lawyer may initiate a process of legal action and plead a case, by issuing notices to offending parties and by arguing in court, according to the stated provisions and the due procedures of law.

Or, in order to institute a policy, a politician may start a campaign of public and legislative action, trying to steer the process of policy making in a favourable direction.

Or, in order to understand particular phenomena, scientists set in motion processes of observation and thought; and they control these processes through precise instruments and methods of observation, and through systematic, carefully defined concepts and theories.

When results are thus achieved through technological control, such achievement expresses knowledge of the actions and processes that are controlled. For example, furniture-making expresses a knowledge of actions and processes by which wood is

Figure 4.2

Level of culture	*Expression of knowledge*	*Transmission and learning*
Production	Development of environment	Sharing and exchange of goods, information and services
Usage	Application of technology	Training of physical and mental skills

cut, shaped, joined and finished, according to planned design. Or, driving a car to a given destination expresses a knowledge of starting, accelerating, steering, braking, traffic negotiation and route finding. Or, curing a disease expresses a knowledge of processes and actions of disease and healing. Or, reaching a specially focused state of meditation expresses knowledge of actions and processes by which the mind is focused. Or, the enforcement of legal rights expresses knowledge of the actions and processes of law. Or, achievements of policy making express knowledge of political action and process. Or, achieving scientific understanding of a particular phenomenon expresses knowledge of scientific processes of observation and thought.

Technological knowledge, of how to control actions and processes, is transmitted and learned through the training of physical and mental skills by which instruments and techniques are used. For example, knowledge of carpentry is learned by training physical skills of using tools and judging wood quality, and by training mental skills of furniture design and project planning. Or, knowledge of driving is learned by training skills of speed control, steering, signalling, sign reading, co-ordination and traffic judgement. Or, medical knowledge is learned by training skills of diagnosis, prognosis, prescription, surgery, therapy and nursing. Or, knowledge of meditation is learned by training skills of personal detachment, emotional control and mental concentration. Or, knowledge of legal techniques is learned by training skills of organizing documentation and procedure, managing clients and officials, grasping relevant facts and presenting arguments. Or, knowledge of politics is learned by training skills of campaign management, contact making, personal lobbying, public promotion, opinion gauging and policy judgement. Or, knowledge of scientific method is learned by training skills of experimental observation and logical thought.

In sum, as people use their environment and its products, knowledge is expressed in the application of technology to achieve desired results. When knowledge is thus technologically expressed, it is transmitted and learned through the training of physical and mental skills.

This can be illustrated by adding to our table, as in figure 4.2.

4.3 Conception

How do people think about the world and the use that they make of it? In people's minds, the world and its various actions and processes are represented by ideas. As people think, ideas are analysed into component concepts, and these concepts are related together so as to form articulated thoughts that represent the world.

For example, in the mathematics of measurement, the idea of quantity is analysed into concepts of units and numbers; and a quantity is thus thought about as a number of particular units. Or, the idea of space is analysed into concepts of positions, distances and directions; and space is thus thought about as a system of positions related by distances and directions. Or, the idea of time is analysed into concepts of moments, periods and duration; and time is thus thought about as a succession of moments related by intervening periods of duration.

Or, in particle physics, the idea of a physical object is analysed into concepts about elementary particles of matter; and a physicist can thus think about an object as a complex structure of particles which interact together so as to produce the properties and actions of that particular object.

Or, in chemistry, the idea of a chemical substance is analysed into concepts about chemical elements; and a chemist can thus think about a substance as a compound of chemical elements which interact together so as to produce the properties and processes of that particular substance.

Or, in the biological and behavioural sciences, the idea of a living organism is analysed into concepts about the form and functions of bodily organs and mental faculties; and a biological or behavioural scientist can thus think about a living creature as an organic system of forms and functions which result in the characteristics and behaviour of that particular creature.

Or, in the humanities and cultural sciences, the idea of culture is analysed into concepts about the meaning of language, literature, art, historical tradition and other fields of culture; and hence a humanities scholar or a cultural scientist can think of a cultural expression by relating its component meanings.

Or, in psychological science, the idea of mind is analysed into concepts about motives and desires; and hence a psychologist or psycho-analyst can think of a person's mind by relating concepts about the motives and desires which are responsible for that person's behaviour and thought.

Or, in theories of logic, the idea of reason is analysed into concepts about logical assumptions and deductions, and hence a logician can think of an argument as a network of assumptions and deductions which are expressed in the statements and conclusions of the argument.

Or, in philosophy of science, the idea of causality is analysed into concepts about causes and effects; and hence a philosopher of science can think of a scientific theory as describing a network of causes and effects which result in the phenomena explained by the theory.

Or, in ordinary language, ideas of the everyday world are analysed into concepts that individual words express; and people thus think about the world by relating concepts together in the phrases and sentences of meaningful speech. By thus articulating ideas so as to represent the world in thought, knowledge of the represented world is expressed in people's minds. For example, knowledge of represented quantities is expressed by thinking of numbers of particular units of quantity; knowledge of represented space is expressed by thinking of positions related by distance and direction; and knowledge of represented time is expressed by thinking of moments related by intervening periods of duration. Similarly, knowledge of physical objects is expressed by thinking of structures of interacting particles; knowledge of chemical substances is expressed by thinking of compounds of chemical elements; knowledge of living creatures is expressed by thinking of organic systems of forms and functions; knowledge of culture is expressed by relating its component meanings; knowledge of mind is expressed by relating motives and desires; knowledge of arguments is expressed by relating assumptions and deductions; knowledge of a scientific theory is expressed by relating the causes and effects that the theory describes; and knowledge of the ordinary world is expressed by relating concepts together in ordinary speech.

Knowledge expressed in ideas is transmitted and learned through the education of intellect, by which people reflect upon the meaning of transmitted ideas and learn to articulate ideas for themselves.

For example, in mathematics, physics and chemistry, ideas are transmitted through the calculation of results by quantitative formulae, which relate units and magnitudes of quantity, positions and distances in space, moments and intervals of time, particles and structures of matter, and elements and compounds of chemical substance. Through explanation and discussion, mathematical and physical scientists reflect upon the meaning of transmitted formulae, and then go on to solve problems by the use of these formulae, thus learning to relate quantitative concepts and to articulate quantitative ideas for themselves.

Or, in biological and behavioural sciences, ideas are transmitted through classification and characterization of organic forms and functions. After reflecting upon the meaning of transmitted classifications and characterizations, biological and behavioural scientists go on to recognize for themselves the class and character of living forms and functions, thus learning to analyse organic concepts and to articulate organic ideas for themselves.

Or, in the humanities and cultural sciences, ideas are transmitted through the interpretation of works of literature and art and other cultural expressions. After reflecting upon the meaning of transmitted interpretations, humanities scholars and cultural scientists go on to make their own interpretations of cultural expression, thus learning to form their own concepts and ideas about culture.

Or, in psychological science, ideas are transmitted through analytic judgements of desire and motive. After reflecting on the meaning of transmitted judgements and analyses, psychologists and psycho-analysts go on to make their own analytic judgements, thus learning to articulate psychological concepts and ideas for themselves.

Or, in logic and philosophy, ideas are transmitted by identifying principles of assumption, deduction, cause and effect. After reflecting on the meaning of transmitted statements about basic principle, logicians and philosophers go on to make their own identification of underlying principles, thus learning to analyse logical and philo-

Figure 4.3

Level of culture	*Expression of knowledge*	*Transmission and learning*
Production	Development of environment	Sharing and exchange of goods, information and services
Usage	Application of technology	Training of physical and mental skills
Conception	Articulation of ideas	Education of intellect

sophical concepts and to articulate logical and philosophical ideas for themselves.

Or, in ordinary language, ideas are transmitted through the use of words and sentences. Language is learned by hearing words used by other people, reflecting upon the meaning of these words, and then using words for oneself: thus learning to use the concepts that words express and to articulate ideas in speech.

In sum, as people think about the world and the use that they make of it, knowledge is expressed in the articulation of ideas that represent the world in people's minds. When knowledge is thus expressed in ideas, it is transmitted and learned through the education of intellect, by which people reflect upon meaning and articulate their own ideas.

This can be illustrated by adding to our ongoing table as in figure 4.3.

4.4 Sensibility

How do people appreciate value, in objects, actions and ideas?

As people make emotional judgements of value, they establish attitudes of feeling how objects should be regarded and used, how actions should be carried out, and how ideas should be conceived.

For example, when a work of craft or art is valued for its craftsmanship and beauty, it is regarded with an attitude of respect and treated with an attitude of due care.

Or, when a method or manner of doing things is valued for its effectiveness and style, it is carried out with an attitude of confidence and pride.

Or, when ideas expressed in art and literature are valued for the entertainment and education they provide, they are thought about with attitudes of enjoyment and interest.

Or, when friends and family are valued for their company and support, they are regarded with attitudes of warmth and affection.

Or, when knowledge is valued for its clarity and directness, it is approached with attitudes of openness and honesty.

As attitudes are established, knowledge of value is expressed. For example, when an object is treated with respect and care, this attitude expresses a knowledge of the object's worth. Or, when actions are performed with a sense of confidence and pride, this attitude expresses knowledge of value in efficient method and appropriate style. Or, when literature or art is appreciated with a sense of enjoyment and interest, this attitude expresses knowledge of entertainment and educational value. Or, when friends or family are regarded with warmth and affection, such attitudes express knowledge of personal value. Or, when knowledge is approached with openness and honesty, these attitudes express an understanding of value in clarity and truth.

This emotional knowledge of value is called 'sensibility'; and it is transmitted and learned through the cultivation of tastes for special objects, actions and ideas in which particular values are appreciated. For example, sensibility is transmitted through the cultivation of tastes for naturally occurring objects of special significance, for specially created objects of craft and art, for useful activities of needed work, for goals of ambition in a professional career, for enjoyable games and recreational pastimes, for manners and conventions of social intercourse, for entertaining and thought-provoking ideas in imaginative art and literature, for personal relationships of family

Figure 4.4

Level of culture	*Expression of knowledge*	*Transmission and learning*
Production	Development of environment	Sharing and exchange of goods, information and services
Usage	Application of technology	Training of physical and mental skills
Conception	Articulation of ideas	Education of intellect
Sensibility	Establishment of attitudes	Cultivation of taste

or friendship, for religious worship towards a deity of transcendent value, and for information and knowledge through enquiry and experience.

In sum, as people appreciate value in the world they see around them, knowledge is expressed in the establishment of attitudes of perception, behaviour and thought. Emotional knowledge of value, called 'sensibility', is transmitted and learned through the cultivation of tastes for specially valued objects, actions and ideas.

This can be illustrated by adding again to our table, as in figure 4.4.

4.5 Communication

How do people understand knowledge that is communicated from various different times in the past and from a variety of different people?

As knowledge is communicated from past to present and from person to person, it is expressed by co-ordinating different points of view.

For example, when knowledge of objects is communicated between different observers, each observation is expressed relative to the observer's position, state and instruments of observation, which must be co-ordinated with the position, state and instruments of other observers.

Or, when knowledge of behaviour and purpose is communicated between different living beings, such knowledge is expressed relative to each living being's own circumstances, behaviour and purposes, which must be co-ordinated with the circumstances, behaviour and purposes of other living beings that take part in the communication.

Or, when knowledge of thought and feeling is communicated between different minds, such knowledge is expressed relative to each mind's own thoughts and feelings, which must be co-ordinated with the thoughts and feelings of communicating minds.

Or, when knowledge is received from the past, through memory or historical records, such remembered or recorded knowledge is expressed in the present by co-ordinating past states of mind, from which the knowledge has come, with the present state of mind that receives this knowledge.

Figure 4.5

Level of culture	*Expression of knowledge*	*Transmission and learning*
Production	Development of environment	Sharing and exchange of goods, information and services
Usage	Application of technology	Training of physical and mental skills
Conception	Articulation of ideas	Education of intellect
Sensibility	Establishment of attitudes	Cultivation of taste
Communication	Co-ordination of viewpoints	Clarification of understanding

As knowledge is thus communicated from different points of view, it is transmitted and learned by the clarification of understanding, as different points of view are taken into account.

