cessive durations in which the primate is realised are contiguous; it follows that the life history of the primate can be exhibited as being the continuous development of occurrences in the electromagnetic field. But these occurrences enter into realisation as whole atomic blocks, occupying definite periods of time.

There is no need to conceive that time is atomic in the sense that all patterns must be realised in the same successive durations. In the first place, even if the periods were the same in the case of two primates, the durations of realisation may not be the same. In other words, the two primates may be out of phase. Also if the periods are different, the atomism of any one duration of one primate is necessarily subdivided by the boundary moments of durations of the other primate.

The laws of the locomotion of primates express under what conditions any primate will change its space-time system.

It is unnecessary to pursue this conception further. The justification of the concept of vibratory existence must be purely experimental. The point illustrated by this example is that the cosmological outlook, which is here adopted, is perfectly consistent with the demands for discontinuity which have been urged from the side of physics. Also if this concept of temporalisation as a successive realisation of epochal durations be adopted, the difficulty of Zeno is evaded. The particular form, which has been given here to this concept, is purely for that purpose of illustration and must necessarily require recasting before it can be adapted to the results of experimental physics.

CHAPTER IX

SCIENCE AND PHILOSOPHY

IN THE PRESENT LECTURE, it is my object to consider some reactions of science upon the stream of philosophic thought during the modern centuries with which we are concerned. I shall make no attempt to compress a history of modern philosophy within the limits of one lecture. We shall merely consider some contacts between science and philosophy, in so far as they lie within the scheme of thought which it is the purpose of these

lectures to develop. For this reason the whole of the great German idealistic movement will be ignored, as being out of effective touch with its contemporary science so far as reciprocal modification of concepts is concerned. Kant, from whom this movement took its rise, was saturated with Newtonian physics, and with the ideas of the great French physicists—such as Clairaut,[1] for instance—who developed the Newtonian ideas. But the philosophers who developed the Kantian school of thought, or who transformed it into Hegelianism, either lacked Kant's background of scientific knowledge, or lacked his potentiality of becoming a great physicist if philosophy had not absorbed his main energies.

The origin of modern philosophy is analogous to that of science, and is contemporaneous. The general trend of its development was settled in the seventeenth century, partly at the hands of the same men who established the scientific principles. This settlement of purpose followed upon a transitional period dating from the fifteenth century. There was in fact a general movement of European mentality, which carried along with its stream, religion, science and philosophy. It may shortly be characterised as being the direct recurrence to the original sources of Greek inspiration on the part of men whose spiritual shape had been derived from inheritance from the Middle Ages. There was therefore no revival of Greek mentality. Epochs do not rise from the dead. The principles of aesthetics and of reason, which animated the Greek civilisation, were reclothed in a modern mentality. Between the two there lay other religions, other systems of law, other anarchies, and other racial inheritances, dividing the living from the dead.

Philosophy is peculiarly sensitive to such differences. For, whereas you can make a replica of an ancient statue, there is no possible replica of an ancient state of mind.

[1] *Cf.* the curious evidence of Kant's scientific reading in the *Critique of Pure Reason, Transcendal Analytic, Second Analogy of Experience,* where he refers to the phenomenon of capillary action. This is an unnecessarily complex illustration; a book resting on a table would have equally well sufficed. But the subject had just been adequately treated for the first time by Clairaut in an appendix to his *Figure of the Earth.* Kant evidently had read this appendix, and his mind was full of it.

There can be no nearer approximation than that which a masquerade bears to real life. There may be understanding of the past, but there is a difference between the modern and the ancient reactions to the same stimuli.

In the particular case of philosophy, the distinction in tonality lies on the surface. Modern philosophy is tinged with subjectivism, as against the objective attitude of the ancients. The same change is to be seen in religion. In the early history of the Christian Church, the theological interest centred in discussions on the nature of God, the meaning of the Incarnation, and apocalyptic forecasts of the ultimate fate of the world. At the Reformation, the Church was torn asunder by dissension as to the individual experiences of believers in respect to justification. The individual subject of experience had been substituted for the total drama of all reality. Luther asked, 'How am I justified?'; modern philosophers have asked, 'How do I have knowledge?' The emphasis lies upon the subject of experience. This change of standpoint is the work of Christianity in its pastoral aspect of shepherding the company of believers. For century after century it insisted upon the infinite worth of the individual human soul. Accordingly, to the instinctive egotism of physical desires, it has superadded an instinctive feeling of justification for an egotism of intellectual outlook. Every human being is the natural guardian of his own importance. Without a doubt, this modern direction of attention emphasises truths of the highest value. For example, in the field of practical life, it has abolished slavery, and has impressed upon the popular imagination the primary rights of mankind.

Descartes, in his *Discourse on Method,* and in his *Meditations,* discloses with great clearness the general conceptions which have since influenced modern philosophy. There is a subject receiving experience: in the *Discourse* this subject is always mentioned in the first person, that is to say, as being Descartes himself. Descartes starts with himself as being a mentality, which in virtue of its consciousness of its own inherent presentations of sense and of thought, is thereby conscious of its own existence as a unit entity. The subsequent history

of philosophy revolves round the Cartesian formulation of the primary datum. The ancient world takes its stand upon the drama of the Universe, the modern world upon the inward drama of the Soul. Descartes, in his *Meditations,* expressly grounds the existence of this inward drama upon the possibility of error. There may be no correspondence with objective fact, and thus there must be a soul with activities whose reality is purely derivative from itself. For example, here is a quotation[1] from *Meditation II:* 'But it will be said that these presentations are false, and that I am dreaming. Let it be so. At all events it is certain that I seem to see light, hear a noise, and feel heat; this cannot be false, and this is what in me is properly called perceiving (*sentire*), which is nothing else than thinking. From this I begin to know what I am with somewhat greater clearness and distinctness than heretofore.' Again in *Meditation III:* '. . . ; for, as I before remarked, although the things which I perceive or imagine are perhaps nothing at all apart from me, I am nevertheless assured that those modes of consciousness which I call perceptions and imaginations, in as far only as they are modes of consciousness, exist in me.'

The objectivism of the medieval and the ancient worlds passed over into science. Nature is there conceived as for itself, with its own mutual reactions. Under the recent influence of relativity, there has been a tendency towards subjectivist formulations. But, apart from this recent exception, nature, in scientific thought, has had its laws formulated without any reference to dependence on individual observers. There is, however, this difference between the older and the later attitudes towards science. The anti-rationalism of the moderns has checked any attempt to harmonise the ultimate concepts of science with ideas drawn from a more concrete survey of the whole of reality. The material, the space, the time, the various laws concerning the transition of material configurations, are taken as ultimate stubborn facts, not to be tampered with.

The effect of this antagonism to philosophy has been equally unfortunate both for philosophy and for science. In this lecture we are concerned with philosophy.

[1] Quoted from Veitch's translation.

