AUDITORY PERCEPTION

The Importance of Hearing for the Study of Perception.

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PREFACE

This preface is not an apology for a theory of auditory perception. It is a statement of why hearing should be studied, and of its importance for human experience. Any person who is already of the opinion that hearing is as important as vision in the ordering of human experience need not peruse the preface. He who thinks of vision as the primary sensory faculty, and who accepts visualistic analysis as the only type of veridical explanation of phenomena should assess the evidence presented here. He should reflect that although he may now be an intrepid user only of visual or verbal imagery, or may have dispensed with such aids to thought, there was a time when the sound "bow-wow" signified dog, and "puff-puff" a train. At that stage of development his interest was focussed as much on sounds as upon the world of objects surrounding him. He too, like Helen Keller, probably delighted in the discovery that every thing had a name. Moreover he enjoyed hearing himself master these verbal sounds, thereby earning the spoken commendation and cooperation of his elders. This stage of development, however, was long forgotten before the appearance of the

philosopher who deals principally with abstract thought and its written symbols.

There is a saying that 'the child is Father to the man.' Similarly, one may say that the hearer is Father to the verbalist and the user of language to the object-ridden visualist who analyses his experience as a collection of sense-data. The primitiveness of some form of experience, however, is not a criterion of its importance in mature experience. The assessment of the relative importance of auditory and visual perception does not depend upon such a criterion. It depends upon the effects an adequate theory of auditory perception will have on investigations in related fields. This preface considers the extent to which auditory perception is an integral factor in various types of experience. Perceptual theorists have relegated hearing to the limbo where the sensory embellishments of experience rest unexamined. In so doing they have discarded one of the most potent influences in the development of human mentality.

It is hardly possible to over-emphasise the importance of vision for our every-day activities and for scientific research. Modern physics would be incomprehensible to persons lacking visual experience comparable to our own, nor would they have technical skills resembling ours. In other forms of experience, however, the importance of vision is over-emphasised.

The logical structure and the content of metaphorical expression in Western European Languages is directly related to visual experience. Hence much of our thinking is visual in character. We see "things" in the environment. We describe this experience in terms which distinguish the percipient subject from the discrete objects which form the content of the perceptual experience. Verbal symbols, qualified by suitable adjectives are used to denote these discrete objects. They form the predicates of the sentences in which we describe our experiences. Thus our linguistic forms bear a striking resemblance to the apparent structure of visual experience. Thought and language are so closely related, that we accept an analysis of thought processes in dualistic terms. Thus we come to analyse all our experiences with reference to the apparent structure of visual experience. We even describe abstract ideas and non-visual phenomena such as sounds, moods, feelings, and actions, in dualistic, visual terms.

We commonly associate the acceptance of dualistic modes of thought with the dominance of the Aristotelian logical categories as they were formalised by Medieval thinkers. An investigation of the interpretation put upon the perceptual theories of Descartes, Locke, Berkeley, and Hume illustrates

how logical categories are integrated with visualistic modes of thought. When commentators, seeking a consistent theory in the writings of philosophers, allow a dualistic logic to influence their selection of material, they systematise those aspects of philosophic works which refer directly to visual experience. A comparison of the original texts with commentaries upon them amply illustrates this. A naive view of the nature of space and time must be accepted in order to describe experience in such terms.

Vision is the most abstract and intellectualistic of our sensory faculties. The information which we obtain by looking at our environment may be described as abstract in the sense that the visual data are accepted as representing physical entities which have a reality other than their form as seen. Recognition of objects as individual entities is most easily achieved by attending to their visual characteristics, but their physical existence is independent of visual considerations. This relationship in which visual data stand to physical objects is without parallel in any other sense. Moreover visual perception may be described as abstract since it can be discussed only in terms which are more intellectual and exact than the described phenomena. Thus the use of vision as the paradigm for a general theory of perception leads to a static, abstract conception of the essential structure of perceptual experience.

Vision has predominated to the exclusion of other data as the material of perceptual investigation. Hence its suitability as a perceptual paradigm has never been investigated. Where touch has been studied it has been considered as important only because it appears to establish the physical reality of objects which we discern in our visual field. Writers such as Bergson, Alexander, Whitehead, and the Gestalt psychologists, who have attacked the visuo-spatial cosmology based upon a dualistic metaphysic, still confine their perceptual theories to a discussion of visual experiences.

There appear to be three main reasons why philosophers investigating perceptual experiences have over-looked the importance of auditory perception.

(1) They have confined their attention to the physical field, and have not taken account of social relations. Vision is the most important sense for gaining acquaintance with inanimate objects. Auditory experience is more important for social relations since communication by means of spoken language is impossible without hearing.

(2) Visual experiences can be defined in geometrical terms. The terminology of Euclidean geometry is accepted in ordinary speech. The structure and content of ordinary language is more suitable for the discussion of visuo-spatial

phenomena than for the discussion of any other perceptual data. The lack of non-visual terminology is connected with the fact that vision is the only form of perception which can be studied in abstraction from temporal factors. Language is predominantly visual both in its range of descriptive adjectives, and in its expressive metaphors.

(3) No adequate theory of auditory perception can be given in terms of the dualistic metaphysical presuppositions which form the basis of existing theories of perception. Auditory data do not lend themselves to analysis as discrete objects inhering in some material substance. Sounds can not be predicated of a static substance, nor can they be treated as qualifying the mental state of a subjective percipient. They are equally recalcitrant to analysis in terms of a mechanistic philosophy, as they can not be exactly located with reference to the hearer, nor do they exhibit discrete parts. Sounds have a protensive unity such that dynamic temporal factors must be used for their systematic analysis. Such material is therefore quite unsuitable for inclusion in discussions of perception which accept the classical metaphysical presuppositions.

Philosophical theory has excluded temporal experience and social relations because its metaphysical concepts are static and dualistic. Theorists have concentrated upon the

objective spatial relations exhibited between inanimate objects. It is impossible to study auditory perception without relating it to the temporal and social modes of experience. Persons who study auditory perception must therefore be prepared to replace the dualistic metaphysics with a monistic or polydimensional theory. This will involve a reorganisation of our notions of the relative importance of space and time, and a re-assessment of the Newtonian point of view, and of theories based upon it, relating to the structure of the physical universe and man's experience of it.