For example, as different observers communicate their varying observations of the same object, they learn from each other by clarifying understanding of the object, as they take into account their various observations of it.

Or, as different living beings communicate varying manifestations of the same underlying principles of behaviour and purpose, they learn from each other by clarifying understanding of these common principles, as their varying manifestations are taken into account.

Or, as different minds communicate varying thoughts and feelings about common issues and interests, they learn from each other by clarifying understanding of these common issues and interests, as varying thoughts and feelings about them are taken into account.

Or, as knowledge is communicated from past to present states of mind, people learn from the past by clarifying understanding of continuing principles of life and history, as past and present views of these continuing principles are taken into account.

In sum, as knowledge is communicated from past experience, and from the experience of different people, it is expressed through the co-ordination of different points of view. As different points of view are taken into account, knowledge is transmitted and learned through the clarification of understanding.

This can be illustrated by adding to our table, as in figure 4.5.

4.6 The impersonal basis of knowledge

How is knowledge put together from different points of view? In order to co-ordinate different points of view, there must be a continuing, impersonal basis of knowledge, which is shared in common by past and present experience and by different people of varying personalities. What is this impersonal basis upon which knowledge is shared in common, beneath the variations of time and personality?

At different levels of culture, knowledge appears to be shared in different ways.

- At the level of *production*, knowledge appears to be shared through a common environment, containing particular objects, particular pieces of information and particular services that people can perceive and produce in common.
- At the level of *usage*, knowledge appears to be shared through common technology, with its particular instruments, techniques, skills and results that people observe and use in common.
- At the level of *conception* knowledge appears to be shared through common ideas, articulated in particular symbols and meanings that people formulate and reflect upon in common.
- At the level of *sensibility*, knowledge appears to be shared through common values, established in particular attitudes and cultivated in particular tastes that people recognize and judge in common.
- At the level of *communication*, knowledge appears to be shared through the co-ordination of different points of view, on the basis of particular assumptions and interpretations that people clarify and understand in common.

In all these different ways of sharing knowledge, there is implied a common, impersonal basis in consciousness.

When a particular object or a particular piece of information or a particular service is perceived in common at different times and by different people, this implies that common perceptions are put together on a common basis in consciousness, which continues through time and is shared by different people.

Similarly, when instruments, techniques, skills and results are observed in com-

Figure 4.6

Level of culture	*Expression of knowledge*	*Transmission and learning*
Production	Development of environment	Sharing and exchange of goods, information and services
Usage	Application of technology	Training of physical and mental skills
Conception	Articulation of ideas	Education of intellect
Sensibility	Establishment of attitudes	Cultivation of taste
Communication	Co-ordination of viewpoints	Clarification of understanding
Consciousness	The impersonal basis of knowledge	

mon, this implies that different observations are put together on the same continuing, impersonal basis in consciousness.

And again, when symbols and meanings are formulated and reflected upon in common, this implies that different formulations and reflections are put together upon the same impersonal basis in consciousness.

And again, when attitudes and tastes are recognized and judged in common, this implies that different recognitions and judgements are put together on the same impersonal basis in consciousness.

And again, when assumptions and interpretations are clarified and understood in common, this implies that different clarifications and understandings are put together on the same impersonal basis in consciousness.

In sum, knowledge has a common, impersonal basis in consciousness, upon which people co-ordinate viewpoints, clarify understanding, establish attitudes, cultivate tastes, articulate ideas, educate their intellects, apply technology, train skills, develop their environment and share goods, information and services.

This can be illustrated by a final addition to our table, as in figure 4.6.

Note: on scientific objectivity

Physical science is based upon the assumption of an external world that different people perceive in common, outside their differing minds. Accordingly, in the context of physical science, truth is sought through the ideal of objectivity, which emphasizes the common objects that we perceive through our differing and all too fallible personalities. Is this objective approach essentially opposed to the self-evident subjectivity of knowledge? Must we accept that true knowledge is not subjective at all, but that it is instead some kind of objective technology, with standardized methods and certified results? It often seems to be so, especially since the word ‘objective’ is so often used to mean ‘impersonally true’, and the word ‘subjective’ is so often used to mean ‘personal’.

But this is a rather superficial and misleading use of the words ‘objective’ and ‘subjective’. Where knowledge is approached objectively, the perceiving body and mind must themselves be treated as objects, so that their partialities and distortions may be observed and corrected, as different perceptions are taken into account from other people and from other places and times. Thus, the ideal of objectivity requires a detachment of knowledge from the limitations and inaccuracies of perceiving body and mind. By treating body and mind objectively, as limited and fallible instruments, their objective limitations and distortions can be progressively eliminated from knowledge. Through this process of clarification, knowledge becomes more impersonal; but it also becomes more subtle and more deeply subjective; as it becomes further removed from the gross objects of limited and coarse perception, and as it thus falls further back upon its impersonal basis in consciousness.

Without this impersonal, subjective basis, there could be no understanding of other lives, no communication between different minds, no continuation of knowledge through time, and no scientific objectivity. Far from being essentially opposed to subjective knowledge, objective science implicitly depends upon an underlying subjective basis which it takes for granted.

5. Nature

5.1 Matter

What is the nature of the world, beneath its varying developments in different circumstances and cultures?

Different objects are produced in different circumstances and in different cultures.

In particular, physical objects are produced from physical matter. As for example, rocks are produced from the cooling of molten lava or from the accumulation of hard deposits. Or, clothes are produced from the spinning and weaving and tailoring of cotton or woollen or synthetic material.

Similarly, but in a more subtle way, mental objects are produced from mental matter. For example, an imaginary country described in a novel is produced from the mental matter of images, perceptions, ideas and feelings in the author's mind and culture. Or, a politician's vision and intentions, published in an election manifesto, are produced from the mental matter of imagined possibilities, formulated plans, reasoned ideas, and felt aspirations that are current in the political and cultural atmosphere of the time. Or, a scientific explanation or theory is produced from the mental matter of observed perception, conceptual interpretation and guiding intuition in the minds of a community of scientists.

Beneath the variations that arise in different circumstances and cultures, different objects share in common the same underlying nature of matter. For example, a religious image cast in bronze and the barrel of a gun are different objects produced in different cultural circumstances, but they share in common the same underlying nature of metallic matter. Or, various modern ideas about family and marriage are mental objects which differ from each other and from traditional ideas about family and marriage; but these different mental objects share in common the same underlying nature of human ideas about family and marriage.

Matter is manifested through its basic property of 'inertia'. Through this property of inertia, objects react against each other, as their motion is stimulated by forces that act from one object to another.

For example, when I throw a stone, the physical matter in the stone is manifested by the inertial reaction that my hand has to push against, as the stone is accelerated into motion. And, when the stone strikes against another object, the physical matter in the stone is manifested by the inertial reaction of its momentum, in the results that follow from the impact.

Similarly, when I think about a new idea, the mental matter in the idea is manifested by the force of mind that has to be called forth (either by spontaneous interest or by deliberated will) in order to set the idea in motion in my thoughts and feelings. And, once this idea is set in motion, its matter is manifested by the impact of its momentum, as it comes up against other ideas.

Through laws of action and reaction, matter is regulated by an order that is called 'structure'.

In particular, physical objects are arranged in physical structures. As for example, atoms are arranged in the structure of a molecule. Or, molecules are arranged in the static and dynamic structures of solids and liquids and gases. Or, mechanical parts are

Figure 5.1

Level of nature	*Manifesting reaction*	*Movtive stimulus*	*Regulating order*	*Branch of learning*
Matter	Inertia	Force	Structure	Physical and structural sciences

arranged in the moving structure of a machine. Or, columns and beams and floors and walls and ceilings and roofs and doors and windows are arranged in the relatively fixed structure of a building.

Similarly, mental objects are arranged in mental structures. As for example, pieces of information are arranged in mental structures signified by coded messages and ordered classifications. Or, concepts signified by words are arranged in mental structures that are represented by physical language. Or, mental images are arranged in mental structures of imagination. Or, ideas are arranged in the mental structures of explanations and theories. Or, relatively simple emotions of attraction and repulsion are arranged in the mental structure of more complex emotions that contain conflicting attractions and repulsions.

The nature of matter is studied through physical and structural sciences. In particular, the nature of physical matter is studied in physical sciences such as physics, chemistry, geology, geography, astronomy and the sciences of materials and engineering. Similarly, the nature of mental matter is studied in structural sciences such as mathematics (which studies the structure of mental abstractions of quantity, space, time and causal relationship), structural linguistics (which studies the structure of communications conveyed by language), information science (including the sciences of coding and computer programming), traditional 'cosmic' sciences like astrology and omen-reading (which study 'subtle' or mental forces of the cosmos expressed in stars and omens and rituals), and sciences of codification and classification (including the codification of technology and law and the classification of knowledge in encyclopedias and libraries).

In sum, the nature of matter is manifested by the various physical and mental objects that are made from it. At this level of nature, there is an interplay of three basic factors: first, a manifesting reaction called 'inertia'; second, a motive stimulus called 'force'; and third, a regulating order called 'structure'. The nature of matter is studied in physical sciences like physics and chemistry, and in structural sciences like mathematics and information science.

This can be illustrated by starting a table, as in figure 5.1.

5.2 Life

What is the nature of life, beneath its varying developments in the actions of living creatures?

Plants, animals and human beings are living creatures whose behaviour manifests something that is called 'life'. When confronted by a particular situation, an object reacts inertially, showing only the properties of matter from which it is made. By contrast, a living creature reacts to situations with behaviour that is stimulated by a sense of purpose. For example, when a stone is dropped on the ground, it merely

Figure 5.2

Level of nature	*Manifesting reaction*	*Movtive stimulus*	*Regulating order*	*Branch of learning*
Matter	Inertia	Force	Structure	Physical and structural sciences
Life	Behaviour	Purpose	Organization	Biological and behavioural sciences

reacts mechanically and chemically with the soil. By contrast, when a seed falls on moist earth, mechanical and chemical reactions are used in the living behaviour of the seed, which is stimulated by recognizable purposes of life. Thus, a seed sends out roots into the soil in search of anchorage, water and nutrition, and it grows a stem and leaves in order to breathe air and to absorb energy from sunlight.

Through characteristic patterns of living behaviour and purpose, life is regulated by an order that is called ‘organization’.

In particular, each living creature has organs that function towards particular purposes; and these organs and their functions are organized together, in the behaviour of a living creature as an individual organism. For example, the roots of a tree provide anchorage, water and nutrition from the ground, the trunk holds up branches, the branches hold up leaves and flowers, the leaves breathe air and absorb energy from sunlight, the flowers enable propagation; and these various organs and functions are organized together, in the behaviour of the tree as an individual organism.

Moreover, different living creatures are organized in ecosystems and societies, with collective functions and purposes. For example, plants and trees and animals and human beings are organized in ecosystems of forest, grassland, desert, wetland, and in ecosystems that span different kinds of habitat. And human beings are organized in families, communities, associations, corporations and civilizations.

The nature of life is studied through biological and behavioural sciences. Biological sciences study the functioning of living bodies, as for example in molecular and cell biology, in biochemistry, physiology and the medical sciences, and in botany, zoology and ecology. Behavioural sciences study the functioning of mentally developed behaviour, as for example in political, economic and management sciences, in history, anthropology, sociology and behavioural psychology, and in traditional sciences of ritual and cosmic teleology (which study the nature of the universe as a macrocosmic organism with a macrocosmic mind, in which individual creatures are small microcosms with microcosmic minds).

In sum, the nature of life is manifested by the actions of living creatures. At this level of nature, there is an interplay of three basic factors: first, a manifesting reaction called ‘behaviour’; second, a motive stimulus called ‘purpose’; and third, a regulating order called ‘organization’. The nature of life is studied in biological and behavioural sciences.

This can be illustrated by adding to our table, as in figure 5.2.

5.3 Intelligence

What is the nature of intelligence, beneath its varying developments in the thoughts of living creatures?