Philosophers are rationalists. They are seeking to go behind stubborn and irreducible facts: they wish to explain in the light of universal principles the mutual reference between the various details entering into the flux of things. Also, they seek such principles as will eliminate mere arbitrariness; so that, whatever portion of fact is assumed or given, the existence of the remainder of things shall satisfy some demand of rationality. They demand meaning. In the words of Henry Sidgwick[1]—'It is the primary aim of philosophy to unify completely, bring into clear coherence, all departments of rational thought, and this aim cannot be realised by any philosophy that leaves out of its view the important body of judgments and reasonings which form the subject matter of ethics.' Accordingly, the bias towards history on the part of the physical and social sciences with their refusal to rationalise below some ultimate mechanism, has pushed philosophy out of the effective currents of modern life. It has lost its proper rôle as a constant critic of partial formulations. It has retreated into the subjectivist sphere of mind, by reason of its expulsion by science from the objectivist sphere of matter. Thus the evolution of thought in the seventeenth century coöperated with the enhanced sense of individual personality derived from the Middle Ages. We see Descartes taking his stand upon his own ultimate mind, which his philosophy assures him of; and asking about its relations to the ultimate matter—exemplified, in the second *Meditation,* by the human body and a lump of wax—which his science assumes. There is Aaron's rod, and the magicians' serpents; and the only question for philosophy is, which swallows which; or whether, as Descartes thought, they lived happily together. In this stream of thought are to be found Locke, Berkeley, Hume, Kant. Two great names lie outside this list, Spinoza and Leibniz. But there is a certain isolation of both of them in respect to their philosophical influence so far as science is concerned; as though they had strayed to extremes which lie outside the boundaries of safe philosophy, Spinoza by retaining older ways of thought, and Leibniz by the novelty of his monads.

The history of philosophy runs curiously parallel to

[1] *Cf. Henry Sidgwick: A Memoir,* Appendix I.

that of science. In the case of both, the seventeenth century set the stage for its two successors. But with the twentieth century a new act commences. It is an exaggeration to attribute a general change in a climate of thought to any one piece of writing, or to any one author. No doubt Descartes only expressed definitely and in decisive form what was already in the air of his period. Analogously, in attributing to William James the inauguration of a new stage in philosophy, we should be neglecting other influences of his time. But, admitting this, there still remains a certain fitness in contrasting his essay, *Does Consciousness Exist,* published in 1904, with Descartes' *Discourse on Method,* published in 1637. James clears the stage of the old paraphernalia; or rather he entirely alters its lighting. Take for example these two sentences from his essay: 'To deny plumply that "consciousness" exists seems so absurd on the face of it—for undeniably "thoughts" do exist—that I fear some readers will follow me no farther. Let me then immediately explain that I mean only to deny that the word stands for an entity, but to insist most emphatically that it does stand for a function.'

The scientific materialism and the Cartesian Ego were both challenged at the same moment, one by science and the other by philosophy, as represented by William James with his psychological antecedents; and the double challenge marks the end of a period which lasted for about two hundred and fifty years. Of course, 'matter' and 'consciousness' both express something so evident in ordinary experience that any philosophy must provide some things which answer to their respective meanings. But the point is that, in respect to both of them, the seventeenth century settlement was infected with a presupposition which is now challenged. James denied that consciousness is an entity, but admits that it is a function. The discrimination between an entity and a function is therefore vital to the understanding of the challenge which James is advancing against the older modes of thought. In the essay in question, the character which James assigns to consciousness is fully discussed. But he does not unambiguously explain what he means by the notion of an entity, which he refuses to apply to consciousness. In

the sentence which immediately follows the one which I have already quoted, he says:

'There is, I mean, no aboriginal stuff or quality of being, contrasted with that of which material objects are made, out of which our thoughts of them are made; but there is a function in experience which thoughts perform, and for the performance of which this quality of being is invoked. That function is *knowing*. "Consciousness" is supposed necessary to explain the fact that things not only are, but get reported, are known.'

Thus James is denying that consciousness is a 'stuff.'

The term 'entity,' or even that of 'stuff,' does not fully tell its own tale. The notion of 'entity' is so general that it may be taken to mean anything that can be thought about. You cannot think of mere nothing; and the something which is an object of thought may be called an entity. In this sense, a function is an entity. Obviously, this is not what James had in his mind.

In agreement with the organic theory of nature which I have been tentatively putting forward in these lectures, I shall for my own purposes construe James as denying exactly what Descartes asserts in his *Discourse* and his *Meditations*. Descartes discriminates two species of entities, *matter* and *soul*. The essence of matter is spatial extension; the essence of soul is its cogitation, in the full sense which Descartes assigns to the word *cogitare*. For example, in Section Fifty-three of Part I of his *Principles of Philosophy*, he enunciates: 'That of every substance there is one principal attribute, as thinking of the mind, extension of the body.' In the earlier, Fifty-first Section, Descartes states: 'By substance we can conceive nothing else than a thing which exists in such a way as to stand in need of nothing beyond itself in order to its existence.' Furthermore, later on, Descartes says: 'For example, because any substance which ceases to endure ceases also to exist, duration is not distinct from substance except in thought; . . .' Thus we conclude that, for Descartes, minds and bodies exist in such a way as to stand in need of nothing beyond themselves individually (God only excepted, as being the foundation of all things); that both minds and bodies endure, because without endurance they would cease to exist; that spatial extension is the essential at-

tribute of bodies; and that cogitation is the essential attribute of minds.

It is difficult to praise too highly the genius exhibited by Descartes in the complete sections of his *Principles* which deal with these questions. It is worthy of the century in which he writes, and of the clearness of the French intellect. Descartes in his distinction between time and duration, and in his way of grounding time upon motion, and in his close relation between matter and extension, anticipates, as far as it was possible at his epoch, modern notions suggested by the doctrine of relativity, or by some aspects of Bergson's doctrine of the generation of things. But the fundamental principles are so set out as to presuppose independently existing substances with simple location in the community of temporal durations, and in the case of bodies, with simple location in the community of spatial extensions. Those principles lead straight to the theory of a materialistic, mechanistic nature, surveyed by cogitating minds. After the close of the seventeenth century, science took charge of the materialistic nature, and philosophy took charge of the cogitating minds. Some schools of philosophy admitted an ultimate dualism; and the various idealistic schools claimed that nature was merely the chief example of the cogitations of minds. But all schools admitted the Cartesian analysis of the ultimate elements of nature. I am excluding Spinoza and Leibniz from these statements as to the main stream of modern philosophy, as derivative from Descartes; though of course they were influenced by him, and in their turn influenced philosophers. I am thinking mainly of the effective contacts between science and philosophy.

This division of territory between science and philosophy was not a simple business; and in fact it illustrated the weakness of the whole cut-and-dried presupposition upon which it rested. We are aware of nature as an interplay of bodies, colours, sounds, scents, tastes, touches and other various bodily feelings, displayed as in space, in patterns of mutual separation by intervening volumes, and of individual shape. Also the whole is a flux, changing with the lapse of time. This systematic totality is disclosed to us as one complex of things. But the seventeenth century dualism cuts straight across it. The ob-

jective world of science was confined to mere spatial material with simple location in space and time, and subjected to definite rules as to its locomotion. The subjective world of philosophy annexed the colours, sounds, scents, tastes, touches, bodily feelings, as forming the subjective content of the cogitations of the individual minds. Both worlds shared in the general flux; but time, as measured, is assigned by Descartes to the cogitations of the observer's mind. There is obviously one fatal weakness to this scheme. The cogitations of mind exhibit themselves as holding up entities, such as colours for instance, before the mind as the termini of contemplation. But in this theory these colours are, after all, merely the furniture of the mind. Accordingly, the mind seems to be confined to its own private world of cogitations. The subject-object conformation of experience in its entirety lies within the mind as one of its private passions. This conclusion from the Cartesian data is the starting point from which Berkeley, Hume, and Kant developed their respective systems. And, antecedently to them, it was the point upon which Locke concentrated as being the vital question. Thus the question as to how any knowledge is obtained of the truly objective world of science becomes a problem of the first magnitude. Descartes states that the objective body is perceived by the intellect. He says *(Meditation II):* 'I must, therefore, admit that I cannot even comprehend by imagination what the piece of wax is, and that it is the mind alone which perceives it. I speak of one piece in particular; for, as to wax in general, this is still more evident. But what is the piece of wax that can be perceived only by the mind? . . . The perception of it is neither an act of sight, of touch, nor of imagination, and never was either of these, though it might formerly seem so, but is simply an *intuition* (*inspectio*) of the mind, . . .' It must be noted that the Latin word 'inspectio' is associated in its classical use with the notion of theory as opposed to practice.