There is a suppressed premise which influences people's views about the relative importance of the various forms of perception. This has had a strong influence on philosophical theory. It is the belief that man's most important senses are those that inform him about inanimate objects in his physical environment. As a theorist man considers his fellow creatures merely as bodies which may be seen and touched. This point of view is admirably stated by Professor Price in the opening paragraph of his paper, "Touch and Organic Sensation".[1]

"Of the traditional Five Senses, it would be generally agreed that sight and touch are by far the most important.

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[1] Aristotelian Society Proceedings 1943-1944.

A being who lacked both of them would have no consciousness of anything which could be called a material world, however acute and well-developed his senses of hearing, taste, and smell might be, while a being who possesses either sight or touch, even though not both has the means of becoming aware of the material world, and he is still capable of being aware of it, even if he has no senses of hearing, smell, or taste at all. Thus the theory of knowledge, so far as it is concerned with sense-experience is primarily a theory of sight and touch."

What underlies the notion of importance in this statement? It is the scheme of values implicit in the doctrine of scientific materialism. The central concept is "that which has greatest significance for us when dealing with inanimate objects of the environment."[1] A point which should be noted

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[1] Compare also this passage from Norman Kemp Smith, "Prolegomena to an Idealist Theory of Knowledge", p.35:
"Through sound we learn of movements, threatening or helpful, throughout the whole extent of a very wide environment, and are able to determine whether they are near or distant. But it is in sight that the admirable effectiveness of Nature's devices is most apparent. For through sight we apprehend the external world in a personal perspective which defines at a glance the spatial three-dimensional relations in which objects stand to the body."
The statement of a similar point of view can be found in Stout, "Mind and Matter" p.236, and C.D.Broad, "Mind and its Place in Nature", chapter vii.

in this context is that the information given by visual and tactual perception is only of minimal importance in, for example, the scientific field. It is what the perceptual datum symbolises, the 'thought about perception', its relational significance, that counts. Perceptual factors have become integrated with intellectual and practical concomitants before they become the initial data of scientific research.

The assertion that a being who possesses either sight or touch has the means of becoming aware of the material world may be challenged. Could such a being abstract from the welter of sheer sensation which his senses record? If so, would he be capable of creating an adequate symbolism for the expression and elucidation of his experience? Studies of deaf children suggest that they see more and observe more accurately than the normal child, but that they have no power of concentration. They do not combine their visual sensa into perceptual unities similar to those of normal people. Thus when the Ewings declare: "No other physical handicap, except mental derangement, and no form of class distinction can isolate so completely as deafness and dumbness,"[1] they are probably thinking not only of the social isolation which lack of language imposes, but also of a mental isolation imposed by a difference in perceptual experience. The deaf child lives

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[1] I.R.& A.W.G.Ewing, "The Handicap of Deafness" (Longmans Green 1938), p.206.

in the community of hearing persons. Yet he groups his visual sensa in patterns which differ from the norm. It seems, therefore, improbable that a being, or a community of beings, possessing only sight and touch would have an experience of the physical world analagous to our own.

Philosophers and other research workers in the linguistic field have either ignored or grossly underrated the importance of hearing in the acquirement of language, and the development of the mental faculties. Not only does deafness impose limitations on and retard the acquirement of vocabulary, but the very structure of language is difficult to understand for those who have to acquire it by means of written symbols. In a discussion of the education of children who are so deaf that they can not acquire speech and language in the normal manner, - classified as Grade III - the following paragraph occurs:

> "The interested layman who visits a school for Grade III pupils is surprised to learn that even among the brighter children who have been in attendance from age five to age sixteen years, many are unable to read with full comprehension the general articles or reports in a popular newspaper. The drift of a passage in a story may be appreciated, but few Grade III children at the end of their schooling have the reading vocabulary or the

conception of sentence structure that is possessed by the average child of ten years of age with normal hearing."[1]

Writers on linguistic matters have overlooked the importance of oral speech in the development and structure of language. An interesting piece of research might be done upon the influence of the invention of the printing press upon European culture with particular reference to philosophic modes of thought. Philosophers admit speech as a distinguishing characteristic of man, then they conveniently forget about its oral qualities. They consider language in the form in which it is least distinctively human. A "thinking machine" can do algebra and give correct answers to many questions. It can not reply in a voice the tones and inflections of which are distinctively human. Modern man has become a print-ridden maniac. Even Professor R.A.Wilson, who is one of the few persons who have stressed the sound origin of language in a philosophical treatment of the subject, writes:

"In oral speech there was no means of raising a fixed objective structure that would preserve the vanishing time sequence of things and events in an ever-accumulating non-vanishing present, as the nature of conscious developing

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[1] "Pupils who are Defective in Hearing". Report by the Advisory Council on Education in Scotland, 1950, p.46, para.164.

reason demands. In the activity of reason as we see it elaborating its own world to-day, in the written or printed symbols of language, the significance of the natural world is being steadily gleaned from its vanishing stream, and being stored up in a non-vanishing continuously present world."[1]

This seems to express a peculiarly modern point of view. The printing press was only discovered in the fifteenth century. If oral speech could not preserve the passing events of the moment how are we to account for the folk-lore and song which is the inheritance of every race and stretches back through endless ages of time? Modern man has lost the power of retaining in oral memory data presented in auditory form. He assumes moreover that such a faculty was never important to men's cultural development. Such an assumption is not consonant with established facts. There is also the possibility that it is merely an historical accident that writing has been the first discovered means of making some permanent record of the transient content of spoken language. It may yet be succeeded by some sound-recording method which will reproduce more than the bare minimum of meaning content.

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[1] "The Miraculous Birth of Language", by R.A. Wilson, (Guild Books no.213) p.175.

In some parts of Scotland, notably in the Hebrides, we have the example of a bilingual people who in many cases have a purely oral knowledge of Gaelic but can read and write as well as speak English. On the evidence presented in philosophical treatises upon language one would expect to find that that language of which they have a visual knowledge would be to them a more useful and expressive medium of thought. Yet the opposite appears to be the case. There must be some theoretical reason for the dominance of the belief in the primacy of the visual form of language over its oral form. It would appear to be the outcome of the dominance of vision in theories of perception.