As living behaviour functions towards its purposes, it represents perception of objects and relationships, and thus it manifests intelligence. Through the stimulus of imagination in the minds of living creatures, certain manifest objects, called symbols, are created and used so as to represent further objects, which are thus symbolically conceived.

For example, by imagining a terrain which is too big to be seen physically all at once, a map is drawn and the terrain is conceived through it.

Or, by imagining a building that is proposed to be constructed, an architect makes drawings and a model, through which the proposed building may be conceived.

Or, by imagining future actions and their results, a living creature forms intentions, decisions and plans, through which future actions and their results are conceived.

Or, when imagining a possible situation, a description is formed in words or pictures or mental images, through which this possible situation is conceived.

Or, by imagining ideas, a thinker forms theories and arguments and explanations, through which the ideas are conceived.

Or, by imagining attitudes and feelings, a novelist tells a story, or an artist paints a picture, or a composer creates a piece of music, through which attitudes and feelings are conceived.

Through intelligible relationships of meaning, intelligence is regulated by an order that is called ‘coherence’.

For example, a map is read by relating the meaning of its symbols so as to form a coherent conception of the terrain. Or, a proposed building is conceived by relating the meanings of architectural drawings and a three dimensional model. Or, a planned course of action is conceived by coherently relating inherently relating intended actions and goals. Or a described situation is conceived by relating the meaning of the words, pictures or mental images that describe it. Or, ideas are conceived by relating the meanings of concepts, in theories, arguments and explanations. Or, attitudes and feelings are conceived by meaningfully relating the incidents in a story or the images in a picture or the sounds in a piece of music.

The nature of intelligence is studied in the humanities and cultural sciences. The humanities study the nature of intelligence expressed in language and in works of art and literature, as for example in linguistics, art and literary criticism, and in the history of language, art, literature and ideas. The cultural sciences study the expression of intelligence in the variety of meaningful behaviour in different cultures, as for example in ethnology, in cultural anthropology, and in comparative studies of art, literature and symbolic expression.

In sum, the nature of intelligence is manifested by meaningful behaviour. At this level of nature, there is an interplay of three basic factors: first, a manifesting reaction called ‘representation’. which reacts to perception by representing it in symbols; second, a motive stimulus called ‘imagination’, which creates symbols and combines them in suggestive ways that stimulate their use; and third, a regulating order called ‘coherence’, which relates the meanings of component symbols into a coherently meaningful whole. The nature of intelligence is studied in the humanities and cultural sciences.

Figure 5.3

Level of nature	*Manifesting reaction*	*Movtive stimulus*	*Regulating order*	*Branch of learning*
Matter	Inertia	Force	Structure	Physical and structural sciences
Life	Behaviour	Purpose	Organization	Biological and behavioural sciences
Intelligence	Representation	Imagination	Coherence	The humanities and cultural sciences

This can be illustrated by adding to our ongoing table, as in figure 5.3.

5.4 Desire

What is the nature of desire, beneath its varying developments in the feelings of living creatures?

As meaningful behaviour represents perception, its response to perceived objects is motivated by underlying choices of purpose and aim, and thus it manifests desire.

For example, if a shopper sees a smart coat on display, and wants to buy it to wear at the office, then this response is motivated by a choice of image that the shopper wants to present at the office.

Or, if a driver sees a child run suddenly in front of the car, and swerves crashing into the sidewalk in order to avoid the child; then this response is motivated by a choice that it is better to smash the mere mechanism of a car than to harm the innocent life of a child.

Or, if a person reads a book and is excited by its ideas, this response is motivated by a choice of intellectual purposes and aims that are awakened and seem to be usefully served by the ideas in the book.

Or, if a person reacts to a sexual advance with disgust and outrage, this is motivated by a choice of aspiration to personal tastes and ethical ideals which find the advance offensive.

Or, if a person willingly makes time in a busy schedule in order to accept an invitation from a dear friend, this is motivated by a choice of social interests in company and friendship, alongside working ambitions in a profession or career.

Through emotional consistency of implied value, desire is regulated by an order called ‘integrity’.

For example, when a person is smartly dressed, it is not just the coat that looks smart; but, instead, the valued quality of smartness is implied by the style of dressing as an integral whole, including coat, hat, shirt, trousers, shoes, and their matching together to form a consistent effect of smartness.

Or, a person’s respect for life does not consist only in swerving a car to avoid hurting a child, but in the integrity of all that person’s attitudes and actions towards living creatures.

Figure 5.4

Level of nature	*Manifesting reaction*	*Movtive stimulus*	*Regulating order*	*Branch of learning*
Matter	Inertia	Force	Structure	Physical and structural sciences
Life	Behaviour	Purpose	Organization	Biological and behavioural sciences
Intelligence	Representation	Imagination	Coherence	The humanities and cultural sciences
Desire	Response	Choice	Integrity	Ethics and psychology

Or, a person's intellectual values are not shown just in some passing excitement at the ideas of a book, but are implied by an integral consistency in that person's use of ideas as a whole.

Or, a person's sexual values are not shown in just one incident of rejecting an advance, but in a consistent integrity of sexual attitudes and behaviour.

Or, a person's value for friendship does not just consist in making time for a few social occasions, but in a consistent faithfulness and loyalty where valued friends are concerned.

The nature of desire is studied in ethics and psychology. Ethics studies the nature of desire in values of conduct towards other living creatures; and psychology studies the nature of desire in the 'psyche' or, in other words, in the motivation of the mind.

In sum, the nature of desire is manifested by the purposes and aims of meaningful behaviour. At this level of nature, there is an interplay of three basic factors: first, a manifesting reaction of emotional response to perceived objects and situations; second, a motive stimulus provided by implied choice of purpose and aim; and third, a regulating order governed by integrity of underlying principles of value. The nature of desire is studied in ethics and psychology.

This can be illustrated by adding again to our table, as in figure 5.4.

5.5 Reason

What is the nature of reason, beneath its varying developments in the understanding of living creatures?

As perceptions are represented by thought and aims are chosen by feeling, these perceptions and aims are explained by the discernment of underlying principles, which are related together in logically ordered systems.

For example, in physics and chemistry, physical observations are explained by discerning underlying principles of mass, force, energy and substance, which are related together by quantitative laws in space and time.

Or, in mathematics, mental abstractions of quantity, space, time, causal relationship and logical system are explained by discerning underlying principles of number, position, distance, direction, duration, consequence and deduction, which are related together by mathematical formulae and calculations.

Figure 5.5

Level of nature	*Manifesting reaction*	*Movtive stimulus*	*Regulating order*	*Branch of learning*
Matter	Inertia	Force	Structure	Physical and structural sciences
Life	Behaviour	Purpose	Organization	Biological and behavioural sciences
Intelligence	Representation	Imagination	Coherence	The humanities and cultural sciences
Desire	Response	Choice	Integrity	Ethics and psychology
Reason	Explanation	Discernment	System	Logic and philosophy of science

Or, in biology and behavioural science, observations of life and aims of behaviour are explained by discerning underlying principles of living form and function, which are related together in logically characterized systems of organization.

Or, in the humanities and cultural sciences, observations and aims of language, literature and other cultural expressions are explained by discerning underlying principles of meaning, which are related together in symbolic systems.

Or, in ethics and psychology, observations and aims of conduct, personal relationship, attitude and emotion are explained by discerning underlying principles of value and motivation, which are related together in moral and psychological systems.

The nature of reason is studied in logic and the philosophy of science. In logic, the nature of reason is studied in the assumptions and deductions of rational argument. In the philosophy of science, the nature of reason is studied in scientific explanations of cause and effect, which describe how causal principles produce observed effects.

In sum, the nature of reason is manifested by the representations of intelligence and the choices of desire. At this level of nature, there is an interplay of three basic factors: first, a manifesting reaction called ‘explanation’, which reacts to perceptions and purposes by explaining them on the basis of underlying principles; second, a motive stimulus called ‘discernment’, which discerns the underlying principles on which explanations are based; and third, a regulating order called ‘system’, by which underlying principles are logically related.

This can be illustrated by adding to our table, as in figure 5.5.

5.6 Nature

What is the nature of consciousness, beneath its varying developments in the knowledge of living creatures?

Knowledge is developed through the association of consciousness with varying faculties of personality, in the bodies and minds of living creatures.

In particular, knowledge of physical objects and physical matter is developed through the association of consciousness with the physical perceptions and actions of a living creature’s senses and body.

Figure 5.6

Level of nature	*Manifesting reaction*	*Movtive stimulus*	*Regulating order*	*Branch of learning*
Matter	Inertia	Force	Structure	Physical and structural sciences
Life	Behaviour	Purpose	Organization	Biological and behavioural sciences
Intelligence	Representation	Imagination	Coherence	The humanities and cultural sciences
Desire	Response	Choice	Integrity	Ethics and psychology
Reason	Explanation	Discernment	System	Logic and philosophy of science
Consciousness	The impersonal basis of knowledge			Philosophical enquiry

Knowledge of mental objects and mental matter is developed through the association of consciousness with the mental perceptions and actions of a living creature's mind.

Knowledge of form and function is developed through the association of consciousness with a living creature's observations of relationship and purpose.

Knowledge of life is developed through the association of consciousness with a living creature's observations and behaviour towards other living creatures and towards itself.

Knowledge of meaning and intelligence is developed through the association of consciousness with a living creature's interpretations, descriptions and prescriptions.

Knowledge of qualities, values and desire is developed through the association of consciousness with a living creature's intuitions and judgements.

Knowledge of underlying principles and reason is developed through the association of consciousness with a living creature's comprehension and co-ordination.

Thus, in all the varying developments of knowledge, consciousness is the one common factor. Or, in other words, consciousness is the continuing, impersonal principle of nature that is shared in common by all manifestations of knowledge, beneath their variations of time and personality.

In this sense, consciousness is the impersonal principle upon which knowledge is based, within the personality of each living creature. This impersonal principle of knowledge is studied through philosophical enquiry, in which knowledge investigates its own basis, in an attempt to clarify misunderstandings that obscure truth.

This can be illustrated by a final addition to our table, as in figure 5.6.

Note: on modern and traditional concepts of nature

In modern physical science, nature is conceived as an external world, outside the minds of human beings and other living creatures. For the specialized purposes of physical science and technology, this conception has proved its use, but, for the broader and subtler needs of living things, it has its limitations, as environmental concerns are beginning to show. The problem with this narrowly physical conception is that it creates an artificial opposition between mind and nature, making nature seem a lifeless collection of dead objects, to be manipulated and dominated by our minds.

In traditional religion and philosophy, nature was conceived to be 'animate'. In other words, nature was taken to include the living actions, perceptions, thoughts and feelings through which it manifests itself before consciousness. Instead of identifying consciousness with the physical perceptions and expressions of bodily action, or with the mental perceptions and expressions of functioning mind, all such physical or mental perceptions and expressions were taken to be partial and limited activities of nature.

On the one hand, consciousness was taken to be 'pure spirit', the illuminating principle of knowledge, unobscured by any partial action towards some limited objective. On the other hand, nature was taken to be the transforming principle that manifests itself in all the changing appearances of creation, including the physical phenomena created by bodily action and the more subtle appearances created by mind.

The illuminating principle of 'pure spirit' was represented by the transcendent God of traditional religions, by Aristotle's 'unmoved mover' (both as God in the external universe and as the essence of soul in living beings), by the concept of 'purusha' (spirit) in Sānkhya philosophy, and by the concept of 'ātman' (self) in Advaita Vedānta. The transforming principle of nature was represented by religious conceptions of divine immanence in the changing manifestations of creation, by Aristotle's conception of 'phusis' (as self-governing nature), and by the concept of 'prakriti' in Sānkhya and Vedānta philosophies.