The two great preoccupations of modern philosophy now lie clearly before us. The study of mind divides into psychology, or the study of mental functionings as considered in themselves and in their mutual relations, and into epistemology, or the theory of the knowledge of

a common objective world. In other words, there is the study of the cogitations, *qua* passions of the mind, and their study *qua* leading to an inspection (*intuition*) of an objective world. This is a very uneasy division, giving rise to a host of perplexities whose consideration has occupied the intervening centuries.

As long as men thought in terms of physical notions for the objective world and of mentality for the subjective world, the setting out of the problem, as achieved by Descartes, sufficed as a starting point. But the balance has been upset by the rise of physiology. In the seventeenth century men passed from the study of physics to the study of philosophy. Towards the end of the nineteenth century, notably in Germany, men passed from the study of physiology to the study of psychology. The change in tone has been decisive. Of course, in the earlier period the intervention of the human body was fully considered, for example, by Descartes in Part V of the *Discourse on Method*. But the physiological instinct had not been developed. In considering the human body, Descartes thought with the outfit of a physicist; whereas the modern psychologists are clothed with the mentalities of medical physiologists. The career of William James is an example of this change in standpoint. He also possessed the clear, incisive genius which could state in a flash the exact point at issue.

The reason why I have put Descartes and James in close juxtaposition is now evident. Neither philosopher finished an epoch by a final solution of a problem. Their great merit is of the opposite sort. They each of them open an epoch by their clear formulation of terms in which thought could profitably express itself at particular stages of knowledge, one for the seventeenth century, the other for the twentieth century. In this respect, they are both to be contrasted with St. Thomas Aquinas, who expressed the culmination of Aristotelian scholasticism.

In many ways neither Descartes nor James were the most characteristic philosophers of their respective epochs. I should be disposed to ascribe these positions to Locke and to Bergson respectively, at least so far as concerns their relations to the science of their times. Locke developed the lines of thought which kept philoso-

phy on the move; for example he emphasised the appeal to psychology. He initiated the age of epoch-making enquiries into urgent problems of limited scope. Undoubtedly, in so doing, he infected philosophy with something of the antirationalism of science. But the very groundwork of a fruitful methodology is to start from those clear postulates which must be held to be ultimate so far as concerns the occasion in question. The criticism of such methodological postulates is thus reserved for another opportunity. Locke discovered that the philosophical situation bequeathed by Descartes involved the problems of epistemology and psychology.

Bergson introduced into philosophy the organic conceptions of physiological science. He has most completely moved away from the static materialism of the seventeenth century. His protest against spatialisation is a protest against taking the Newtonian conception of nature as being anything except a high abstraction. His so-called anti-intellectualism should be construed in this sense. In some respects he recurs to Descartes; but the recurrence is accompanied with an instinctive grasp of modern biology.

There is another reason for associating Locke and Bergson. The germ of an organic theory of nature is to be found in Locke. His most recent expositor, Professor Gibson,[1] states that Locke's way of conceiving the identity of self-consciousness 'like that of a living organism, involves a genuine transcending of the mechanical view of nature and of mind, embodied in the composition theory.' But it is to be noticed that in the first place Locke wavers in his grasp of this position; and in the second place, what is more important still, he only applies his idea to self-consciousness. The physiological attitude has not yet established itself. The effect of physiology was to put mind back into nature. The neurologist traces first the effect of stimuli along the bodily nerves, then integration at nerve centres, and finally the rise of a projective reference beyond the body with a resulting motor efficacy in renewed nervous excitement. In biochemistry, the delicate adjustment of the chemical composition of the parts to the preservation of the whole organism is detected. Thus the mental

[1] *Cf.* his book, *Locke's Theory of Knowledge and its Historical Relations,* Camb. Univ. Press, 1917.

cognition is seen as the reflective experience of a totality, reporting for itself what it is in itself as one unit of occurrence. This unit is the integration of the sum of its partial happenings, but it is not their numerical aggregate. It has its own unity as an event. This total unity, considered as an entity for its own sake, is the prehension into unity of the patterned aspects of the universe of events. Its knowledge of itself arises from its own relevance to the things of which it prehends the aspects. It knows the world as a system of mutual relevance, and thus sees itself as mirrored in other things. These other things include more especially the various parts of its own body.

It is important to discriminate the bodily pattern, which endures, from the bodily event, which is pervaded by the enduring pattern, and from the parts of the bodily event. The parts of the bodily event are themselves pervaded by their own enduring patterns, which form elements in the bodily pattern. The parts of the body are really portions of the environment of the total bodily event, but so related that their mutual aspects, each in the other, are peculiarly effective in modifying the pattern of either. This arises from the intimate character of the relation of whole to part. Thus the body is a portion of the environment for the part, and the part is a portion of the environment for the body; only they are peculiarly sensitive, each to modifications of the other. This sensitiveness is so arranged that the part adjusts itself to preserve the stability of the pattern of the body. It is a particular example of the favourable environment shielding the organism. The relation of part to whole has the special reciprocity associated with the notion of organism, in which the part is for the whole; but this relation reigns throughout nature and does not start with the special case of the higher organisms.

Further, viewing the question as a matter of chemistry, there is no need to construe the actions of each molecule in a living body by its exclusive particular reference to the pattern of the complete living organism. It is true that each molecule is affected by the aspect of this pattern as mirrored in it, so as to be otherwise than what it would have been if placed elsewhere. In

the same way, under some circumstances an electron may be a sphere, and under other circumstances an egg-shaped volume. The mode of approach to the problem, so far as science is concerned, is merely to ask if molecules exhibit in living bodies properties which are not to be observed amid inorganic surroundings. In the same way, in a magnetic field soft iron exhibits magnetic properties which are in abeyance elsewhere. The prompt self-preservative actions of living bodies, and our experience of the physical actions of our bodies following the determinations of will, suggest the modification of molecules in the body as the result of the total pattern. It seems possible that there may be physical laws expressing the modification of the ultimate basic organisms when they form part of higher organisms with adequate compactness of pattern. It would, however, be entirely in consonance with the empirically observed actions of environments, if the direct effects of aspects as between the whole body and its parts were negligible. We should expect transmission. In this way the modification of total pattern would transmit itself by means of a series of modifications of a descending series of parts, so that finally the modification of the cell changes its aspect in the molecule, thus effecting a corresponding alteration in the molecule—or in some subtler entity. Thus the question for physiology is the question of the physics of molecules in cells of different characters.

We can now see the relation of psychology to physiology and to physics. The private psychological field is merely the event considered from its own standpoint. The unity of this field is the unity of the event. But it is the event as one entity, and not the event as a sum of parts. The relations of the parts, to each other and to the whole, are their aspects, each in the other. A body for an external observer is the aggregate of the aspects for him of the body as a whole, and also of the body as a sum of parts. For the external observer the aspects of shape and of sense-objects are dominant, at least for cognition. But we must also allow for the possibility that we can detect in ourselves direct aspects of the mentalities of higher organisms. The claim that the cognition of alien mentalities must necessarily be by means of indirect inferences from aspects of shape and

of sense-objects is wholly unwarranted by this philosophy of organism. The fundamental principle is that whatever merges into actuality, implants its aspects in every individual event.