Persons who accept the 'status quo' in perceptual theory consider that a study of auditory perception is valueless and slightly ridiculous. They think that hearing is an unimportant element in human experience. They reject as nonsensical any account of auditory perception which can not be directly translated into visualist terms. A study of the visual experiences of persons fully acquainted with both oral and written language is capable, they think, of giving an adequate account of perception as such. Such persons maintain that if hearing and sight represent two different types of perception, and a satisfactory analysis of auditory perception is obtained, this will not affect perceptual issues in general.

Yet hearing is as much a perceptual activity as seeing. Unless philosophers consciously admit that they are prepared to deal only with that form of perception which relates to visuo-spatial extension, they must examine auditory perception. To distort the data of hearing by interpreting them in visuo-spatial terms is as impracticable as it is useless.

It is not merely in the philosophical field that auditory perception is considered to be less important than visual perception. If you tell a random selection of normal people that the loss of hearing is a greater handicap than the loss of sight the majority will deny it. One reason why the loss of vision is considered to be a greater handicap is because this disability is visually evident to other people. Similarly the loss of a limb is considered by many to be a greater misfortune than some form of illness which leaves the outward structure of the body unimpaired. These valuations are based upon unexamined visual evidence. There are some cogent psychological reasons for them. They illustrate, however, the extent to which vision dominates our day-to-day experience.

We are always willing to help a blind person, and will use much verbal ingenuity to inform a blind friend of what is happening in his environment. The deaf, on the other hand, are social outcasts. After a few unavailing efforts to make ourselves understood, we shun meeting a deaf neighbour. The

normal person tends to accept deafness as an insurmountable barrier to social relations. He probably comforts himself with the thought that the deaf person can move about freely and enjoy the spectacle of the passing scene. If a comparison is made between the deaf and the blind in terms of mental and emotional strain, capacity for social enjoyment and personal fulfilment, the deaf must be admitted to be much more severely handicapped. It is relatively simple for a blind person to 'use' the eyes of a companion, especially if he has previously had his sight. There is no such simple substitute for the lost hearing of deaf ears. Even the most efficient lip-reading and the power to talk fairly normally, - skills which the deaf person can acquire only by considerable mental effort, - give merely the minimum requirements for communication. Such means of communication convey only a fraction of the total significance of spoken language as heard. Sound, which is the missing factor, is one of the subtlest emotional stimuli in personal communication. The dictum that 'It is not so much what you say as the way you say it' is a statement of a profound truth.

Those persons who dogmatically maintain that visual perception is the only type of sensory experience worthy of consideration must face the fact that through vision alone no

knowledge of language and no form of communication above the level attained by the higher animals is possible, without special training by members of the normal hearing community. When epistemology and perception became central issues in philosophical discussions, a materialist and mechanistic philosophy of nature was current. Thus the investigation of our ways of knowing inanimate objects, or perhaps more specifically, the investigation of the relationship between visual data and the physical environment has been prominent. This has focussed attention on spatial extension to the exclusion of all else. Philosophers have admitted that speech is the distinguishing characteristic of man. The extent to which the vocal and oral aspects of speech influence and stabilise human behaviour has not been considered.

If visual perception is the most important form of awareness we should expect that the congenitally blind child would be less able to achieve normal mental and social development than the congenitally deaf child, other things being equal. There is some variation in the evidence collected from many different sources in various countries regarding the degree of retardation caused by total or partial loss of sight or of hearing, but in all cases the degree of retardation which deafness imposes is assessed as greater than that which

blindedness imposes on the development of a child. If the sensory disability is contracted after the acquisition of language and normal thought processes, the seriousness of the handicap which the loss of auditory stimuli imposes will not be so severe. In the social field, however, it will be very acute.

The mental life of congenitally blind persons of good intelligence is very rich and varied. They are often facile verbalisers who use visual terms with an ease and correctness which makes us forget that the conceptual content of these terms is not the same for them as for the normal person. It would appear from this that they are able to compensate for their lack of visual imagery in other forms of experience which the normal person probably possesses but does not develop to the same degree. The deaf, on the other hand, are not able to compensate for their loss of auditory imagery with such facility. There are very few deaf persons who develop as wide a range of interests and as varied an approach to specific problems as the normal person. The congenitally deaf child's education consists mainly in teaching him means of compensating for his loss of hearing by substituting an other set of sensory symbols for the sound symbols normally significant in linguistic communication. He does not, in the absense of verbal symbolism, develop any other symbolism

of the same abstractive and expressive power. He therefore lacks one of the chief incentives to thought. He lacks also the mental discipline which verbal communication provides. A child's emotional and social orientation as well as his mental development are severely handicapped by the lack of auditory perception. This is because the human voice has a strong emotional appeal to which, from a very early age, we normally react quite unreflectively.

The magnitude of the handicap which deafness imposes can perhaps best be realised by considering the educational problems to which visual and auditory abnormality give rise. In a report of the Advisory Council on Education in Scotland made in 1950 the general attitude towards visually handicapped children is that they are perfectly normal expect that they lack one sensory faculty. The Report states that it is evident that "the group as a whole require an educational service as diverse in method and content as that provided for sighted children."[1]

In a report made by the same body on "Pupils who are Defective in Hearing" there is no comparison drawn to the normal educational programme. The lack of auditory perception creates a problem-situation not merely in one isolated field

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[1] "Pupils who are Defective in Vision", p.19, para.49.

of activity, but in every field. The Report quotes those who have made a study of hearing disability as being unanimous in asserting that hearing loss is more highly correlated with educational backwardness than is any other of a large number of physical conditions.[1] Studies of the intelligence of deaf children using non-verbal test material give the approximate average intelligence quotient as 90. Evidence suggests that the blind, on the other hand, are only slightly inferior to the sighted. There are many among them who have superior intelligence. It is estimated that on account of the slowing up of the reading process for those using braille the average blind pupil is retarded in attainment by two years, whereas the deaf child of sixteen is estimated to be at least four years retarded.