When consciousness is thus no longer identified with merely partial and limited activities of nature, it turns out that consciousness and nature are ultimately identical. From a religious point of view, this final identity of consciousness and nature is represented by the affirmation that God is both the transcendent spirit of all aspiration and the immanent nature of all creation. In Aristotle's philosophy, this same identity is represented by the conception of 'final cause', that all nature moves finally for love of the unmoved mover. In Sānkhya philosophy, there is a similar conception that nature's activities are finally inspired by the changeless spirit called 'purusha', thus implying that this changeless spirit is the final cause and the ultimate reality underlying all the changing manifestations of nature. And, in the non-dualist philosophy of Advaita Vedānta, it is explicitly conceived that all nature's changing manifestations are nothing but differing appearances of consciousness, so that knowing consciousness is identical with the nature which it knows.

Unfortunately, traditional conceptions have their own kind of problem, particularly in the modern world. They tend to be expressed in ritual and mythical metaphors; and they tend to argue from authority, on the basis of mystical states of experience that have been esoterically achieved and interpreted by an elevated few. This may have been appropriate in traditional societies, when communications were much poorer and education was far less widely spread than in the modern world. But surely, the traditional manner of ritual and mystical authority can no longer be so appropriate today, now that modern advances in science and education have developed our ability to reason directly from common experience.

How can this new spirit of scientific enquiry be deepened, so that a better understanding of life and mind may be included in our conception of nature, without turning the clock back to ritual and mystical ways of thought? Or, in other words, how can the nature of life and mind be better understood, through direct, open-minded reasoning on the basis of common experience?

This question is raised in particular by our growing environmental crisis, which clearly requires a widespread change of attitudes, as people ask questions and think things out for themselves.

6. *Philosophical enquiry*

6.1 Self

What is the self that each person calls 'I'?

The word 'I' is used in different ways, by identifying the self with different elements of personality. Each of these identifications of the self leads to a particular philosophical position.

- First, the self may be identified with a person's body: as for example when a person says 'I am fat' or 'I am thin' or 'I sit' or 'I walk'. This leads to the position called 'materialism', which views the self as a material body in a world of matter.
- Second, the self may be identified as a functioning person, with purposes and needs: as for example in statements like 'I am going to work', 'I am having lunch', 'I am visiting a friend', 'I am getting married'. This leads to the position called 'pragmatism', which takes the common-sense view that the self is not just a material body, but a living person with needs, wishes and intentions in a world of life and action.
- Third, the self may be identified with a person's mind: as for example when a person says 'I think' or 'I feel' or 'I suppose' or 'I believe'. This leads to the position called 'idealism', which takes the view that a person's body is merely a physical instrument of the mind, and it is this mind which is a person's self, as it thinks and feels and forms ideas.
- Fourth, the self may be identified as an inner soul undergoing experiences of good and ill: as for example when a person asks 'What benefit do I achieve by doing good?' or 'What loss do I suffer from doing wrong?' or 'Where shall I be after death?' or 'Where was I before birth?' or 'Where have I gone wrong?' or 'How can I become good?' This leads to a position that may be described by the word 'religion', since religion generally takes the view that a person's actions and ideas are outward expressions of an inner soul, and it is this inner soul which is a person's self, as it experiences the consequences of its inclinations towards good or ill.
- Fifth, the self may be identified with a succession of relative points of view: as for example when a person says 'I look at it from this point of view' or 'I look at it from that point of view' or 'I understand it this way' or 'I understand it that way'. This leads to a position called 'relativism', which considers that a person's good or bad experiences depend upon the different points of view which a person takes at different moments of time; and hence, behind the apparent impression of a continuing soul which benefits from good or suffers from ill, there is only a succession of different points of view.
- Sixth, the self may be identified as consciousness, the knowing principle within each person: as for example when a person says 'I know' or 'I am conscious'. This leads to a position called 'non-dualism', which considers that different points of view are related on the basis of a continuing principle of consciousness, shared in common by different points of view.

Figure 6.1

	Materialism	*Pragmatism*	*Idealism*	*Religion*	*Relativism*	*Non-dualism*
Self	Body	Person	Mind	Soul	Points of view	Conscious-ness

It must be understood that the word 'consciousness' does not refer here to the changing appearances of consciousness in a person's mind, as different awarenesses of objects come and go at different moments of time. Instead, the word 'consciousness' is used to describe the *continuing principle* that illuminates the changing appearances of awareness in a person's mind.

In the mind's apparent awareness of an object, there seems to be a duality of subject and object. On the one hand, there is a mind that seems to know the object. And, on the other hand, there is a separate object that seems to be known. Thus, subject and object seem to be different from each other, in the apparent awareness of a person's mind.

By contrast, where consciousness is taken to be the continuing principle that illuminates appearances, there is no duality of subject and object. Each appearance is a part of consciousness; and thus, as it illuminates appearances, consciousness knows only itself, beneath all apparent divisions between the knower and the known.

In sum, different identifications of the self give rise to different philosophical positions: which may be illustrated by starting a table, as in figure 6.1.

6.2 Reality

What reality is known by self?

- Where self is identified with body, it is taken to know the material objects with which the body comes in contact. Thus, from the materialist position, reality consists of material objects.
- Where self is identified as a functioning person, it is taken to know the practical results of life and action in a world of people and objects. Thus, from the position of a pragmatist, reality consists of practical results.
- Where self is identified with mind, a person's body is no longer taken to know anything in itself. Instead, the body is taken to be an external instrument through which physical objects are known by the mind. As sense perceptions are transmitted through the body, they come into the mind as apparent ideas and are interpreted through further ideas. Strictly speaking, the mind does not know any physical object at all. Instead, it only knows ideas, from which it interprets perceptions, objects and a world. Thus, from the idealist position, reality consists basically in ideas.
- Where self is identified with an inner soul that experiences good and ill, neither body nor intellect are taken to know the underlying basis of reality. Instead, both body and intellect are taken to be external instruments through which the soul knows an ethical order of good and ill. As sense perceptions and ideas are trans-

Figure 6.2

	Materialism	*Pragmatism*	*Idealism*	*Religion*	*Relativism*	*Non-dualism*
Self	Body	Person	Mind	Soul	Points of view	Consciousness
Reality	Objects	Results	Ideas	Moral order	Appearances	Non-duality

mitted by body and intellect, they are experienced by the soul as expressions of an underlying moral order. Thus, from the position of religion, reality consists basically in a moral order that underlies all actions and ideas in the apparent world.

- Where self is identified as a succession of points of view, neither body nor intellect nor moral experience are taken to know any underlying basis of reality. Instead, body, intellect and moral experience are taken to be external instruments through which various points of view arise and give way to other points of view. As sense-perceptions, ideas and good or ill arise in body, intellect and moral experience, they form different points of view that show relative appearances of the world. Thus, from the relativist position, there are only relative appearances from different points of view, and it is meaningless to ask about the reality or unreality of any world that these appearances may seem to show.
- Where self is identified as consciousness, neither body, nor any of the senses, nor mind, nor soul, nor any point of view is taken to know anything in itself. Instead, body, senses, mind, soul and all points of view are taken to be external instruments through which the world appears before consciousness, as consciousness illuminates the changing appearances that come and go in the course of experience. Since all appearances arise in consciousness and are hence part of consciousness, it is evident that consciousness knows nothing but itself. Thus, from the non-dualist position, all reality consists in the non-duality of consciousness, where there is no division between the self that knows and the reality that is known.

In sum, different views of reality may be illustrated by adding to our table, as in figure 6.2.

6.3 Knowledge

How does self know reality?

- From a materialist position, the body knows objects through its actions towards them, including the outward actions that bring the sense organs into contact with objects and the sensory reactions of sight, sound, smell, taste and touch that result from sensual contact.
- From a pragmatist's position, a person knows results through their achievement in the world, both by achieving results for oneself and by assessing results achieved by others.

Figure 6.3

	Materialism	*Pragmatism*	*Idealism*	*Religion*	*Relativism*	*Non-dualism*
Self	Body	Person	Mind	Soul	Points of view	Conscious-ness
Reality	Objects	Results	Ideas	Moral order	Appear-ances	Non-duality
Know-ledge	Action towards objects	Achieve-ment of results	Interpr-etation of ideas	Ethical discern-ment	Underst-anding of viewpoints	Self-illumin-ation of con-ciousness

- From an idealist position, the mind knows ideas by interpreting them, both by outward interpretation so as to direct action towards objects and by reflective interpretation towards understanding.
- From a religious position, the soul knows moral order through ethical discrimination, whereby it makes good or bad choices and undergoes their consequences.
- From a relativist position, appearances are known by understanding the relative viewpoints from which they arise.
- From a non-dualist position, consciousness is known by its inherent self-illumination, which lights up all appearances in experience, no matter how these appearances may be perceived or achieved or interpreted or discriminated or understood.

In sum, different aspects of knowledge may be illustrated by adding to our ongoing table, as in figure 6.3.

6.4 Value

What value is sought and found, as reality is known by self?

- From a materialist position, the value of objects lies in their usefulness for the achievement of desired purposes.
- From a pragmatist's position, the value of results lies in the desired benefits they bring.
- From an idealist position, ideas have value as ideals to which people aspire.
- From a religious position, the moral order of the world consists in a conflict of good and ill; and value is thus determined by a predominance of good over ill.
- From a relativist position, suffering is caused by an ignorant attachment to passing appearances from limited points of view; and freedom from suffering is thus sought through values of non-attachment to passing appearances.
- From a non-dualist position, unhappiness is caused by the false sense of a separate ego, which divides itself off from the world that it knows. Thus happiness is sought through the dissolution of ego in non-dual reality, where subject and object are realized as one.

Figure 6.4

	Materialism	*Pragmatism*	*Idealism*	*Religion*	*Relativism*	*Non-dualism*
Self	Body	Person	Mind	Soul	Points of view	Conscious-ness
Reality	Objects	Results	Ideas	Moral order	Appear-ances	Non-duality
Know-ledge	Action towards objects	Achieve-ment of results	Interpr-etation of ideas	Ethical discern-ment	Underst-anding of viewpoints	Self-illumin-ation of con-ciousness
Value	Usefulness of objects	Benefit of results	Aspira-tion to ideals	Predom-inance of good	Non-attach-ment to appearances	Dissolution of ego

In sum, different aspects of value may be illustrated by adding again to our table, as in figure 6.4.

6.5 Truth

How is knowledge tested to be true or false?

- From a materialist position, knowledge is taken to be true if it correctly predicts objective consequences.
- From a pragmatist's position, knowledge is taken to be true if it effectively prescribes actions that achieve desired results.
- From an idealist position, knowledge is proved true by deducing it from accepted assumptions.

Figure 6.5

	Materialism	*Pragmatism*	*Idealism*	*Religion*	*Relativism*	*Non-dualism*
Self	Body	Person	Mind	Soul	Points of view	Conscious-ness
Reality	Objects	Results	Ideas	Moral order	Appear-ances	Non-duality
Know-ledge	Action towards objects	Achieve-ment of results	Interpr-etation of ideas	Ethical discern-ment	Underst-anding of viewpoints	Self-illumin-ation of con-ciousness
Value	Usefulness of objects	Benefit of results	Aspira-tion to ideals	Predom-inance of good	Non-attach-ment to appearances	Dissolution of ego
Truth	Prediction of object-ive cons-equences	Effective-ness of prescribed actions	Deduct-ion from accepted assump-tions	Guidance towards correct discern-ment	Co-ordin-ation of different points of view	Continuity and self-evidence

- From a religious position, knowledge is proved true if it provides correct guidance in discriminating good from ill.
- From a relativist position, knowledge is proved true by co-ordinating appearances from different points of view, thus arriving at a common understanding that takes different viewpoints into account.
- From a non-dualist position, knowledge is proved true by its continuity through changing states of experience, and by its self-evidence in all subjective or objective experiences.

In sum, different aspects of truth may be illustrated by adding to our table, as in figure 6.5.

6.6 Relative and absolute

How can truth be known impartially, beneath the partial perceptions of body and mind?