Further, even for self-cognition, the aspects of the parts of our own bodies partly take the form of aspects of shape, and of sense-objects. But that part of the bodily event, in respect to which the cognitive mentality is associated, is for itself the unit psychological field. Its ingredients are not referent to the event itself; they are aspects of what lies beyond that event. Thus the self-knowledge inherent in the bodily event is the knowledge of itself as a complex unity, whose ingredients involve all reality beyond itself, restricted under the limitation of its pattern of aspects. Thus we know ourselves as a function of unification of a plurality of things which are other than ourselves. Cognition discloses an event as being an activity, organising a real togetherness of alien things. But this psychological field does not depend on its cognition; so that this field is still a unit event as abstracted from its self-cognition.

Accordingly, consciousness will be the function of knowing. But what is known is already a prehension of aspects of the one real universe. These aspects are aspects of other events as mutually modifying, each the others. In the pattern of aspects they stand in their pattern of mutual relatedness.

The aboriginal data in terms of which the pattern weaves itself are the aspects of shapes, of sense-objects, and of other eternal objects whose self-identity is not dependent on the flux of things. Wherever such objects have ingression into the general flux, they interpret events, each to the other. They are here in the perceiver; but, as perceived by him, they convey for him something of the total flux which is beyond himself. The subject-object relation takes its origin in the double rôle of these eternal objects. They are modifications of the subject, but only in their character of conveying aspects of other subjects in the community of the universe. Thus no individual subject can have independent reality, since it is a prehension of limited aspects of subjects other than itself.

The technical phrase 'subject-object' is a bad term for

the fundamental situation disclosed in experience. It is really reminiscent of the Aristotelian 'subject-predicate.' It already presupposes the metaphysical doctrine of diverse subjects qualified by their private predicates. This is the doctrine of subjects with private worlds of experience. If this be granted, there is no escape from solipsism. The point is that the phrase 'subject-object' indicates a fundamental entity underlying the objects. Thus the 'objects,' as thus conceived, are merely the ghosts of Aristotelian predicates. The primary situation disclosed in cognitive experience is 'ego-object amid objects.' By this I mean that the primary fact is an impartial world transcending the 'here-now' which marks the ego-object, and transcending the 'now' which is the spatial world of simultaneous realisation. It is a world also including the actuality of the past, and the limited potentiality of the future, together with the complete world of abstract potentiality, the realm of eternal objects which transcends, and finds exemplification in and comparison with, the actual course of realisation. The ego-object, as consciousness here-now, is conscious of its experient essence as constituted by its internal relatedness to the world of realities, and to the world of ideas. But the ego-object, in being thus constituted, is within the world of realities, and exhibits itself as an organism requiring the ingression of ideas for the purpose of this status among realities. This question of consciousness must be reserved for treatment on another occasion.

The point to be made for the purpose of the present discussion is that a philosophy of nature as organic must start at the opposite end to that requisite for a materialistic philosophy. The materialistic starting point is from independently existing substances, matter and mind. The matter suffers modifications of its external relations of locomotion, and the mind suffers modifications of its contemplated objects. There are, in this materialistic theory, two sorts of independent substances, each qualified by their appropriate passions. The organic starting point is from the analysis of process as the realisation of events disposed in an interlocked community. The event is the unit of things real. The emergent enduring pattern is the stabilisation of

the emergent achievement so as to become a fact which retains its identity throughout the process. It will be noted that endurance is not primarily the property of enduring beyond itself, but of enduring within itself. I mean that endurance is the property of finding its pattern reproduced in the temporal parts of the total event. It is in this sense that a total event carries an enduring pattern. There is an intrinsic value identical for the whole and for its succession of parts. Cognition is the emergence, into some measure of individualised reality, of the general substratum of activity, poising before itself possibility, actuality, and purpose.

It is equally possible to arrive at this organic conception of the world if we start from the fundamental notions of modern physics, instead of, as above from psychology and physiology. In fact by reason of my own studies in mathematics and mathematical physics, I did in fact arrive at my convictions in this way. Mathematical physics presumes in the first place an electromagnetic field of activity pervading space and time. The laws which condition this field are nothing else than the conditions observed by the general activity of the flux of the world, as it individualises itself in the events. In physics, there is an abstraction. The science ignores what anything is in itself. Its entities are merely considered in respect to their extrinsic reality, that is to say, in respect to their aspects in other things. But the abstraction reaches even further than that; for it is only the aspects in other things, as modifying the spatio-temporal specifications of the life histories of those other things, which count. The intrinsic reality of the observer comes in: I mean what the observer is for himself is appealed to. For example, the fact that he will see red or blue enters into scientific statements. But the red which the observer sees does not in truth enter into science. What is relevant is merely the bare diversity of the observer's red experiences from all of his other experiences. Accordingly, the intrinsic character of the observer is merely relevant in order to fix the self-identical individuality of the physical entities. These entities are only considered as agencies in fixing the routes in space and in time of the life histories of enduring entities.

The phraseology of physics is derived from the materialistic ideas of the seventeenth century. But we find that, even in its extreme abstraction, what it is really presupposing is the organic theory of aspects as explained above. First, consider any event in empty space where the word 'empty' means devoid of electrons, or protons, or of any other form of electric charge. Such an event has three rôles in physics. In the first place, it is the actual scene of an advanture of energy, either as its *habitat* or as the locus of a particular stream of energy: anyhow, in this rôle the energy is there, either as located in space during the time considered, or as streaming through space.

In its second rôle, the event is a necessary link in the pattern of transmission, by which the character of every event receives some modification from the character of every other event.

In its third rôle, the event is the repository of a possibility, as to what would happen to an electric charge, either by way of deformation or of locomotion, if it should have happened to be there.

If we modify our assumption by considering an event which includes in itself a portion of the life-history of an electric charge, then the analysis of its three rôles still remains; except that the possibility embodied in the third rôle is now transformed into an actuality. In this replacement of possibility by actuality, we obtain the distinction between empty and occupied events.

Recurring to the empty events, we note the deficiency in them of individuality of intrinsic content. Considering the first rôle of an empty event, as being a *habitat* of energy, we note that there is no individual discrimination of an individual bit of energy, either as statically located, or as an element in the stream. There is simply a quantitative determination of activity, without individualisation of the activity in itself. This lack of individualisation is still more evident in the second and third rôles. An empty event is something in itself, but it fails to realise a stable individuality of content. So far as its content is concerned, the empty event is one realised element in a general scheme of organized activity.

Some qualification is required when the empty event

is the scene of the transmission of a definite train of recurrent wave-forms. There is now a definite pattern which remains permanent in the event. We find here the first faint trace of enduring individuality. But it is individuality without the faintest capture of originality: for it is merely a permanence arising solely from the implication of the event in a larger scheme of patterning.

Turning now to the examination of an occupied event, the electron has a determinate individuality. It can be traced throughout its life-history through a variety of events. A collection of electrons, together with the analogous atomic charges of positive electricity, forms a body such as we ordinarily perceive. The simplest body of this kind is a molecule, and a set of molecules forms a lump of ordinary matter, such as a chair, or a stone. Thus a charge of electricity is the mark of individuality of content, as additional to the individuality of an event in itself. This individuality of content is the strong point of the materialistic doctrine.