Some people may object that it is only because our educational methods depend so much upon verbal understanding that deafness appears as such a severe handicap. It is not however merely lack of verbal facility which deafness imposes. It limits experience. The deaf have difficulty in fully comprehending the motives of others, and also in finding an adequate means of expressing themselves. They lack opportunity to learn from the wisdom of others, and to share fully in

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[1] cf. Burt, C., "The Backward Child". University of London Press, 1937.

common social experiences. Effective two-way communication is the boon which auditory perception bestows upon man. So far we have not evolved any substitute for verbal speech of a comparable range and effectiveness. The Report states:

> "Controversies exist about the place of speech in the education of the deaf, but there can be no doubt about the need for language. The means may be in question, but there can be no disagreement regarding the obligation of society to provide some comprehensible and integrated system of communication that is richer in meaning and more adaptable than gesture. To enter into the heritage of human life, even at the most impoverished level, it is necessary to possess an instrument for understanding the thoughts of others. To take an active share at a minimal level in the life of any human group, it is necessary to have some power of communication."[1]

It is not merely a child's capacity for formal education but his entire social and cultural well-being which is handicapped by defective hearing. The testimony of one who is both blind and deaf corroborates the view that lack of auditory perception is a more severe handicap than lack of visual perception. Dr. J.Kerr Love quotes a letter which

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[1] "Pupils who are Defective in Hearing", p.30, para.109.

Helen Keller wrote to him on March 31, 1910 in which she says:

> "The problems of deafness are deeper and much more complex, if not more important, than those of blindness. Deafness is a much worse misfortune. For it means the loss of the most vital stimulus - the sound of the voice that brings language, sets thoughts astir, and keeps us in the intellectual company of man."[1]

That auditory perception is essential for effective two-way communication between persons may be admitted, while the assertion that it is therefore an essential factor in mental and intellectual development is still doubted. Evidence taken from other fields supports the contention that auditory perception is the sensory faculty most closely associated with normal thought processes. Psychiatrists working upon visual and auditory hallucinations have produced evidence which suggests that auditory perception is more intimately connected with the higher brain centres than visual perception.

> "Generally speaking, visual hallucinations are characteristic of the acute, and auditory hallucinations of the chronic, psychosis, and owing to their greater tendency to become chronic, the latter are of more grave prognostic significance."

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[1] Quoted from J.Kerr Love, "Deafness and Common-sense",p.55. (Muller 1936).

"Compared with the visual sense, language, and therefore the spoken word has a much closer contact with our inner life, our thoughts, our emotions, our desires, and endeavours, and it provides the most intimate contact with the minds of our fellows. These are important factors in making auditory hallucinations highly significant to the patient...."[1]

Drug intoxications and other cases of acute delirium tend to produce visual hallucinations, whereas auditory hallucinations are associated with the more chronic states of mental disorder. The incidence of deafness among the insane is high. Amongst primitive people and less well educated civilised persons it is fairly well established that visual hallucination is more common than auditory hallucination.

It might be maintained that it is the importance of verbal language for thought that makes auditory perception appear to be more closely connected with the higher mental functions. The linguistic issue is of secondary importance to the discussion, since auditory perception is more essential for linguistic understanding than visual perception. To stress the importance of language, therefore, does not weaken the

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[1] "The Significance of Auditory and Visual Hallucination", pp.12 & 15. Paper read before the Section of Neurology and Psychiatry at the British Medical Association meeting in Aberdeen 1939, by P.K. McCowan, Physician Superintendent, Crichton Royal, Dumfries.

assertion that auditory perception is of fundamental importance for mental processes. Similar evidence could be gathered from anthropology, linguistics, and other sources in the field of social relations.

Much of the material in this preface is directly concerned with social relations. The fundamental question is whether or not these types of experience are to be considered as of greater or less importance than the knowledge of inanimate objects. The study of social relations must include the study of our awareness of other environmental factors, whereas the study of objects in space cannot be stretched to cover social and temporal modes of experience. In the past the perceptual bases of social communication have been ignored because vision has been accepted as the perceptual paradigm. If we admit the importance of social relations then we must admit the necessity for an adequate study of auditory as well as of visual and tactual perception. The student who accepts perception as a social phenomenon may neglect existing perceptual theories with impunity. They are based exclusively on vision and touch, and refer to a dualistic metaphysic which verges upon a solipsistic interpretation of experience. Other persons are merely presumed to exist, they are not an integral factor in the theoretical structure of classical metaphysics.

We must allow the solipsist to remain undisturbed in his visuo-spatial world, and only deny him the benefits of language. Any philosopher, however, who admits the reality of social experiences cannot consistently deny that there is more in perception than 'meets the eye'. He can no longer reasonably accept vision as the only sensory experience worthy of attention, but must allow that the study of auditory perception is not only valuable but essential for a proper understanding of the problems involved in modern linguistic and epistemological research. If this Preface has persuaded the reader that an examination of auditory perception is not only valuable in itself, but essential for the furtherance of perceptual and epistemological research, then it has served its purpose.

P A R T I.

THE CLASSICAL THEORY OF PERCEPTION.

THE PERCEPTUAL PROBLEM

The problem of analysing and describing perception is one with which philosophers have always busied themselves. Moreover perceptual problems cannot be treated in isolation from other branches of philosophy. Since the European philosophic tradition accepts a dualistic schema as the basic presupposition upon which to build a metaphysical theory, the problems of perception are stated in dualistic terms. Thus the subject-object relation is regarded as being fundamental in the structural pattern of experience. Knowing is then conceived as a relation between the subject who perceives and the objects which are known. Such an interpretation of the knower-known relation is the basis for a mechanistic theory of perception. This presupposes that a subject-predicate form of analysis is suitable for dealing with all types of data, and not merely with abstract logical material. In perceptual analysis the dominant concept is that of primary substances in which attributes inhere. Thus theorists separate the discussion of perception as it relates to the material world from its discussion as it relates to mental processes. As Whitehead writes:

"All modern philosophy hinges round the difficulty of describing the world in terms of subject and predicate, substance and quality, particular and universal. The result always does violence to that immediate experience which we express in our actions, our hopes, our sympathies, our purposes, and which we enjoy in spite of our lack of phrases for its verbal analysis. We find ourselves in a buzzing world, amid a democracy of fellow creatures; whereas, under some disguise of other, orthodox philosophy can only introduce us to solitary substances, each enjoying an illusory experience: "O Bottom, thou are changed! what do I see on thee?""[1]

Most perceptual theories are controlled by the concept of the physical object. Thus they are essentially materialistic. In the application of Medieval logical concepts to empirical data, the subject-predicate dichotomy, which is the corner-stone of formal logic, becomes metamorphosed into the distinction between a percipient subject and physical objects. We do not have any direct awareness of physical objects in hearing, smelling, or tasting. Thus sight and touch are accepted as the most important senses, since they alone can be analysed in terms of the prevalent theoretical categories.