Body and mind are partial instruments of knowledge, in the sense that they give rise to partial appearances of what they perceive. For example, when my eyes perceive a flower, they give rise to an image of the flower. But this image is not the whole flower. Rather, it is a partial appearance of the flower from a particular point of view that is limited by the visual capacity of my eyes and by the physical position of my body in space. From other points of view, different appearances arise, showing that there is more to the flower than appears from any limited point of view. Similarly, when my mind perceives a flower, it gives rise to an idea of the flower; and this idea is only a partial appearance of the flower, from a point of view that is limited by the particular way in which my mind is thinking or feeling at that particular moment of time. From other points of view, it becomes evident that there is more to the flower than appears in any limited idea of it.

In order to know truth impartially, perceptions must somehow come together, from different points of view. This requires an impersonal basis of knowledge which is shared in common by different points of view, beneath the variations of time and personality. How far is it possible to find such an impersonal basis, upon which truth may be known impartially?

- From a materialist position, knowledge is based upon a material world of physical objects. Thus, impartiality is sought by observing more and more physical objects, from more and more positions in space and time, using more and more physical instruments.

  As more and more of the world is observed in this way, knowledge becomes less and less partial. But it can never be entirely impartial or entirely certain, because there is always the possibility that some future observation may disprove the predictions of material knowledge. Hence, material knowledge is always relative, in the sense that it is more or less partial and more or less uncertain.

- From a pragmatist's position, knowledge is based upon an external world of events and people. Thus, impartiality is sought by observing more and more of the world, from the viewpoints of more and more people.

  Again, knowledge can become less partial by observing more of the world, but it can never be entirely impartial or certain, because there is always the possibility that prescribed methods and actions will fail to be effective in new situations. Hence, pragmatic knowledge is also essentially relative.

- From an idealist point of view, knowledge is based upon fundamental assumptions. These fundamental assumptions are abstracted from particular perceptions, as basic ideas from which further perceptions may be interpreted. Here, impartiality is sought by progressively testing and correcting assumptions, as more and more of the physical and mental world is perceived, through the experience of more and more people.

  And here again, knowledge may become less partial by testing it against more experience; but it can never be entirely impartial or certain, because there is always the possibility that hitherto accepted assumptions will fail and will have to be revised, as experience is interpreted in the future. Hence, the intellectual knowledge of idealism is also essentially relative.

- From a religious position, knowledge is based upon ethical principles that underlie the moral order of the universe. In theistic religions like Christianity, aspiration to ethical principles is centred upon the worship of a deity; but other religions and systems of value may aspire to ethical principles by focussing upon living creatures and human beings, as for example in the atheistic religion of Jainism or in the ethics of agnostic humanism. In either case, religious and ethical knowledge seeks impartiality through aspiration to underlying principles of value in more and more of the actions, perceptions, thoughts and feelings through which the world and its moral order are experienced.

  And here again, knowledge may become less partial through continued aspiration to ethical values in the course of experience; but it cannot be entirely impartial or uncertain, because there is always the possibility that an ethical principle may turn out to have been misused or misunderstood. Hence, religious and ethical knowledge is also essentially relative.

- From a relativist position, knowledge of the world is just a progressive co-ordination of viewpoints, with no conclusive end. When different viewpoints are co-ordinated, they merely create a further viewpoint, with partialities and limitations that need to be corrected from still further points of view.

  Hence, all knowledge of the world is essentially relative, and it is meaningless to look for impartiality or certainty anywhere in the world. The only basis that all viewpoints can share in common is their relativity: that each viewpoint is incomplete in itself and must be understood in relation to other points of view.

- From a non-dualist position, all viewpoints are related by consciousness, which continues from one viewpoint to another, illuminating each relative appearance that arises from each limited point of view. Thus, all relative knowledge of the apparent world is based upon the self-illumination of consciousness, as consciousness illuminates the appearances that arise in it.

  This self-illumination is the knowledge that consciousness has of itself. It is a direct, immediate knowledge, without any intervening medium of transmission that could create distortions, in the way that our partial, uncertain bodies and minds create distortions in our knowledge of the apparent world. Hence, where all knowledge of the apparent world is relative, indirect and liable to be distorted, the self-illumination of consciousness is immediate, undistorted and absolute.

Figure 6.6

	Materialism	*Pragmatism*	*Idealism*	*Religion*	*Relativism*	*Non-dualism*
Self	Body	Person	Mind	Soul	Points of view	Conscious-ness
Reality	Objects	Results	Ideas	Moral order	Appear-ances	Non-duality
Know-ledge	Action towards objects	Achieve-ment of results	Interpr-etation of ideas	Ethical discern-ment	Underst-anding of viewpoints	Self-illumin-ation of con-ciousness
Value	Usefulness of objects	Benefit of results	Aspira-tion to ideals	Predom-inance of good	Non-attach-ment to appearances	Dissolution of ego
Truth	Prediction of object-ive cons-equences	Effective-ness of prescribed actions	Deduct-ion from accepted assump-tions	Guidance towards correct discern-ment	Co-ordin-ation of different points of view	Continuity and self-evidence
Imper-sonal basis of know-ledge	Material world of physical objects	External world of events and people	Basic assump-tion of accepted ideas	Under-lying ethical princ-iples	Relativity of the world's appear-ances	Absolute truth beneath appear-ances

Non-dualist philosophy enquires into this self-illuminating consciousness, in search of an absolute basis of undistorted truth, beneath the distortions of partial appearance.

In sum, different aspects of the impersonal basis of knowledge may be illustrated by adding finally to our table, as in figure 6.6.

Note: on some particular schools of thought

In India, the relativist position has traditionally been represented by Buddhist philosophy; and the non-dualist position has traditionally been represented by the Advaita Vedānta school of Hindu philosophy.

Buddhism describes the changing, transitory nature of the relative world, and points out that what we take to be a continuing object or a continuing personality is just a collection of changing characteristics with no real continuity or individuality at all. The Buddhist goal is thus freedom from suffering, by ceasing the ignorant attempt to cling on to the passing characteristics of personality and the passing things of the relative world.

Hinduism accepts that the apparent world is relative and transitory; but goes on to look for an unchanging reality which is shown in common by all the apparent variations and changes of the world, as this reality is differently perceived from changing points of view. In Advaita philosophy, this unchanging, absolute reality is identified as nothing but consciousness, which is each person's real self. The aim of Advaita is thus to find complete knowledge and lasting happiness, by dissolving the false sense of separate ego in the realization that self and all reality are one and the same thing.

Through the many heated debates that raged between Buddhist and Advaita scholars in classical India, the two traditions developed side by side and contributed greatly to each other; because in fact the relativist and non-dualist positions do not really contradict each other.

- On the one hand, relativism implies that everything in the world is perceived relative to some particular, changeable point of view; and this amounts to an invariant, absolute principle of relativity (which can be summed up in the somewhat paradoxical statement that nothing is absolute and invariable except for relativity itself).
- On the other hand, in the non-dualist approach, this same unfailing principle of relativity is taken to show that no object is really separate from its perception, and thus the underlying reality of each perceived object is identical with the true nature of the perceiving self. This non-dual reality cannot be described as any physical or mental object in the perceived world, nor as any physical or mental characteristic of perceiving personality. So it does not contradict the relativist position that all objects in the world and all characteristics of personality are relative, uncertain and liable to change.

Elsewhere in the world, a similar complementarity can be found between an emphasis on the changeability of the relative world and the realization of a continuing, invariant unity that underlies all difference and change.

In China, Taoism emphasized the continuity in change and sought harmony in the unity of opposites:

> There is a thing inherent and natural,
> which existed before heaven and earth.
> Motionless and fathomless,
> it stands alone and never changes;
> it pervades everywhere and never becomes exhausted.…
> I do not know its name.
> If I am forced to give it a name,
> I call it Tao, and I name it as supreme.
> Supreme means going on;
> going on means going far;
> going far means returning.

(From the *Tao te ching*, translated by Ch'u Ta-Kao, London, the Buddhist Lodge, 1937.)

Similarly, in ancient Greece, Heraclitus is reported to have said,

> You cannot step twice into the same rivers;
> for fresh waters are ever flowing in upon you.
>
> The one is made up of all things,
> and all things issue from the one.

(Fragments 41, 42 and fragment 59, from John Burnet, *Early Greek philosophy*, Black, 4th Edition, England, 1930)

And further, in ancient Greece, Parmenides said that reality 'is uncreated and indestructible, for it is complete, immovable, and without end. Nor was it ever, nor will it be; for now it is, all at once, a continuous one.' According to Parmenides, the apparent changes and variations of the world are. ultimately illusory, in the sense that 'all these things are but names which mortals have given, believing them to be true – coming into being and passing away, being and not being, change of place and alteration of bright colour.' (Again from Burnet, *Early Greek philosophy*)

In modern physics, the theory of relativity is founded upon the invariance of common principles that underlie the varying viewpoints of relative observation; and Albert Einstein was himself quite relentless in his search for a definite, invariant unity beneath the varying, uncertain phenomena of nature. So much so that he refused to accept as final the uncertainty principle of quantum mechanics (with its implication that reality is inherently indefinite and variable, within the limits of the uncertainty principle). Many physicists feel that the founder of relativity theory was backsliding towards the very absolutism that he had shown to be inadequate; but it could also be argued that Einstein was the truer and profounder relativist, who saw more clearly the meaninglessness of relativity without a firm basis in common, invariant reality.

In religious and spiritual traditions all over the world, another complementarity arises, between non-duality and spiritual devotion. A devotee seeks unity with a worshipped god or with some ultimate principle of truth; and, thus, the final purpose of spiritual worship is to realize a non-dual unity between the devotee and the ultimate principle that is approached through devotion. Of course, this realization of unity cannot take place at any physical or mental level of personal worship, where the devotee must feel that his or her personality and ego are worthless nothings in the face of what is worshipped. At any such personal level, it is quite simply blasphemy to assume a pretension of non-duality that worshipper and worshipped are one. This paradox has given rise to much mystical expression and some apparent tension between religion and philosophy. It is an old problem of head and heart, as described in the following (rather free) rendering of a Sanskrit verse from the Advaita Vedānta tradition.

Among all ways of striving to be free,
it's love that is the best, one must agree.
To question one's own truth, to ask what's there:
that is the love of those who ask with care.

Shrī Shankara: Viveka-cūḍāmaṇī, *stanza 31*

Part 3

Questions of Value

Poor soul, the centre of my sinful earth,
[Fooled by] these rebel pow'rs that thee array,
Why dost thou pine within and suffer dearth,
Painting thy outward walls so costly gay?
Why so large cost, having so short a lease,
Dost thou upon thy fading mansion spend?
Shall worms, inheritors of this excess,
Eat up thy charge? Is this thy body's end?
Then, soul, live thou upon thy servant's loss,
And let that pine to aggravate thy store;
Buy terms divine in selling hours of dross;
Within be fed, without be rich no more:
    So shalt thou feed on Death, that feeds on men,
    And Death once dead, there's no more dying then.

William Shakespeare – Sonnet 146

1. Function

O little self, within whose smallness lies
All that man was, and is, and will become,
Atom unseen that comprehends the skies
And tells the tracks by which the planets roam;
That, without moving, knows the joys of wings,
The tiger's strength, the eagle's secrecy,
And in the hovel can consort with kings,
Or clothe a God with his own mystery.
O with what darkness do we cloak thy light,
What dusty folly gather thee for food,
Thou who alone art knowledge and delight,
The heavenly bread, the beautiful, the good.
  O living self, O God, O morning star,
  Give us thy light, forgive us what we are.

John Masefield – Sonnet 44

1.1 Means

How is an object valued?

Each object is a limited part of the world, a partial piece of existence perceived by our limited bodies, senses and minds. Thus viewed, an object can only be valued for the way in which it is used, as a means toward some further end. But then, how is an object used?

First, an object may be used practically. In particular, it may be used as a piece of material for modifying and shaping into some required form: as for example iron ore may be smelted and alloyed into steel, or a lump of clay may be baked and shaped into a porcelain jug, or sound may be shaped into words, or thought articulated into the forms of ideas. Or, an object may be used as a component in the structure of some larger object: as for example columns and beams are used to hold up a building, or wheels are used to enable the movement of a car, or words are used as parts of speech, or concepts and ideas are used in the mental structures of thought. Or, an object may be used as an instrument for effecting and guiding a required process: as for example a saw is used to cut wood, or a lathe is used to machine metal, or a car is used to get from one place to another, or a person's tongue is used to speak words, or concepts and ideas are used to stimulate and direct the processes of thought.