It can, however, be equally well explained on the theory of organism. When we look into the function of the electric charge, we note that its rôle is to mark the origination of a pattern which is transmitted through space and time. It is the key of some particular pattern. For example, the field of force in any event is to be constructed by attention to the adventures of electrons and protons, and so also are the streams and distributions of energy. Further, the electric waves find their origin in the vibratory adventures of these charges. Thus the transmitted pattern is to be conceived as the flux of aspects throughout space and time derived from the life history of the atomic charge. The individualisation of the charge arises by a conjunction of two characters, in the first place by the continued identity of its mode of functioning as a key for the determination of a diffusion of pattern; and, in the second place, by the unity and continuity of its life history.

We may conclude, therefore, that the organic theory represents directly what physics actually does assume respecting its ultimate entities. We also notice the complete futility of these entities, if they are conceived as fully concrete individuals. So far as physics is con-

cerned, they are wholly occupied in moving each other about, and they have no reality outside this function. In particular for physics, there is no intrinsic reality.

It is obvious that the basing of philosophy upon the presupposition of organism must be traced back to Leibniz.[1] His monads are for him the ultimately real entities. But he retained the Cartesian substances with their qualifying passions, as also equally expressing for him the final characterisation of real things. Accordingly for him there was no concrete reality of internal relations. He had therefore on his hands two distinct points of view. One was that the final real entity is an organising activity, fusing ingredients into a unity, so that this unity is the reality. The other point of view is that the final real entities are substances supporting qualities. The first point of view depends upon the acceptance of internal relations binding together all reality. The latter is inconsistent with the reality of such relations. To combine these two points of view, his monads were therefore windowless; and their passions merely mirrored the universe by the divine arrangement of a preëstablished harmony. This system thus presupposed an aggregate of independent entities. He did not discriminate the event, as the unit of experience, from the enduring organism as its stabilisation into importance, and from the cognitive organism as expressing an increased completeness of individualisation. Nor did he admit the many-termed relations, relating sense-data to various events in diverse ways. These many-termed relations are in fact the perspectives which Leibniz does admit, but only on the condition that they are purely qualities of the organising monads. The difficulty really arises from the unquestioned acceptance of the notion of simple location as fundamental for space and time, and from the acceptance of the notion of independent individual substances as fundamental for a real entity. The only road open to Leibniz was thus the same as that later taken by Berkeley [in a prevalent interpretation of his meaning], namely an appeal to a *deus ex machina* who was capable of rising superior to the difficulties of metaphysics.

In the same way as Descartes introduced the tradi-

[1] *Cf.* Bertrand Russell, *The Philosophy of Leibniz,* for the suggestion of this line of thought.

tion of thought which kept subsequent philosophy in some measure of contact with the scientific movement, so Leibniz introduced the alternative tradition that the entities, which are the ultimate actual things, are in some sense procedures of organisation. This tradition has been the foundation of the great achievements of German philosophy. Kant reflected the two traditions, one upon the other. Kant was a scientist, but the schools derivative from Kant have had but slight effect on the mentality of the scientific world. It should be the task of the philosophical schools of this century to bring together the two streams into an expression of the world-picture derived from science, and thereby end the divorce of science from the affirmations of our aesthetic and ethical experiences.

CHAPTER X

ABSTRACTION

IN THE PREVIOUS CHAPTERS I have been examining the reactions of the scientific movement upon the deeper issues which have occupied modern thinkers. No one man, no limited society of men, and no one epoch can think of everything at once. Accordingly for the sake of eliciting the various impacts of science upon thought, the topic has been treated historically. In this retrospect I have kept in mind that the ultimate issue of the whole story is the patent dissolution of the comfortable scheme of scientific materialism which has dominated the three centuries under review. Accordingly various schools of criticism of the dominant opinions have been stressed; and I have endeavoured to outline an alternative cosmological doctrine, which shall be wide enough to include what is fundamental both for science and for its critics. In this alternative scheme, the notion of material, as fundamental, has been replaced by that of organic synthesis. But the approach has always been from the consideration of the actual intricacies of scientific thought, and of the peculiar perplexities which it suggests.

In the present chapter, and in the immediately succeeding chapter, we will forget the peculiar problems of modern science, and will put ourselves at the stand-

point of a dispassionate consideration of the nature of things, antecedently to any special investigation into their details. Such a standpoint is termed 'metaphysical.' Accordingly those readers who find metaphysics, even in two slight chapters, irksome, will do well to proceed at once to the chapter on 'Religion and Science,' which resumes the topic of the impact of science on modern thought.

These metaphysical chapters are purely descriptive. Their justification is to be sought, (i) in our direct knowledge of the actual occasions which compose our immediate experience, and (ii) in their success as forming a basis for harmonising our systematised accounts of various types of experience, and (iii) in their success as providing the concepts in terms of which an epistemology can be framed. By (iii) I mean that an account of the general character of what we know must enable us to frame an account of how knowledge is possible as an adjunct within things known.

In any occasion of cognition, that which is known is an actual occasion of experience, as diversified[1] by reference to a realm of entities which transcend that immediate occasion in that they have analogous or different connections with other occasions of experience. For example a definite shade of red may, in the immediate occasion, be implicated with the shape of sphericity in some definite way. But that shade of red, and that spherical shape, exhibit themselves as transcending that occasion, in that either of them has other relationships to other occasions. Also, apart from the actual occurrence of the same things in other occasions, every actual occasion is set within a realm of alternative interconnected entities. This realm is disclosed by all the untrue propositions which can be predicated significantly of that occasion. It is the realm of alternative suggestions, whose foothold in actuality transcends each actual occasion. The real relevance of untrue propositions for each actual occasion is disclosed by art, romance, and by criticism in reference to ideals. It is the foundation of metaphysical position which I am maintaining that the understanding of actuality requires a reference to ideality. The two realms are intrinsically inherent in

[1] *Cf.* my *Principles of Natural Knowledge*, Ch. V, Sec. 13.

the total metaphysical situation. The truth that some proposition respecting an actual occasion is untrue may express the vital truth as to the aesthetic achievement. It expresses the 'great refusal' which is its primary characteristic. An event is decisive in proportion to the importance (for it) of its untrue propositions: their relevance to the event cannot be dissociated from what the event is in itself by way of achievement. These transcendent entities have been termed 'universals.' I prefer to use the term 'eternal objects,' in order to disengage myself from presuppositions which cling to the former term owing to its prolonged philosophical history. Eternal objects are thus, in their nature, abstract. By 'abstract' I mean that what an eternal object is in itself—that is to say, its essence—is comprehensible without reference to some one particular occasion of experience. To be abstract is to transcend particular concrete occasions of actual happening. But to transcend an actual occasion does not mean being disconnected from it. On the contrary, I hold that each eternal object has its own proper connection with each other such occasion, which I term its mode of ingression into that occasion. Thus an eternal object is to be comprehended by acquaintance with (i) its particular individuality, (ii) its general relationships to other eternal objects as apt for realisation in actual occasions, and (iii) the general principle which expresses its ingression in particular actual occasions.

These three headings express two principles. The first principle is that each eternal object is an individual which, in its own peculiar fashion, is what it is. This particular individuality is the individual essence of the object, and cannot be described otherwise than as being itself. Thus the individual essence is merely the eternal object considered as adding its own unique contribution to each actual occasion. This unique contribution is identical for all such occasions in respect to the fact that the object in all modes of ingression is just its identical self. But it varies from one occasion to another in respect to the differences of its modes of ingression. Thus the metaphysical status of an eternal object is that of a possibility for an actuality. Every actual occasion is defined as to its character by how these possibilities are actualised for that occasion. Thus actualisa-

tion is a selection among possibilities. More accurately, it is a selection issuing in a gradation of possibilities in respect to their realisation in that occasion. This conclusion brings us to the second metaphysical principle: An eternal object, considered as an abstract entity, cannot be divorced from its reference to other eternal objects, and from its reference to actuality generally; though it is disconnected from its actual modes of ingression into definite actual occasions. This principle is expressed by the statement that each eternal object has a 'relational essence.' This relational essence determines how it is possible for the object to have ingression into actual occasions.