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[1] Whitehead, "Process and Reality" (Cambridge University Press 1929), p.68.

When perceptual theorists limit the field of their studies in this manner two distinct problems become fused. There is the problem of the nature of physical objects as external independent entities in the physical world. There is also a problem involved in defining the structure and content of perceptual experience as a subjective process. In many so-called perceptual theories the study of perception is undertaken only in so far as it may suggest a solution to the former problem. Since no distinction is made between the two problems, theorists have failed to realise that concentration upon physical data and their conceptual correlates may lead to an inadequate view of the general structure and content of perceptual experiences. Even the structure and function of those perceptual experiences such as sight and touch which directly affect our experiencing of physical objects may be distorted. A mechanistic analysis of these forms of perceptual experience appears to be just such a distortion.

In modern theories of perception some form of epiphenomenalism is often accepted as a satisfactory account of the experience. Such a view presupposes a mind-body dichotomy and is really an attempt to analyse the contents of mental awareness on a mechanistic basis. One cannot satisfactorily

explain the interrelation between the two diverse fields of mental and physical experience in epiphenomenalist terms. Moreover the fact that the fields are diverse is an empirical postulate. It is not grounded upon any metaphysical distinction inherent in the epiphenomenalist view.

In a mechanistic account of the content of perception, and in an epiphenomenalist account, the whole of experience is interpreted in the spatialised detemporalised categories which are effective for analysing the content of visual experience. It should be noted that scientific accounts of sound-perception depend upon interpreting the auditory data in terms of their visual correlates. Likewise tactual perception is usually studied with reference to our visual apprehension of the world. Thus every type of perceptual theory is based upon a visualistic account of the content of experience. Such an account cannot explain the most characteristic features of auditory, tactual, and kinaesthetic perception. Thus it seems necessary to inquire if there is a common genus 'perception' of which these various types of experiences are the species. It may be that the notion 'perception' is merely an omnibus term. If so, to seek a general theory of perception relating to its various species is folly.

All experience gives us an acquaintance, however vague,

with the passing of events. The apprehension of this duration is more than a sheer feeling. Mere organic sensation gives us no idea of a time preceding or succeeding the present. Perception may be described as that faculty or process, - it is so fundamental that we do not have a linguistic term of sufficient generality to describe it, - by means of which we obtain the apprehension of duration. This is its most fundamental and universal characteristic. Every particular type of perceptual activity is a specific and restricted form of this awareness. We apprehend the inter-relations of sight, touch, hearing, smell, and taste only in so far as they are temporally related. Each gives us an awareness of events which succeed and overlap one another. The fact that some forms of sensory awareness also give us an apprehension of spatial extension is less significant for a general inquiry into the structure of perceptual experience.

Perception tends to become fused with sensing and with thinking. Thus one of the main problems of perceptual theory has been to distinguish them. If we accept temporal awareness as the most fundamental characteristic of perception it is possible thus to distinguish perception from sensing. In sensing we appear to apprehend something instantaneously.

In perceiving we apprehend something within a discriminable duration. In perceiving, not merely an isolated datum, but a synthesis of data with their relata, form the content of the experience. We have an awareness of structural elements by means of which emphasis is placed on some parts of the data while the remainder become recessive factors in the total experience. These structural elements may be very simple. For example, we see a circular disc against a blue cloudless sky, whereas we could only sense a visual 'something'. We hear the chirrup of a grass-hopper against the hum of noise which is an ever-present feature of the environment, where we could only sense an intensification of pitch and volume, i.e. a discriminated noise. The fact that the data of perception are presented as having individualised character implies that there is an element of interpretation, a rudimentary symbol-using activity implicit in every perceptual process. Sensing is a less highly organised activity not differing in kind from perceiving but occupying a shorter temporal duration and giving a less detailed apprehension of environmental factors. When we speak of sensing being an instantaneous awareness of data, we are using the term 'instantaneous' in the sense in which it is equivalent to 'a minimum duration of time'. It is only by reflecting upon the content of sensory awareness

that we apprehend it as composed of individualised entities discriminated from other environmental factors.

Perceiving is often described in a manner which makes it equivalent to thinking. Professor Price, for example, defines it as "My being perceptually conscious of a material thing". In every perception there are two essential factors. (1) There is duration, and (2) there are relations between 'parts'. These relations may be both internal and external to the 'focus' of perception. In theories which describe perception in spatial terms both the temporal components and the relata are described as mental additions. Such an analysis cannot allow the existence of a non-conscious synthesis of sensory material. Hence perceiving becomes identical to thinking.

There is a conscious use of symbols in every thought process. We symbolise experience in a definite manner because we are aiming at the clarification of some specific problem. What Whitehead terms the 'subjective aim' which transforms the subject into a 'subject-superject' is thus an important factor in thinking. Moreover the subjective-aim may be reflected back into the data of the initial experience causing a distortion in the interpretation of the relation between the factors inherent in the data and their symbolic representation. Thus thinking is subject to error on account

of its conscious purposive content. Perception does not imply consciousness although it includes temporal and relational factors.

Sensing is an instantaneous awareness of environmental factors which, when we reflect upon its content, appears to give us an awareness of a specific sensum on each occasion of sensing. Perception has a durational content such that we apprehend a unitary percept, unified by the symbolic synthesis of sensory and relational factors. Its parts are distinct sensa if considered in abstraction from their temporal setting. In knowing we have the awareness of unitary percepts together with a negative judgment which is affected by the content of the subjective-aim. Thus we might differentiate between sensing, perceiving, and knowing by stating that sensing is concerned only with present experience, perception with a synthesis of present and past experiences, while knowing includes also a reference to the future and therefore to potential as well as to actual factors in experience. It is the reference to potentiality which introduces the possibility of error.

The verb 'to perceive' is often loosely used in a sense which makes it equivalent to 'to see'. This usage is the result of analysing all forms of perception in static, dualistic terms, and of taking vision alone as the perceptual

paradigm. It is possible to substitute 'visual datum' for 'percept', and 'seeing' for 'perceiving' throughout the entire discussion of many 'general' theories of perception without becoming involved in any ambiguity.