Second, an object may be used intellectually, as a symbol or a symbolic form for representing a current state of knowledge and for thus enquiring further, towards a more accurate and less partial state of knowledge. For example, a map can be used to describe a terrain and to thus enquire further into our knowledge of the terrain (by checking the map against further perception and thought of the terrain). Or, a blue-print can be used to build a bridge and to thus lead towards a further knowledge of bridge-building and engineering. Or, rules and laws can be formulated to prescribe procedures that are to be followed for the present, thus leading towards a further knowledge upon which new rules and laws will eventually be formulated. Or, a book can be written to describe a subject and thus to ask further questions about our knowledge of the subject. Or, ideas and theories can be conceived to express a current way of thinking and thus to enquire into truer and profounder ways of thought.

Third, an object may be used emotionally, to express feeling and value. And here, to the extent that an object is identified with the value that it expresses, it may even seem to have intrinsic value, not merely as a means but as an end in itself. For example, when a mother smiles and looks pleased at something her child has done, this emotional behaviour expresses value; and an affectionate child may well take such approving looks and smiles as ends in themselves, to the extent that they are identified with the approval and affection which they express. Or, a work of art or literature expresses value, and may well seem an end in itself to someone who identifies this particular work with the feelings and values that are found expressed in it. Or, a religious conception of God expresses value, and must seem an end in itself to the devotee who identifies this particular conception with the ultimate, universal value that it expresses.

1.2 Ends

For what ends can an object be used?

An inherent problem arises here, because of the limited character of our minds. Each purpose or end that our minds conceive is what we call 'an objective'. It is itself a limited object desired by some limited mind. Each such limited object can only have a relative value. It can only be valued relative to some further purposes or ends which it serves to achieve.

For example, when iron ore is smelted and alloyed into steel, the steel produced is of value for the structural members and mechanical components and instruments that can in turn be made of it. Or when clay is shaped and baked into a porcelain jug, the jug is valued for its use in pouring liquids and for its decorative display. Or, when sound is shaped into words, the words are valued for their use in making up sentences and speech. Or, when thought is articulated into ideas, the ideas thus formed are valued for their use in asking questions and developing explanations and theories, and for guiding thought towards the solution of pressing or puzzling problems.

Or, when columns and beams are used to hold up a building, the building is valued as a home for living in, or as a place of work or entertainment, or as an aesthetic work of architecture which contributes to the beauty of the surroundings. Or, when wheels are used to enable the movement of a car, this movement is valued for the various destinations which it enables goods and passengers to reach. Or, when words are used as parts of speech, the speech so formed is used to convey meanings and to express intentions and emotions. Or, when concepts and ideas are used to form explanations and theories, these explanations and theories are used to develop technologies and predict results and to enquire further into knowledge and understanding.

Or, when a saw is used to cut wood, the pieces cut are of value for the furniture that is made up from them; and this furniture in its turn is valued for its use as chairs for sitting in, as tables for eating and working on, as cupboards and shelves for storage and display, and so on.

Or, when a car is used to travel from one place to another, the destination is valued for the work that is done there, the enjoyment that is had there, the people that are met there, or the further destinations that can be reached from there. Or, when a person's tongue is used to speak words, the words are valued for the particular meanings they convey and the particular emotions they express; and, in turn, these meaningful communications and emotional expressions are valued for the states of mind and experience to which they lead. Or, when concepts and ideas are used to stimulate and guide thought, the thoughts thus formed are valued for their application to solve practical problems and clarify theoretical understanding; and the resulting practical solutions and theoretical clarifications are in turn valued as intermediate stages towards further developments of practice and theory.

Or, when a map is used to describe a terrain, the description is valued for its use in finding one's way about the terrain, thus leading to further use and further knowledge of the terrain. Or, when a blueprint is used to build a bridge, the bridge is valued for its practical effect on road and rail communications and for the engineering experience gained in its construction and use. Or, when rules and laws are prescribed, the resulting formulation is valued for its practical effect on organized procedure and for the organizational and management experience that is thereby gained. Or, when a book is written to describe a subject and ask questions about it, this description and enquiry are valued for their use in helping a reader to learn about the subject and to think about the questions that it raises. Or, when ideas and theories are conceived so as to express a way of thinking, the expression is valued for its use in examining this way of thought and reflecting upon it, thus leading to further insights and clarifications about what is being considered.

Or, when a mother looks pleased and smiles at something her child has done, this emotional expression is valued for the training of character and the sense of value it imparts to the child. Or, when a work of art expresses value, this expression is itself valued for its effectiveness and honesty and for the resulting development and clarification that it brings about in the emotions of those who appreciate it. Or, when a sense of ultimate value is expressed by a religious conception of God, this religious conception is in turn valued for its effect upon a devotee's ethical character and upon the devotee's central sense of what life is finally for.

But, is there any final 'end in itself'? Is there any ultimate end which has an absolute value in itself, without having to depend on any further purposes or ends? Through our limited bodies, senses and minds, we perceive only those limited parts of the world that we call 'objects'. To take into account the wider world, we have to conceive that objects act upon each other, in the functioning of the world as a larger whole than any of the limited objects that we perceive in it. And, in any such picture of a 'wider world' or a 'larger whole', we have to conceive of functions and purposes or ends that do not just depend on narrow objects or separate parts, but on the wider world or the larger whole. Thus, the value of any narrow object or separate part must necessarily depend upon further purposes or ends; and no such limited object (or objective) can be sensibly considered as a final 'end in itself'.

This means that no objective investigation of the world can fully examine what objects are valued for. As body, senses and mind look out upon the objective world, questions of value can only be put off from one purpose or end to some further purpose or end, which in its turn must be valued on the basis of some yet further purpose or end; and so on indefinitely, without any conclusive end.

The only alternative is to investigate the subjective experience of knowing and feeling value and of wishing to fulfil desires.

1.3 Ego

Whose purposes and aims does a person value and seek to achieve? The answer depends on whom a person is identified to be. If a person is identified with a particular body, then it must seem that this person seeks to achieve the purposes of that particular body. If a person is identified with particular senses, this person must seem to follow the inclinations and desires of those particular senses. If a person is identified with a particular mind, then this person must seem to follow the wishes of that particular mind.

When a person identifies with a particular body, a particular set of senses and a particular mind, the resulting sense of self is called 'ego'. Since each person's body, senses and mind are limited parts of the world, with limited functions, inclinations and wishes, the sense of ego initially makes it seem that a person is bound to follow the limited purposes and aims of his or her own body, senses and mind. Thus a person's ego inherently implies a problem of attaching undue importance to body, senses and mind, in opposition to the rest of the world that is perceived through them.

How then do people manage this problem of ego, and how do they try to correct the distorted sense of egotistical importance? There are two main ways: objective and subjective.

The *objective approach* is to try taking more and more of the world into account, thus helping to realize the relative smallness and unimportance of a person's body, senses and mind. In the course of practical work, people learn that success is achieved only in the face of an existing situation and environmental conditions, which have to be taken into account in making decisions and carrying them out. In the course of objective enquiry, people learn that impartial and accurate knowledge requires an examination of different areas of experience and a reconciliation of different points of view. In the course of social and ethical life, people learn consideration for the feelings of others; and they learn to consider not only their own needs and interests as separate individuals, but also the needs and interests of family and friends, of community and society, and of nation and world as a whole. In the course of religious worship, a devotee tries to surrender all limited purposes and aims to God, whose infinite purpose and will is conceived to underlie all the functioning of the entire universe.

But again, this objective approach is unavoidably relative and can never quite reach a final end. By taking more and more of the world into account, the distortions of egotism can perhaps be reduced, but they cannot be entirely removed; because the entire world can never quite be fully taken into account: as long as it is viewed objectively, through our limited bodies, senses and minds.

In the course of practical work, people only achieve more or less partial objectives, by taking into account a lesser or greater part of the overall situation and environmental conditions of the world.

In the course of objective enquiry, people only find relatively impartial and accurate knowledge, through a relatively broad examination of differing experiences and a relatively intensive reconciliation of differing views.

In the course of social and ethical life, people can only be relatively considerate about the feelings of others; and the balancing of individual, social and global needs is a relative matter that depends upon our more or less partial perceptions of particular individuals, of various societies and cultures, and of the large-scale world as a whole.

In the course of religious worship, a devotee cannot quite surrender all limited purposes and aims, nor can God's infinite purpose and will be quite understood: so long as the devotee still views God objectively, through the limited medium of body, senses and mind.

The *subjective approach* is to examine the sense of ego, and to ask why it is that people identify themselves as bodies, senses and minds. Why does a person identify a particular body as 'I', in opposition to the rest of the world? The answer is obvious. What the ego calls 'I' is just that part of experience which seems to know the rest of the world.

In each person's experience, the particular body called 'I' is just that part of physical experience which does not seem to be merely a known object, but which seems instead to be the sentient subject that knows the rest of the physical world.

However, if a person reflects a little further, that the body is only a physical object through which sense-perceptions are carried out, then a different picture emerges. The body is no longer identified as 'I', because it is merely an objective instrument through which the senses perceive a world of sights, sounds, smells, tastes and feelings of touch. Instead of the body, it is the senses that are now identified as 'I', because it is they that seem to know the world of sensual experience.

Similarly, if a person reflects still further, that the senses are only organic faculties which transmit perceptions to the mind, then again a different picture emerges. Neither body nor senses are identified as 'I', because they are merely objective instruments through which the mind perceives a world of meaning and value. Instead of body and senses, it is the mind that is now identified as 'I', because it is the mind that seems to know experience.

In short, a person's body, senses and mind are identified as 'I' only when they are taken to know experience. It thus becomes clear that the word 'I' essentially refers to a subjective something which knows a person's experience. Though it often seems that body and senses are the knowing subjects of physical and sensual experience, a more careful examination shows that they are only objective instruments of the mind. They are only instruments through which experience seems to be known by mind; and in themselves they do not really know anything at all. There is something inherently misleading about identifying them as the knowing self which a person calls 'I'.

But then, what about the mind? Is it the knowing subject of mental experience, as it is usually taken to be? Again, as with body and senses, a more careful examination shows that the mind is an objective instrument. Or, in other words, it is an instrument that functions towards some further objective. Through its perceptions, thoughts and feelings, the mind forms a succession of changing appearances, which come and go in the course of a person's experience. These changing appearances are illuminated by consciousness. It thus turns out that the mind does not really know anything in itself, because it is only an instrument through which changing appearances of the world are known by consciousness. As with body and senses, it is inherently misleading to identify mind with the knowing self that a person calls 'I'.

And what about consciousness? Is it in turn a mere objective instrument, which functions on some further, more fundamental basis of knowledge? The answer depends on how the word 'consciousness' is used.

Very often, the word 'consciousness' is used to describe the changing perceptions, thoughts and feelings that seem to come and go in a person's mind. But this is only the *apparent* consciousness of mind. Correctly speaking, it is not consciousness at all, but only the mind's formation of appearances, which are illuminated by consciousness.

In the true sense of the word, consciousness is essentially the illuminating principle of experience. Since nothing can appear without the illumination of consciousness, it follows that consciousness must be present in all the changing and varied appearances of experience. Thus, it is the continuing principle of illumination that is shared in common by all experience, at different moments of time and in different minds.

Since no appearance has any existence apart from consciousness, it follows that all appearances are contained in consciousness. As consciousness knows appearances, it does not know anything other than its own self. All of its knowledge is only self-illumination. Thus, consciousness knows appearances by its own self-illuminating nature: by simply being itself, without any action towards anything else, without depending on anything else. In other words, consciousness is not an instrument that functions towards some further objective, nor does it depend on any further, more fundamental basis. It is the final basis of knowledge, the knowing subject that is each person's real self.