In other words: If A be an eternal object, then what A is in itself involves A's status in the universe, and A cannot be divorced from this status. In the essence of A there stands a determinateness as to the relationships of A to other eternal objects, and an indeterminateness as to the relationships of A to actual occasions. Since the relationships of A to other eternal objects stands determinately in the essence of A, it follows that they are internal relations. I mean by this that these relationships are constitutive of A; for an entity which stands in internal relations has no being as an entity not in these relations. In other words, once with internal relations, always with internal relations. The internal relationships of A conjointly form its significance.

Again an entity cannot stand in external relations unless in its essence there stands an indeterminateness which is its patience for such external relations. The meaning of the term 'possibility' as applied to A is simply that there stands in the essence of A a patience for relationships to actual occasions. The relationships of A to an actual occasion are simply how the eternal relationships of A to other eternal objects are graded as to their realisation in that occasion.

Thus the general principle which expresses A's ingression in the particular actual occasion α is the indeterminateness which stands in the essence of A as to its ingression into α, and is the determinateness which stands in the essence of α as to the ingression of A into α. Thus the synthetic prehension, which is α, is the solution of the indeterminateness of A into the deter-

minateness of α. Accordingly the relationships between A and α is external as regards A, and is internal as regards α. Every actual occasion α is the solution of all modalities into actual categorical ingressions: truth and falsehood take the place of possibility. The complete ingression of A into α is expressed by all the true propositions which are about A and α, and also—it may be—about other things.

The determinate relatedness of the eternal object A to every other eternal object is how A is systematically and by the necessity of its nature related to every other eternal object. Such relatedness represents a possibility for realisation. But a relationship is a fact which concerns all the implicated relata, and cannot be isolated as if involving only one of the relata. Accordingly there is a general fact of systematic mutual relatedness which is inherent in the character of possibility. The realm of eternal objects is properly described as a 'realm,' because each eternal object has its status in this general systematic complex of mutual relatedness.

In respect to the ingression of A into an actual occasion α, the mutual relationships of A to other eternal objects, as thus graded in realisation, require for their expression a reference to the status of A and of the other eternal objects in the spatio-temporal relationship. Also this status is not expressible (for this purpose) without a reference to the status of α and of other actual occasions in the same spatio-temporal relationship. Accordingly the spatio-temporal relationship, in terms of which the actual course of events is to be expressed, is nothing else than a selective limitation within the general systematic relationships among eternal objects. By 'limitation,' as applied to the spatio-temporal continuum, I mean those matter-of-fact determinations—such as the three dimensions of space, and the four dimensions of the spatio-temporal continuum—which are inherent in the actual course of events, but which present themselves as arbitrary in respect to a more abstract possibility. The consideration of these general limitations at the base of actual things, as distinct from the limitations peculiar to each actual occasion, will be more fully resumed in the chapter on 'God.'

Further, the status of all possibility in reference to

actuality requires a reference to this spatio-temporal continuum. In any particular consideration of a possibility we may conceive this continuum to be transcended. But in so far as there is any definite reference to actuality, the definite *how* of transcendence of that spatio-temporal continuum is required. Thus primarily the spatio-temporal continuum is a locus of relational possibility, selected from the more general realm of systematic relationship. This limited locus of relational possibility expresses one limitation of possibility inherent in the general system of the process of realisation. Whatever possibility is generally coherent with that system falls within this limitation. Also whatever is abstractedly possible in relation to the general course of events—as distinct from the particular limitations introduced by particular occasions—pervades the spatio-temporal continuum in every alternative spatial situation and at all alternative times.

Fundamentally, the spatio-temporal continuum is the general system of relatedness of all possibilities, in so far as that system is limited by its relevance to the general fact of actuality. Also it is inherent in the nature of possibility that it should include this relevance to actuality. For possibility is that in which there stands achievability, abstracted from achievement.

It has already been emphasised that an actual occasion is to be conceived as a limitation; and that this process of limitation can be still further characterised as a gradation. This characteristic of an actual occasion (α, say) requires further elucidation: An indeterminateness stands in the essence of any eternal object (A, say). The actual occasion α synthesises in itself every eternal object; and, in so doing, it includes the *complete* determinate relatedness of A to every other eternal object, or set of eternal objects. This synthesis is a limitation of realisation but *not* of content. Each relationship preserves its inherent self-identity. But grades of entry into this synthesis are inherent in each actual occasion, such as α. These grades can be expressed only as relevance of value. This relevance of value varies—as comparing different occasions—in grade from the inclusion of the individual essence of A as an element in the aesthetic synthesis (in some grade of inclusion) to the lowest grade

which is the exclusion of the individual essence of *A* as an element in the aesthetic synthesis. In so far as it stands in this lowest grade, every determinate relationship of *A* is merely ingredient in the occasion in respect to the determinate *how* this relationship is an unfulfilled alternative, not contributing any aesthetic value, except as forming an element in the systematic substratum of unfulfilled content. In a higher grade, it may remain unfulfilled, but be aesthetically relevant.

Thus *A,* conceived merely in respect to its relationships to other eternal objects, is '*A* conceived as *not-being*'; where 'not-being' means 'abstracted from the determinate fact of inclusions in, and exclusions from, actual events.' 2Also '*A* as *not-being* in respect to a definite occasion α' means that *A* in all its determinate relationships is excluded from α. Again *A* as *being* in respect to α' means that *A* in some of its determinate relationships is included in α. But there can be no occasion which includes *A* in all its determinate relationships; for some of these relationships are contraries. Thus, in regard to excluded relationships, *A* will be *not-being* in α, even when in regard to other relationships *A* will be *being* in α. In this sense, every occasion is a synthesis of *being* and *not-being*. Furthermore, though some eternal objects are synthesised in an occasion α merely *qua not-being,* each eternal object which is synthesised *qua being* is also synthesised *qua not-being*. '*Being*' here means 'individually effective in the aesthetic synthesis.' Also the 'aesthetic synthesis' is the 'experient synthesis' viewed as self-creative, under the limitations laid upon it by its internal relatedness to all other actual occasions. We thus conclude—what has already been stated above—that the general fact of the synthetic prehension of all eternal objects into every occasion wears the double aspect of the indeterminate relatedness of each eternal object to occasions generally, and of its determinate relatedness to each particular occasion. This statement summarises the account of how external relations are possible. But the account depends upon disengaging the spatio-temporal continuum from its mere implication in actual occasions—according to the usual explanation—and upon exhibiting it in its origin from the general

nature of abstract possibility, as limited by the general character of the actual course of events.

The difficulty which arises in respect to internal relations is to explain how any particular truth is possible. In so far as there are internal relations, everything must depend upon everything else. But if this be the case, we cannot know about anything till we equally know everything else. Apparently, therefore, we are under the necessity of saying everything at once. This supposed necessity is palpably untrue. Accordingly it is incumbent on us to explain how there can be internal relations, seeing that we admit finite truths.

Since actual occasions are selections from the realm of possibilities, the ultimate explanation of how actual occasions have the general character which they do have, must lie in an analysis of the general character of the realm of possibility.