The problem with which the perceptual theorist is now faced is to determine the extent to which theories of perception are misleading because they depend upon the acceptance of metaphysical concepts which are no longer acceptable in modern philosophical research. The aim of the succeeding sections is to illustrate that not only do the existing theories presuppose a dualistic metaphysic but that the problems with which they deal are essentially those inherent in the materialist, mechanistic philosophy of the seventeenth and eighteenth century. The extent to which visual experience has dominated perceptual theory will be evident if we trace the development of perceptual theory in the philosophical writings of Descartes, Locke, Berkeley, Hume, and take a representative selection of modern writings on perceptual topics. It should be noted how visualistic modes of thought become dominant as successive theorists attempt to state what is consistent with sensationalist presuppositions in earlier theories. There are signs of the development of a complementary theory based upon the feeling elements in the total experience, but this lies outside the main trend of philosophical speculation.

The dominance of visual experience in classical Greek philosophy is so wide-spread that no detailed discussion of it is necessary. Plato, Aristotle, and Democritus use 'eidos', which literally means 'aspect', or 'thing seen', to designate the essence of things. Not only their perceptual theory , - which is not an isolated branch of study and does not present many problems for them, - but their metaphysical, cosmological and mathematical theories are based on visual experience. This is not surprising, as Greek philosophy is essentially aesthetic in character and the visual arts are rivalled only by literature as an expression of the Greek genius for aesthetic creation. Time is of little importance for ancient thinkers. Aesthetic values are above time. Time is significant only in a negative sense as that in which decadence occurs. The Greeks value the finite, clearly delineated, static, instantaneous awareness of significant forms. Thus perceptual problems in the modern sense are unknown to them. It is not until Descartes' explicit statement of the subjectivist predicament that the problems of perception become of major importance in philosophical research.

THE METAPHYSICAL BASIS OF DESCARTES' PHILOSOPHY

Descartes has been called "The Father of Modern Philosophy". His importance in philosophical inquiry rests not upon the solutions which he suggested to various problems, but upon the fact that he is the first thinker clearly to state the fundamental epistemological problems created by the empirical approach to nature and the new emphasis upon the importance of the individual person in seventeenth century speculation. Aristotle holds that matter and form, the material and the spiritual, are two aspects of the real which can be separated only by an act of abstraction. Descartes separates the two absolutely.

Descartes' speculations are controlled by the idea of substance, that which requires nothing but itself in order to exist. He starts, moreover, from two totally unrelated kinds of substances. There is matter, the essence of which is pure extension, complemented by a spiritual substance, the essence of which resides in pure thought. This dualism is the central crux of Descartes' metaphysical system. He represented it as the outcome of his theory. In fact it is one of the basic presuppositions of his metaphysics.

Historically the separation of man from nature, and of the spiritual from the material, is the outcome of Christian teaching about the value of the individual human soul. Stoicism fostered the subjectivist attitude by emphasising the personal as distinct from the social and civic virtues discussed in Greek philosophy. Descartes' philosophy, although he claims to be basing it upon the dictates of pure reason, owes much to current scientific thought, especially that of Galileo, and to the Medieval thinkers. The external form of the problems raised by Augustine about the subjectivity of knowing in terms of a representative theory of knowledge, are almost identical to the problems which Descartes discusses. Augustine holds that all knowledge must be given through a knowledge of the self. He therefore postulates the 'cogito ergo sum' as the sole certainty for knowledge. His main problem is how mental images afford us knowledge of that which is non-mental and extended. Descartes presses this problem one stage further back by questioning how it is possible for material and spiritual substances to interact. His problem is how any change in the material universe, or in the percipient's body, can occasion a correlative change in spiritual substance, or in the percipient's mind. This problem is intensified by his

use of the mathematical method, of which he is the originator, and his mechanistic view of Nature.

> "Nature is thus not merely dehumanised but also despiritualised, and becomes the direct opposite of the mind. All that is asserted of the one must be denied of the other. Matter is extended, infinitely divisible, purely passive; mind is unextended, indivisible, active. Matter as being in space has all its parts external to one another: mind as being out of space has its whole content within itself. Each extended thing is dependent on what is beyond it: the self is independent of all else, and self-sufficient. This dualism has been named the Cartesian dualism, not because Descartes invented or discovered it, but simply because in him it gained its most thorough and perfect expression. It was involved in the scientific and general thought of his time, and to it, as the then ascertainable truth about the self and nature, he had to adopt his thinking. He starts from this dualism, and his special metaphysical problem is to determine how under these conditions knowledge is possible."[1]

Descartes, starting from a dualistic stand-point, is forced to adopt a representative view of perception, and to

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[1] N.Kemp Smith, "Studies in the Cartesian Philosophy", (McMillan, 1902), p.12f.

accept the 'cogito' as the only certainty for knowledge. Moreover, he accepts a subject-predicate mode of analysis which creates a schism within the mental and material realms themselves. The mind reflects upon its own activities which may be predicated of it. It also intuits images of external objects. There are also two external worlds. One is the object of sensation. The other is predicated by thought and is composed only of matter and motion. These distinctions are the outcome of Descartes' use of two opposed methods of analysis, the mathematical and the subjective, which he attempts, quite irrationally, to coordinate.

We have considered those elements of Descartes' thought which he acquired from his predecessors, and from the 'intellectual climate' in which he found himself. A point of some importance in understanding the philosophy of the seventeenth century is that thinkers had then no concept of development or evolution. They had only the idea of composition which implies a distinction between the simple and the complex. A complex is regarded as the mere sum of its constituents. These are not thought to have been modified in being combined. Hence the importance placed upon the discovery of the nature of simple individually existent entities. Descartes believes that it is a failure to apprehend the correct data, and to discern the true arrangement of the parts, which leads to false knowledge.

Descartes holds that there is no connection between certain knowledge and that which is merely probable. Thus his main rule of method is never to accept as true anything except that which is presented to the mind so clearly and distinctly that it is certain and indubitable. In mathematics we have such knowledge. Thus he proposes to separate mathematical reasoning from its content in order to determine the structure of pure intellectual thought. Now mathematical reasoning starts from the acceptance of a set of self-evident axioms. Descartes, therefore, seeks to base all his reasoning on clear and distinct ideas. This leads to his method of doubt, and to a distinction between reason and perception or imagination. In applying the mathematical method to concrete experience Descartes has to assert that knowledge is given only by a clear vision of the intellect which he terms an intuition. Intuition instantaneously grasps both individual facts and the relationships existing between them. The instantaneous intuition of relations is a necessary presupposition of the acceptance of the 'cogito' theory.