Through the false identification of ego, the self appears to be a limited personality, with a limited body, a limited set of senses, and a limited mind. Because of its limitation and partiality, this apparent self can only have a limited value, in relation to something else. In particular, a body can only have value in relation to its senses and mind; for, without sensation and meaning, a body is just dead matter. Similarly, the senses can only have value in relation to the mind; for mindless sensation is meaningless and uninteresting. And the mind can only have value in relation to consciousness; for, without the illumination of consciousness, the mind would be a lifeless, mechanical computer.

By contrast, consciousness itself cannot be limited; because it is the knowing basis upon which all limitation is perceived. Body, senses and mind depend upon consciousness for their functioning as a person's apparent self; and they derive their living value from consciousness, because it is the knowing, subjective principle of living things. But consciousness does not derive its value from anything other than itself, because there is nothing further from which its value could be derived. As each person's real self, which is unfailingly present throughout experience, it is the centre of each person's apparent existence. As the knowing principle of all experience, it has its own intrinsic value of self-illumination, where knowing and being are identical.

2. *Wish*

Consumed by pleasure unconsumed,
tried for lack of trying,
used up by time unutilized,
we that lust still, keep dying.

Bhartrihari: Shatakatrayam, *155*

2.1 Need

Why are objects desired?

From a physical point of view, an object is desired because it serves toward the fulfilment of some bodily need. For example, food is desired for nutrition, which serves the body's needs for energy and maintenance and growth. Similarly, clothing is desired for bodily warmth and protection; houses and buildings are desired for shelter and security, exercise is desired for bodily health and the development of physical capability; weapons are desired for hunting and defence and war; instruments and machines are desired for farming and manufacturing and construction and for developing and controlling the physical environment; money is desired to buy food and clothing and property and other material goods and services; work is desired to earn money and to serve the needs of individual bodies and of society as a collection of bodies; sex is desired for procreation and the physical continuation of family, community and society; and so on.

As viewed from the senses, objects are desired to serve the needs of sensual stimulation and satisfaction. For example, food is desired for its appetizing taste and smell and for the satisfaction of hunger; clothes are desired for their attractive looks and comfortable feel; exercise is desired for its sensations of exhilaration and well-being; sex is desired for arousal and relaxation; sights and sounds are desired for their attractive shapes and colours and for their pleasing harmony; smells and tastes are desired for their stimulation and satisfaction of appetite; feelings of touch are desired for excitement and comfort.

As viewed from mind, objects are desired to serve the needs of mental function and well-being. In particular, the practical mind desires objects to serve the needs of achieving prescribed goals. As for example, construction materials, equipment, labour and a supervised plan are desired to build a house. Or, as advertisements, media coverage and a campaign are required to direct public attention towards a commercial product or towards some political or social or cultural question. Or, as votes are desired to win public office, and as public office is desired to carry out apolitical program. Or, as suitable instruments and methods are desired for obtaining prescribed information and for observing prescribed phenomena. Or, as mental exercises and techniques are desired to develop prescribed capabilities of mind and to achieve prescribed states of experience.

The intellect desires objects to serve the needs of description and prescription and of interpretation and clarification. As for example, words and symbols are desired to represent objects and thus to form descriptions and prescriptions. Or, as meaningful ideas and conceptions are desired to interpret observations and representations. Or, as definite statements and explanations are desired to investigate truth and clarify understanding.

Finally, emotional mind desires objects to serve the needs of expression and enjoyment. As for example, colourful language is desired to express immediate feelings and to enjoy their spontaneity. Or, as ethical actions are desired to express moral character and to enjoy the benefits of virtue. Or, as sexual relations are desired to express attraction and to enjoy affection. Or, as a work of art is desired to express authentic emotion and to enjoy its truth and beauty.

In all these different kinds of desire, there is a common, essential characteristic that may be described by the words 'need' or 'want' or 'insufficiency'. For its physical functioning and health, a person's body depends upon other physical objects and upon the senses and mind. For sensual stimulation and satisfaction, the senses depend upon external objects in the outside world, upon the internal functioning of the body and upon thoughts and feelings in the mind. For mental functioning and well-being, the mind depends upon the world of objects that it perceives outside itself; it depends upon the body and senses through which it perceives this outside world; and it depends upon its continuing basis of consciousness, from where its changing functions and perceptions are co-ordinated and lit up.

In sum, as limited parts of the world, a person's body, senses and mind depend for their functioning and their well-being upon other parts of the world. As such, they are inherently insufficient in themselves; and they are inherently bound to need or to want objects other than themselves.

This 'wanting' of other objects is the essence of personal desire.

2.2 Change

What is the effect of insufficiency and desire?

A straightforward answer is easily found. The effect of insufficiency is change. As body, senses and mind are affected by influences from outside, and as they are driven by desire for other objects, they are caught up in processes of change.

The *life of the body* consists in processes of nutrition and growth, of replenishment and maintenance, of wastage and decay. By taking in nutrition, the fertilized ovum grows into an embryo, the embryo develops to emerge from its mother's womb as a baby, the baby grows to become a child, the child grows up and matures into a physical adult.

Through cyclical processes of recuperation and replenishment, the body repairs the wear and tear of its various parts and maintains their energy and organization as a functioning whole. As for example, hair and nails and skin and internal tissues keep growing and re-growing to compensate for the general wear of use and to mend the particular damages of special injury. Or, as the blood keeps circulating to bring nutrients for the growth and re-growth of tissue, to bring fuel and oxygen for internal combustion and muscular energy, and to bring hormones with chemical messages that help regulate and co-ordinate the internal functioning of the body. Or, as nutrients and oxygen come into the blood through the digestive and respiratory cycles. Or, as the balanced functioning and co-ordination of the body is maintained by the hormonal and nervous systems, through cyclical states of relative activity and recuperation, excitement and relaxation, waking and sleep.

Through such cyclical processes of replenishment and re-growth, the body seems to maintain a continuing identity of relatively stable characteristics. In particular, the body seems more or less to have a continuing shape and form and a continuing organization of continuing functions and capabilities. But, behind this apparent continuity, the body keeps on assimilating new matter and discarding waste, so that the body is never quite the same piece of matter from one moment to the next. And with the passage of years, the body retains less and less of the matter that it contained before, so that a very considerable part of the body becomes materially changed. And further, even the shape and form and functioning of the body must of course change and deteriorate with advancing age, until the final breakdown of bodily functioning in death.

The *life of the senses* consists in the transmission of perceptions from the external world, through body, to mind. As the body's surroundings change, and as it changes its position and condition in the world, the eyes see changing sights, the ears hear changing sounds, the nose smells changing odours, the tongue tastes changing flavours, and the sense of touch feels changing tactile sensations of heat and cold, roughness and smoothness, flatness and roundness, pressure and movement, comfort and discomfort, and so on. As the mind's attention turns from one sensation to another, a person seems to experience a stream of changing sensations, which keep appearing and disappearing during the course of experience.

The *life of mind* consists in the process of perception, thought and feeling. As sensations appear in the mind, they are interpreted by thinking that physical or mental objects have been perceived, and the mind is driven by emotional feelings of desire and intention towards the objects that it perceives, conceives and interprets. Thus, the mind functions to form a succession of changing appearances, as perceptions, thoughts and feelings come and go in the course of experience.

This mental functioning has a peculiar subtlety that distinguishes it from the functioning of a gross physical object. A gross object is made up of matter whose existence is conceived to be relatively independent of its state of motion or rest. In particular, a human body is made up of arms and legs, a trunk and a head; and these gross body parts are conceived to exist more or less independently of how they are moving about or whether they are in motion or at rest. If the body were to die, or if it were somehow frozen in a state of suspended animation, then of course its living functions would cease and in this sense it would not be alive; but its existence as a physical body would continue, until it was destroyed by some further damage or decomposition.

By contrast, the mind has no existence independent of its functioning. When the mind comes to rest, as for example in dreamless sleep, it does not remain as an unconscious body made up of gross material parts. Instead, it immediately dissolves into a state of experience where no object, nor any perception, nor any thought, nor any feeling appears. In this state of mental dissolution, mind cannot be examined; for it no longer functions to produce appearances, and no mental appearances remain to be examined.

Of course, when the state of dreamless sleep is viewed from outside, by a person in the waking state, it is often conceived that a sleeper's mind goes on functioning unconsciously in deep sleep. But such a conception implies that the word 'mind' is being used to describe some sort of sophisticated computer brain, whose functioning is a kind of calculation which can take place independently of consciousness. In the present discussion, and throughout this book, the word ‘mind’ is used in a very different way. It is used to describe the formation of appearances that are illuminated by consciousness.

In this sense, there is no mind apart from the changing appearances that come and go in a person’s experience. And these changing appearances are inherently impermanent; for they do not even continue from one moment to the next, as one appearance is replaced by another, in the succession of moments that makes up the course of mental experience.

2.3 Freedom

Can there be any freedom, from the inherent insufficiency and impermanence of body, senses and mind?

Strictly speaking, neither body, nor senses, nor mind can ever be free. Since they are limited and insufficient parts of the world, they are affected by forces and influences from outside themselves, and their actions are part of larger processes in the world that contains them. Because they are changing and impermanent, they cannot even control their own actions, without depending upon some further basis of stability and continuity.

The usual formula of ‘free will’ is a contradiction in terms. Wherever there is desire or will towards some limited objective, the limitations of this objective are in themselves a restriction of freedom. So far as a person’s motivations are known, and so far as future events are predicted, the physical, sensual and mental freedom of personality is accordingly restricted. Thus, it is only through ignorance that body, senses and mind can seem free at all.

And yet, there is a vital sense of freedom associated with personality and knowledge. People do seek freedom, and they do seek knowledge in order to increase their freedom. In fact, it is freedom and knowledge that distinguish a living person from a piece of dead matter; and from this point of view it may be taken that freedom and knowledge are the very essence of life.

The body seeks freedom by developing its capabilities and its environment, so as to achieve a degree of self-sufficiency and security in providing for its physical needs. However, this achievement depends upon technological control, over the body’s own capabilities and over its physical environment. In turn, this technological control depends upon perception and knowledge. But here, a problem arises.

The body is not only a part of the physical world, it is also the instrument through which each person perceives the physical world. Whenever the physical world is perceived, some assumptions about the body have to be taken for granted in order to make the perception; and this perception is liable to doubt and distortion, because of the unexamined assumptions that are involved. At some later stage, these assumptions may be examined and corrected; but such a later examination must itself depend upon a perception of the world that was based upon the original, unexamined assumptions about the perceiving body; and so, any corrections that are made must themselves remain finally open to doubt and distortion.

In short, there is an inevitably circular problem of knowing the body through the body, and a fundamental ignorance must always cloud our knowledge of the body as a physical instrument. In particular, the motivating forces of bodily action can never quite be fully known; and future events can never be fully predicted, in a world that is perceived through such an uncertain instrument. It is this inevitable ignorance which creates the appearance that our bodies can somehow be free.

But, if the body's appearance of freedom is thus created by ignorance, then surely it must be concluded that this appearance is not quite accurate. The freedom attributed to the body must more accurately be attributed to something else, which gives the body its apparent life and freedom. What could be this something else, which makes the body seem alive and free?

Most obviously, this something else must be the senses, for it is the senses which distinguish the sentient purposes of a living body from the insensible movement of a lifeless object.

The senses seek freedom through pleasure and comfort; for these are states of relative self-sufficiency, in which the senses are relatively little driven (by dissatisfaction and discomfort) towards missing objects. However, in order to achieve enjoyable states of pleasure and comfort, the senses have to guide the body towards anticipated objects of enjoyment, whose pleasure and comfort is somehow sensed in advance. Again, as in the case of bodily achievement, the achievement of sensual enjoyment depends upon control and knowledge; and a similar problem arises.