The *analytic character* of the realm of eternal objects is the primary metaphysical truth concerning it. By this character it is meant that the status of any eternal object A in this realm is capable of analysis into an indefinite number of subordinate relationships of limited scope. For example if B and C are two other eternal objects, then there is some perfectly definite relationship $R(A, B, C)$ which involves A, B, C only, as to require the mention of no other definite eternal objects in the capacity of relata. Of course, the relationship $R(A, B, C)$ may involve subordinate relationships which are themselves eternal objects, and $R(A, B, C)$ is also itself an eternal object. Also there will be other relationships which in the same sense involve only A, B, C. We have now to examine how, having regard to the internal relatedness of internal objects, this limited relationship $R(A, B, C)$ is possible.

The reason for the existence of finite relationships in the realm of eternal objects is that relationships of these objects among themselves are entirely unselective, and are systematically complete. We are discussing possibility; so that every relationship which is possible is thereby in the realm of possibility. Every such relationship of each eternal object is founded upon the perfectly definite status of that object as a relatum in the general scheme of relationships. This definite status is

what I have termed the 'relational essence' of the object. This relational essence is determinable by reference to that object alone, and does not require reference to any other objects, except those which are specifically involved in its individual essence when that essence is complex (as will be explained immediately). The meaning of the words 'any' and 'some' springs from this principle—that is to say, the meaning of the 'variable' in logic. The whole principle is that a particular determination can be made of the *how* of some definite relationship of a definite eternal object A to a definite finite number n of other eternal objects, *without* any determination of the other n objects, $X_1, X_2, \ldots X_n$, except that they have, each of them, the requisite status to play their respective parts in that multiple relationship. This principle depends on the fact that the relational essence of an eternal object is not unique to that object. The mere relational essence of each eternal object determines the complete uniform scheme of relational essences, since each object stands internally in all its possible relationships. Thus the realm of possibility provides a uniform scheme of relationships among finite sets of eternal objects; and all eternal objects stand in all such relationships, so far as the status of each permits.

Accordingly the relationships (as in possibility) do not involve the individual essences of the eternal objects; they involve *any* eternal objects as relata, subject to the proviso that these relata have the requisite relational essences. [It is this proviso which, automatically and by the nature of the case, limits the 'any' of the phrase 'any eternal objects.'] This principle is the principle of the *Isolation of Eternal Objects* in the realm of possibility. The eternal objects are isolated, because their relationships as possibilities are expressible without reference to their respective individual essences. In contrast to the realm of possibility the inclusion of eternal objects within an actual occasion means that in respect to some of their possible relationships there is a togetherness of their individual essences. This realised togetherness is the achievement of an emergent value defined—or, shaped—by the definite eternal relatedness in respect to which the real togetherness is achieved. Thus the eternal relatedness is the form—the εδος—; the emergent actual

occasion is the *superject* of informed value; value, as abstracted from any particular superject, is the abstract matter—the $\upsilon\lambda\eta$—which is common to all actual occasions; and the synthetic activity which prehends valueless possibility into superjicient informed value as the substantial activity. This substantial activity is that which is omitted in any analysis of the static factors in the metaphysical situation. The analysed elements of the situation are the attributes of the substantial activity.

The difficulty inherent in the concept of finite internal relations among eternal objects is thus evaded by two metaphysical principles, (i) that the relationships of any eternal object *A,* considered as constitutive of *A,* merely involve other eternal objects as bare relata without reference to their individual essences, and (ii) that the divisibility of the general relationship of *A* into a multiplicity of finite relationships of *A* stands therefore in the essence of that eternal object. The second principle obviously depends upon the first. To understand *A* is to understand the *how* of a general scheme of relationship. This scheme of relationship does not require the individual uniqueness of the other relata for its comprehension. This scheme also discloses itself as being analysable into a multiplicity of limited relationships which have their own individuality and yet at the same time presupposes the total relationship within possibility. In respect to actuality there is first the general limitation of relationships, which reduces this general unlimited scheme to the four-dimensional spatio-temporal scheme. This spatio-temporal scheme is, so to speak, the greatest common measure of the schemes of relationship (as limited by actuality) inherent in all the eternal objects. By this it is meant that, *how* select relationships of an eternal object *(A)* are realised in any actual occasion, is always explicable by expressing the status of *A* in respect to this spatio-temporal scheme, and by expressing in this scheme the relationship of the actual occasion to other actual occasions. A definite finite relationship involving the definite eternal objects of a limited set of such objects is itself an eternal object: it is those eternal objects as in that relationship. I will call such an eternal object 'complex.' The eternal objects which are the relata in a complex eternal object will be called the 'components'

of that eternal object. Also if any of these relata are themselves complex, their components will be called 'derivative components' of the original complex object. Also the components of derivative components will also be called derivative components of the original object. Thus the complexity of an eternal object means its analysability into a relationship of component eternal objects. Also the analysis of the general scheme of relatedness of eternal objects means its exhibition as a multiplicity of complex eternal objects. An eternal object, such as a definite shade of green, which cannot be analysed into a relationship of components, will be called 'simple.'

We can now explain how the analytical character of the realm of eternal objects allows of an analysis of that realm into grades.

In the lowest grade of eternal objects are to be placed those objects whose individual essences are simple. This is the grade of zero complexity. Next consider any set of such objects, finite or infinite as to the number of its members. For example, consider the set of three eternal objects *A, B, C,* of which none is complex. Let us write *R(A, B, C)* for some definite possible relatedness of *A, B, C.* To take a simple example, *A, B, C* may be three definite colours with the spatio-temporal relatedness to each other of three faces of a regular tetrahedron, anywhere at any time. Then *R(A, B, C)* is another eternal object of the lowest complex grade. Analogously there are eternal objects of successively higher grades. In respect to any complex eternal object, $S(D_1, D_2, \ldots D_n)$, the eternal objects $D_1, \ldots D_n$, whose individual essences are constitutive of the individual essence of $S(D_1, \ldots D_n)$, are called the components of $S(D_1, \ldots D_n)$. It is obvious that the grade of complexity to be ascribed to $S(D_1, \ldots D_n)$, is to be taken as one above the highest grade of complexity to be found among its components.

There is thus an analysis of the realm of possibility into simple eternal objects, and into various grades of complex eternal objects. A complex eternal object is an abstract situation. There is a double sense of 'abstraction,' in regard to the abstraction of *definite* eternal objects, *i.e.,* non-mathematical abstraction. There is abstraction from actuality, and abstraction from possibility.

For example, *A* and *R(A, B, C)* are both abstractions from the realm of possibility. Note that *A* must mean *A* in all its possible relationships, and among them *R(A, B, C)*. Also *R(A, B, C)* means *R(A, B, C)* in all its relationships. But this meaning of *R(A, B, C)* excludes other relationships into which *A* can enter. Hence *A* as in *R(A, B, C)* is more abstract than *A simpliciter*. Thus we pass from the grade of simple eternal objects to higher and higher grades of complexity, we are indulging in higher grades of abstraction from the realm of possibility.

We can now conceive the successive stages of a definite progress towards some assigned mode of abstraction from the realm of possibility, involving a progress (in thought) through successive grades of increasing complexity. I will call any such route of progress 'an abstractive hierarchy.' Any abstractive hierarchy, finite or infinite, is based upon some definite group of simple eternal objects. This group will be called the 'base' of the hierarchy. Thus the base of an abstractive hierarchy is a set of objects of zero complexity. The formal definition of an abstractive hierarchy is as follows:

An 'abstractive hierarchy based upon *g*,' where *g* is a group of simple eternal objects, is a set of eternal objects which satisfy the following conditions,

(i) the members of *g* belong to it, and are the only simple eternal objects in the hierarchy,

(ii) the components of any complex eternal object in the hierarchy are also members of the hierarchy, and

(iii) any set of eternal objects belonging to the hierarchy, whether all of the same grade or whether differing among themselves as to grade, are jointly among the components or derivative components of at least one eternal object which also belongs to the hierarchy.