Descartes' evasion of problems connected with duration and change is an example of the effect which the acceptance of a theory of composition in place of some conception of dynamic process had in seventeenth century thought. His attempt to apply the mathematical method to problems of existence is one form of this. His emphasis upon clear and

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distinct ideas is also based upon it. The extent to which the idea of substance, as an enduring identity, controls Descartes' metaphysics illustrates the lack of temporal factors in his system. Matter is defined initially as pure extension without reference to force, energy, or change. In interpreting the 'cogito' he concludes from the fact that he is a thinking being, that there is a soul-substance, or mind, which is instantaneously transparent to thought. Space is described as a form of pure extension which can be analysed atomically. Time is also described atomically, but whereas space is conceived as a substance, time is only a mode. Its parts do not depend upon one another and never coexist. The importance of the instant in Descartes' philosophy is one aspect of the dominance ofcomposition in place of an evolutionary theory. Jean Wahl comments thus on the importance of the instant in Descartes' philosophy:

> "At each important step of his philosophy, from the cogito and the transmission of light to the creation of God by himself, we find actions that happen in the instant rather than in time: for Descartes is afraid of time, since, according to him it is related to memory which may be fallible. And this importance of the instant is easily seen by intuition, that is a state of mind that takes place in a single moment."[1]

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[1] Jean Wahl, "The Philosopher's Way", (O.U.P.1949), p.92.

The importance of intuition in Descartes' system, and its relation to mathematical method, can hardly be over-emphasised. The same complete lack of appreciation of temporal factors in analysing our perceptual awareness of concrete data is manifested in almost every philosophical study of visual perception. The content, arrangement, and terminology used in visual theories may differ, but a dichotomy between the percipient and what he perceives, a mathematical analysis of the external world, and a non-temporal intuitive act of awareness are presupposed.

Descartes' mathematical method cannot solve the problems of dualism and of existence. Moreover, it breaks down even as a methodological principle. Mathematics deals with implications which hold amongst a set of axioms each of which is self-evident. When Descartes applies this method to problems of existence he finds only one thing of the existence of which he is intuitively certain, that being his own existence as a thinking being. The existence of the physical world depends upon a deduction from the one certain proposition, "Cogito ergo sum". In mathematics we intuit propositions each of which carries its own evidence with it. To infer the existance of other things from the infallibility of the 'cogito' is, therefore, not analagous to the procedure

followed in mathematical reasoning. Descartes puts a gloss on this inconsistency by demanding clear and distinct ideas as the basis of his theory of knowledge. This is really an appeal to ~~the use of~~ a visual analogy to give a semblance of connection between logical clarity and existential self-evidence. The idea of substance and its modes, and the idea of cause and effect, can only be applied to existing things as they are perceptually apprehended. Descartes treats them as if they are mathematical relations. He fails to distinguish between knowledge and reality, truth and existence, and the methods of investigation proper to each. Thus he introduces into perceptual theory many insoluble problems which are still being discussed in dualistic terms today. In refusing to admit any relation between the knowable and the probable Descartes discards sensory and empirical experience as a basis for knowledge. There is then no possibility of apprehending anything other than the universal attributes of substances, i.e. pure extension and pure thinking.

Descartes tries to argue from the truth of mathematical deductions to the existence of material substance. He defines material substance as pure extension, which he identifies with space. But he cannot analyse the material

external world without referring to something other than space. Descartes has to admit motion in order to distinguish empty space from objects in space. This is not consistent with his initial dualism or with his atomic description of time as a mode of substance.

The conception of material substance as being essentially spread out in mathematical space is one which has had a potent influence upon perceptual theory. Theorists do not recognise the extent to which this theoretical presupposition about the nature of spatial extension influences their analyses of perceptual data. Theories of visual perception are mostly efforts to explain the percipient's relation to a two-dimensional mathematical space, rather than examinations of the phenomenology of sensory space and the structure of the perceptual activity by means of which we apprehend it.[1] Some persons may object that if we attempt to examine sensory space we shall have many different spaces, one for vision, one for touch, one for sound, etc.. Empirical evidence would suggest that the opposite is the case, and that it is only when we start from an 'a priori' view of space based upon Euclidean geometry that we have difficulty in correlating our sensory experiences with spatial awareness. If we had a satisfactory

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[1] Cf. quotation from J.J. Gibson, p.126 f. infra.

account of the relationships holding between visual, tactual, and kinaesthetic awareness, then the problems of space perception would lose much of their complexity. Be this as it may, it is certain that Descartes' account of the structure of material substance has had a considerable influence upon later theories of perception.

Descartes explicitly states the subjectivist predicament in his account of spiritual substance. The 'cogito ergo sum' can be interpreted in two ways. Firstly, if taken as a necessary truth of reason, it expresses a universal fact, that there cannot be consciousness without existence. But as Whitehead has written,

> "Mere existence has never entered into the consciousness of man, except as the remote terminus of an abstraction in thought. Descartes' "Cogito, ergo sum" is wrongly translated, "I think therefore I am". It is never bare thought or bare existence that we are aware of."[1]

Secondly, therefore, the 'cogito' may be interpreted as establishing the certainty of the particular contingent fact that I, in so far as I am conscious at this particular moment, must now exist. Descartes identifies the universal truth, consciousness implies existence, with the particular

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[1] Whitehead, "Nature and Life", p.90

case, I think, therefore I am. He assumes the personal identity of the subject who thinks or doubts. This implies that the thinker of this moment is the same person as the subject who thinks at another time and place. But personal identity cannot be inferred from the universal proposition that consciousness implies existence. Descartes is tacitly introducing not only temporal passage, but the idea of duration, - a succession which has some form of identity running through it, - into his system. Thus he discusses spiritual substance, the essence of which is said to be pure thought, not in terms of its formal elements, but with reference to a personal subject.