Like the body, the senses are instruments of knowledge which have an inevitably circular problem of knowing themselves through themselves; and a basic ignorance must always cloud our knowledge of the senses as instruments of sensation. Again, this ignorance creates an inaccurate impression that the senses are somehow free; where in fact the freedom attributed to the senses must come from something else, which gives the senses their apparent freedom and life. In the case of the senses, this something else is most obviously the mind; for it is through mind that sensation comes alive as meaningful perception, thus enabling interpretation, motivation and choice.

The mind seeks freedom through the achievement of desired objects; for, as long as the mind is driven by desire for some object that is yet to be achieved, it clearly cannot be self-sufficient or free. Again, as in the case of bodily and sensual achievement, the achievement of the mind's desires depends upon control and knowledge; and once again, a similar problem arises.

Like body and senses, the mind is an instrument of knowledge which has an inevitably circular problem of knowing itself through itself; and a basic ignorance must always cloud our knowledge of mind as an instrument of mental appearance. Once again, this ignorance creates the inaccurate appearance that the mind is somehow free; where in fact the freedom attributed to the mind must come from something else, which gives the mind its apparent freedom and life.

In the case of the mind, this something else must be consciousness; for it is consciousness that distinguishes the living perceptions, thoughts and feelings of mind from the lifeless calculations of a computer-brain. It is consciousness which illuminates changing appearances and enables them to be understood in relation to each other, thus bringing them to the life and freedom of continuing knowledge.

Unlike body, senses and mind, consciousness is not an instrument through which some outer world of physical, sensual or mental objects is known by an inner self. Instead of being a mere instrument or medium of knowledge, consciousness is knowledge itself. It is the self-illuminating principle which continues through all experience, lighting up all changing appearances of physical, sensual and mental objects.

Because its knowledge is nothing else but its own self-illuminating nature, consciousness only knows itself. It is thus entirely self-sufficient, as the sole reality of everything it seems to know. Because it is the sole reality of all appearances, it remains unchanged through all the changing appearances of experience. Thus, unaffected by any apparent change, it is untroubled and permanent; and it does not die. Being self-sufficient, unaffected and deathless, it is truly free and alive.

3. *Happiness*

So they lov'd, as love in twain
Had the essence but in one;
Two distincts, division none:
Number there in love was slain.

William Shakespeare: The phoenix and the turtle

3.1 Suffering

What is the state of suffering, which living creatures seek to avoid?

Viewed from the body, suffering consists in bodily harm and malfunction, caused by unfavourable events. and conditions in the physical world. For example, when struck by falling rooks, the body suffers bruises and cuts and perhaps torn ligaments and broken bones. Or, when water and food supplies run short, the body suffers dehydration and malnutrition. Or, when the body works too long and too hard, it suffers exhaustion and weakness. Or, when disease attacks and old age sets in, the body suffers ill health and degeneration.

Viewed from the senses, suffering consists in the unpleasantness and discomfort of undesirable sensations. For example, when a person comes suddenly out of a dark room into the full light of day, the sense of vision suffers from the unpleasantness and discomfort of excessive brightness. Or, when a musician plays a wrong note, the sense of hearing suffers the unpleasantness and discomfort of discordant sound. Or, when the wind blows from the direction of a nearby garbage dump, the sense of smell suffers the unpleasantness and discomfort of putrefying odour. Or, when too much mustard has been added to a sandwich, the sense of taste suffers the unpleasantness and discomfort of overly sharp bitterness. Or, when a person's skin is abraded by a fall on rough ground, the sense of touch suffers the unpleasantness and discomfort of searing pain.

Viewed from the mind, suffering consists in frustrated desire for intended objects and in negative emotions towards perceived objects. For example, when a student feels disappointed at failing an examination, the mind suffers frustrated desire for the academic qualification and career opportunities that taking the examination was intended to achieve. Or, when a tactless remark is found offensive, the mind suffers negative emotions of humiliation and outrage towards the perceived offence. Or, when a person apprehends that something terrible may happen, the mind suffers negative emotions of anxiety and fear towards the perceived danger. Or, when a dear friend or family member is killed in an accident, the mind suffers pain and grief at the tragic loss.

These different kinds of suffering have one thing in common. They are all states of disharmony, where a separate ego is at odds with the experience that it knows. When ego identifies with body, it suffers bodily injuries and malfunctions, which are its states of disharmony with physical experience. Where ego is identified with the senses, it suffers unpleasantnesses and discomforts, which are its states of disharmony with sensual experience. Where ego is identified with the mind, it suffers frustrations and negative emotions, which are its states of disharmony with mental experience.

In short, suffering is essentially a state of duality, where ego seems discordant and disunited with what it knows.

3.2 Enjoyment

What is the state of enjoyment, which living creatures seek to attain?

As the opposite of suffering, enjoyment is evidently a state of non-duality, where a person is at one with the happenings that take place in experience. The word 'happy' is derived from the root 'hap'; and it thus describes a person who is at one with 'hap' or, to use more modern language, it describes a person who is at one with what happens. Accordingly, the word 'happiness' describes the non-dual unity that is experienced in the state of enjoyment. But then, how is happiness experienced, and where does it come from?

Viewed from the body, happiness is experienced by enjoying the possession of physical benefits, like a nice house, or wholesome food and fine clothing, or sound health and sturdy capabilities. However, such physical possessions are enjoyed only at some times, and not at others. At times, people get bored of being at home and want to go out; at times, they feel full and stop enjoying their food; at times, they lose interest in the clothes they own and their attention turns elsewhere; and at times, they stop taking pleasure in their physical health and capabilities. The problem is that all physical possessions are experienced and enjoyed through the senses; and what the senses enjoy on one occasion, they may not enjoy on another. Thus it becomes clear that happiness does not come merely from physical possession; because physical enjoyment itself depends on the senses.

Viewed from the senses, happiness is experienced by enjoying the consummation of sensual pleasure: as for example in viewing a spectacular landscape, or in hearing music, or in the delicate scent of fresh flowers, or in tasting culinary delights, or in the pleasing sensations of successful sex. But again, as with physical possessions, a pleasurable sensation is sometimes enjoyed, and sometimes not. There are times when a spectacular landscape is taken for granted; or when music seems merely noisy or fades into the background; or when the scent of flowers is hardly noticed; or when delicious food tastes flat and dull; or when sexual sensations seem meaningless and gross. The trouble is that all sensations are experienced and enjoyed through meaning and emotion, which are functions of the mind; and what mind enjoys on one occasion, it may not enjoy on another. Thus, it becomes clear that happiness does not come merely from sensual pleasure, because sensual enjoyment depends on the mind.

Viewed from mind, happiness is experienced by enjoying the fulfilment of desire: as for example in landing a good job, or in finding an answer to a puzzling question, or in meeting a friend whom one has missed. When an object is desired, the mind is restless and dissatisfied, in a state of duality where a person misses or longs for something that is yet to be achieved. When a desired object is attained, the mind comes to rest and dissolves, in a state of non-duality in which happiness is temporarily experienced.

From where does this happiness come? It cannot be inherent in the desired object, because the enjoyment of attaining the object soon passes, and the mind goes on to seek happiness in the attainment of other objects. For example, when a good job has been landed, a person enjoys the achievement and celebrates for a while, but must soon go on to seek further achievements that the job itself demands. Or, when an answer has been found to a particular question, a person may be satisfied for a while, but then soon goes on to other matters or to further questions that the answer has raised. Or, when friends meet after a long time, at first they just enjoy meeting up again, and then they go on to talk of other interests and turn attention to other enjoyments.

Nor can happiness come solely from the mind, because the mind is quite evidently not happy in itself. The functioning of mind is motivated by desire for missing or lacking objects, which shows that the mind is inherently dissatisfied with itself. In fact, happiness is experienced precisely when the fulfilment of desire has brought the mind to rest, thus dissolving it in non-dual consciousness. Viewed in this way, happiness turns out to be the true non-duality of consciousness, which shines out temporarily through the fulfilment of desire.

Accordingly, enjoyment is a temporary state that manifests the changeless nature of consciousness, as self-illuminating peace and unconditioned happiness.

3.3 Love

Can lasting happiness be attained, beyond the alternation of suffering and enjoyment?

As long as a person identifies with body, senses and mind, the limited ego is bound to be driven by its own incompleteness to desire missing objects, and thus to alternate between the dissatisfaction and fulfilment of desire. Accordingly, as long as a person has an ego, dissatisfaction and suffering must alternate with the enjoyment of fulfilled desire; and happiness must seem temporary. Lasting happiness can only be attained by sacrificing ego or, in other words, by giving up identification with body, senses and mind.

This sacrifice of ego is achieved through the emotion called ‘love’. When a person is said to ‘like’ something, the word ‘like’ implies merely a general attraction. When a person is said to ‘love’ something, the word ‘love’ implies an extreme form of liking or attraction, where there is a willingness to make sacrifices for the sake of what is loved.

There are of course different degrees of love. When something is loved as a mere object, to be used for the benefit of perceiving body, senses or mind, then this kind of love may be called ‘lust’ or ‘infatuation’. It implies a willingness to sacrifice other objects of the perceiving ego, but not to sacrifice the ego itself.

Where other people are loved, not as mere objects, but as other perceiving egos, then this kind of love may be called ‘fondness’ or ‘affection’. It implies that a person is partially willing to sacrifice ego and its desires, by taking into account the egos and wishes of other persons, for reasons of mutual benefit.

Where enjoyable sensations are loved, as expressions of pleasure and comfort, then this kind of love may be described as ‘sensual’ or ‘epicurean’. It indicates a willingness to give up identification with the gross body, but not with the senses.

Where useful actions and achievements are loved, as expressions of effective purpose, then this kind of love may be described as ‘practical’ or ‘purposeful’. It demonstrates a willingness to give up identification with body and senses, but not with will and practical mind.

Where ideas and discussions are loved, as expressions of thought and reason, then this kind of love may be described as ‘idealistic’ or ‘intellectual’. It displays a willingness to sacrifice identification with body, senses and practical mind, but not with intellect.

Where emotions and qualities and faithfully accepted beliefs are loved, as expressions of feeling and value, then this kind of love may be described as 'aesthetic' or 'ethical' or 'religious'. It shows a willingness to sacrifice identification with body, senses, practical mind and intellect, but not with emotional mind.

Where fairness and balance and harmony are loved, as expressions of detached understanding, then this kind of love may be described as 'dispassionate' or 'universal'. It manifests a willingness to give up identification with body, senses, practical mind, intellect and emotional mind, but not with understanding.

To realize complete unity with what is loved, all trace of separate ego must dissolve. In other words, there must remain no trace of identification with any part of body, senses or mind. Through such a complete realization of non-duality, it turns out that what is really loved is the true nature of self: which different people share in common, and where knower and known are one. As love thus reaches completion, it may be described as 'spiritual' or 'objectless' or 'unconditioned'.

In a story from the *Brihadāranyaka Upanishad*, when Yājnyavalkya is asked for knowledge of immortality, he says (in a free rendering of the Sanskrit original):

What does a wife love in her husband?
Is it just that he's a husband?
If it's that, it isn't love.
All she can love in him is self.

And when a husband loves his wife,
is it love if she's just a wife?
All he can love in her is self.

So also love of children, friends,
living creatures, places, objects,
love of power, love of knowledge.
All that's loved is only self. *from 4.5.6*

And a little later, to explain what is meant by 'self', Yājnyavalkya finally says:

Duality seems to arise
where it appears that something sees
or hears or smells or tastes or touches
something else besides itself;

or where it seems that something
speaks about or thinks about or knows
some object other than itself.

But when all things are realized
as nothing else but self alone,
by whom can what be seen? By whom
can what be heard, smelled, tasted, touched,
described, conceived, desired and known?

By whom is knowledge truly known?

The knowing self cannot be any
kind of object in the world.

Not this, nor that, nor here, nor there
in space or time, it never can
be anything perceived through any
faculty of any body
or of any sense or mind.

It is unowned, can't be possessed;
it does not die, does not decay,
is unattached, cannot be bound
or limited or qualified;
nor can it ever suffer harm
or be disturbed in any way.

Thus, deathlessness may be attained
by asking, till no lies remain:

'How can the self that knows be known?' *from 4.5.15*