It is to be noticed that the components of an eternal object are necessarily of a lower grade of complexity than itself. Accordingly any member of such a hierarchy, which is of the first grade of complexity, can have as components only members of the group *g*; and any member of the second grade can have as components only members of the first grade, and members of *g;* and so on for the higher grades.

The third condition to be satisfied by an abstractive hierarchy will be called the condition of connexity. Thus an abstractive hierarchy springs from its base; it includes every successive grade from its base either indefinitely onwards, or to its maximum grade; and it is 'connected' by the reappearance (in a higher grade) of any set of its members belonging to lower grades, in the function of a set of components or derivative components of at least one member of the hierarchy.

An abstractive hierarchy is called 'finite' if it stops at a finite grade of complexity. It is called 'infinite' if it includes members belonging respectively to all degrees of complexity.

It is to be noted that the base of an abstractive hierarchy may contain any number of members, finite or infinite. Further, the infinity of the number of the members of the base has nothing to do with the question as to whether the hierarchy be finite or infinite.

A finite abstractive hierarchy will, by definition, possess a grade of maximum complexity. It is characteristic of this grade that a member of it is a component of no other eternal object belonging to any grade of the hierarchy. Also it is evident that this grade of maximum complexity must possess only one member; for otherwise the condition of connexity would not be satisfied. Conversely any complex eternal object defines a finite abstractive hierarchy to be discovered by a process of analysis. This complex eternal object from which we start will be called the 'vertex' of the abstractive hierarchy: it is the sole member of the grade of maximum complexity. In the first stage of the analysis we obtain the components of the vertex. These components may be of varying complexity; but there must be among them at least one member whose complexity is of a grade one lower than that of the vertex. A grade which is one lower than that of a given eternal object will be called the 'proximate grade' for that object. We take then those components of the vertex which belong to its proximate grade; and as the second stage we analyse them into their components. Among these components there must be some belonging to the proximate grade for the objects thus analysed. Add to them the components of the vertex which also belong to this grade of

'second proximation' from the vertex; and, at the third stage analyse as before. We thus find objects belonging to the grade of third proximation from the vertex; and we add to them the components belonging to this grade, which have been left over from the preceding stages of analysis. We proceed in this way through successive stages, till we reach the grade of simple objects. This grade forms the base of the hierarchy.

It is to be noted that in dealing with hierarchies we are entirely within the realm of possibility. Accordingly the eternal objects are devoid of real togetherness: they remain within their 'isolation.'

The logical instrument which Aristotle used for the analysis of actual fact into more abstract elements was that of classification into species and genera. This instrument has its overwhelmingly important application for science in its preparatory stages. But its use in metaphysical description distorts the true vision of the metaphysical situation. The use of the term 'universal' is intimately connected with this Aristotelian analysis: the term has been broadened of late; but still it suggests that classificatory analysis. For this reason I have avoided it.

In any actual occasion α, there will be a group g of simple eternal objects which are ingredient in that group in the most concrete mode. This complete ingredience in an occasion, so as to yield the most complete fusion of individual essence with other eternal objects in the formation of the individual emergent occasion, is evidently of its own kind and cannot be defined in terms of anything else. But it has a peculiar characteristic which necessarily attaches to it. This characteristic is that there is an *infinite* abstractive hierarchy based upon g which is such that all its members are equally involved in this complete inclusion in α.

The existence of such an infinite abstractive hierarchy is what is meant by the statement that it is impossible to complete the description of an actual occasion by means of concepts. I will call this infinite abstractive hierarchy which is associated with α 'the associated hierarchy of α.' It is also what is meant by the notion of the connectedness of an actual occasion. This connectedness of an occasion is necessary for its synthetic unity and for its intelligibility. There is a connected hierarchy of con-

cepts applicable to the occasion, including concepts of all degrees of complexity. Also in the actual occasion, the individual essences of the eternal objects involved in this complex concepts achieve an aesthetic synthesis, productive of the occasion as an experience for its own sake. This associated hierarchy is the shaper, or pattern, or form, of the occasion in so far as the occasion is constituted of what enters into its full realisation.

Some confusion of thought has been caused by the fact that abstraction from possibility runs in the opposite direction to an abstraction from actuality, so far as degree of abstractness is concerned. For evidently in describing an actual occasion α, we are nearer to the total concrete fact when we describe α by predicating of it some member of its associated hierarchy, which is of a high grade of complexity. We have then said more about α. Thus, with a high grade of complexity we gain in approach to the full concreteness of α, and with a low grade we lose in this approach. Accordingly the simple eternal objects represent the extreme abstraction from an actual occasion; whereas simple eternal objects represent the minimum of abstraction from the realm of possibility. It will, I think, be found that, when a high degree of abstraction is spoken of, abstraction from the realm of possibility is what is usually meant—in other words, an elaborate logical construction.

So far I have merely been considering an actual occasion on the side of its full concreteness. It is this side of the occasion in virtue of which it is an event in nature. But a natural event, in this sense of the term, is only an abstraction from a complete actual occasion. A complete occasion includes that which in cognitive experience takes the form of memory, anticipation, imagination, and thought. These elements in an experient occasion are also modes of inclusion of complex eternal objects in the synthetic prehension, as elements in the emergent value. They differ from the concreteness of full inclusion. In a sense this difference is inexplicable; for each mode of inclusion is of its own kind, not to be explained in terms of anything else. But there is a common difference which discriminates these modes of inclusion from the full concrete ingression which has been discussed. This *differentia* is *abruptness*. By

'abruptness' I mean that what is remembered, or anticipated, or imagined, or thought, is exhausted by a finite complex concept. In each case there is one finite eternal object prehended within the occasion as the vertex of a finite hierarchy. This breaking off from an actual illimitability is what in any occasion marks off that which is termed mental from that which belongs to the physical event to which the mental functioning is referred.

In general there seems to be some loss of vividness in the apprehension of the eternal objects concerned: for example, Hume speaks of 'faint copies.' But this faintness seems to be a very unsafe ground for differentiation. Often things realised in thought are more vivid than the same things in inattentive physical experience. But the things apprehended as mental are always subject to the condition that we come to a stop when we attempt to explore ever higher grades of complexity in their realised relationships. We always find that we have thought of just this—whatever it may be—and of no more. There is a limitation which breaks off the finite concept from the higher grades of illimitable complexity.

Thus an actual occasion is a prehension of one infinite hierarchy (its associated hierarchy) together with various finite hierarchies. The synthesis into the occasion of the infinite hierarchy is according to its specific mode of realisation, and that of the finite hierarchies is according to various other specific modes of realisation. There is one metaphysical principle which is essential for the rational coherence of this account of the general character of an experient occasion. I call this principle, 'The Translucency of Realisation.' By this I mean that any eternal object is just itself in whatever mode of realisation it is involved. There can be no distortion of the individual essence without thereby producing a different eternal object. In the essence of each eternal object there stands an indeterminateness which expresses its indifferent patience for any mode of ingression into any actual occasion. Thus in cognitive experience, there can be the cognition of the same eternal object as in the same occasion having ingression with implication in more than one grade of realisation. Thus the translucency of realisation, and the possible multiplicity of modes of ingression into the same occasion, together