The same presupposition is found in theories of visual perception. The personal identity of the percipient subject is tacitly accepted, thus importing durational elements into perceptual theory. The content of perception is then analysed in complete independence of temporal factors. The dualism between spiritual and material substance might theoretically be interpreted as a dualism between material which is temporally organised (the mind), and material which is static and spatialised (matter). If theorists wish to exclude temporal considerations from their discussions of knowledge and perception, as some would claim, then they must be consistent about it. They should not identify

consciousness with personal self-identity. Descartes is the first to introduce this inconsistency into a mechanistic philosophical theory. It should be noted that Descartes is forced to use the idea of motion for an analysis of material substance in isolation from the percipient subject. Thus temporal elements are admitted to be inherent elements in both mental and material substance.

Descartes' interpretation of the 'cogito' proves too much when it is taken as establishing the self-identity of the thinking subject. It also proves too little. Thinking, and likewise doubting, is a transitive verb. Such verbs imply an object. We may doubt the validity of each judgment concerning an individual thing, but we cannot dispense with an object for thought. As one commentator has phrased it, "While the existence of mind is a presupposition of our knowledge of objects, objects to be known are equally a presupposition of the existence of mind." Mind does not know itself more readily and certainly than it knows the non-self. Descartes starts by assuming the existence of the objective world. This presupposition is a necessary basis for the argument that the mind needs no external stimulus in thinking.

The confusion caused by separating the object from the

transitive verb which governs it haunts the term 'perception'. 'Perception' is still used to denote 'the act of perceiving', or the 'mental image', or 'the object apprehended either directly or indirectly'. Seeing, like thinking, has attained an independent status similar to that of an intransitive verb. I can 'see' without reference to the object seen, but cannot hear without reference to the heard sounds. The natural outcome of this is that the objective content is also assumed to have an independent status. Visual theorists, therefore, concentrate upon explaining the existential status of the objects seen. This is why we cannot analyse auditory perception in terms of current perceptual theories. Sounds, which are the objective content of hearing, do not qualify an independent, static, material substance.

The separation of material and spiritual substance is the foundation of modern science. It represents an important advance in the understanding of methods of inquiry. Descartes' most original contribution to philosophy, however, is his explicit formulation of the subjectivist issue. This important insight concerning the analysis of human knowledge is negatived when it is combined with a mechanistic account of the physical world. A series of universals qualifying self-existent entities which have definite spatial and

temporal positions replaces the idea of emergent individual value. Epistemologically this view ought to lead to solipsism. A subject existing at a distinct point, in space and time cannot know other particulars. Descartes appeals to personal identity to establish the continuity of the percipient's knowing, and to a form of mental judgment (intuition) to connect the knower with the extended material universe. He has no grounds, however, upon which to base an inference to the particular by an appeal to the faculty of judgment. His theory of mind and his theory of extended material substance are incompatible. Thus the outcome of Descartes' speculations is not a unified self-consistent system. As Whitehead writes:

> "Descartes modified traditional philosophy in two opposite ways. He increased the metaphysical emphasis on the substance-quality forms of thought. The actual things "required nothing but themselves in order to exist," and were to be thought of in terms of their qualities, some of them essential attributes, and others accidental modes. He also laid down the principle, that those substances which are the subjects enjoying conscious experiences provide the primary data for philosophy, namely, themselves as in the enjoyment of such experience. This is the famous subjectivist bias which entered into philosophy with Descartes."[1]

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[1] Whitehead, "Process and Reality", (Cambridge University Press, 1929), p.221f.

DESCARTES' VIEWS ON PERCEPTION.

It is not surprising to discover that Descartes' philosophical speculations imply two irreconcilable theories of perception. The first is implicit in the "Regulae ad Directionem Ingenii", the "Discourse on Method", and the first and second Meditation. Had Descartes developed this theory he would have found that it is incompatible with his main metaphysical position. This view of perception as an awareness of 'realitas objectiva' is the basis for the different perceptual theory which is implied in the last four Meditations and in the Principles. This later view is explicitly formalated by Descartes' successors.

In the "Regulae" Descartes assumes that 'simple natures' or 'innate ideas' are the ultimate elements from which all experience is compounded. These can only be intuited as elements in the concretely real, separated out by analysis from data given in our observation of particulars. Descartes accepts sensory experience as the source of these ideas. He does not suggest any opposition between perception and conception.

Later Descartes determines to reject as absolutely false all opinions in regard to which he can suppose the least

ground for doubt. By this method he hopes to ascertain what, if anything, in his belief is wholly indubitable. Since our senses sometimes deceive us he supposes that nothing really exists such as they present. Since we may experience the same data in dreams as when we are awake he supposes that no datum of our waking consciousness is more veridical than the illusions of our dreams.

An unconscious emphasis upon visualistic modes of thought is evident in this discussion. Waking consciousness is opened to sceptical attack because its visual imagery resembles the visual illusions of our dreams. Descartes, in the Discourse, proceeds to assert that while he thus wishes to think that all is false it is absolutely necessary that he who thus thinks should be somewhat. But doubt requires a positive ground. Descartes implicitly accepts the veracity of the content of normal conscious experience when he compares it to the imagery of dreams, otherwise there would be no grounds for comparison. He then identifies the two. In discrediting the reality of our waking consciousness Descartes gives us grounds for doubting the reality of our own reflective experience of self. It too may be only a dream-image. It is because Descartes separates mental from physical substance that he is able to discredit the objective content of experience while maintaining the veracity of our

subjective consciousness of the self. This theoretical separation cannot be maintained phenomenologically.

Descartes' dismissal of sensory experience as a basis for knowledge depends upon his metaphysical beliefs concerning the nature of mental and material substances. Material substance is essentially pure extension, the sensory correlate of which is visual space. Empirically we apprehend space by attending to the position, shape, and movement of what is situated in it. But space is the surrounding medium devoid of objects. Hence we associate space with a purely mental abstraction which may be apprehended by mind although it is distinct from it. Likewise visual images are conceived as being intelligible to mind and also related to external material objects. Such visual phenomena present a means of relating the mental and the material elements of experience.

In the first "Meditation" Descartes gives a more detailed statement of the same position as he maintains in the "Discourse on Method". He writes:

> "But it may be said, perhaps, that although the senses occasionally mislead us respecting minute objects, and such as are so far removed from us as to be beyond the reach of close observations, there are yet many others of their informations (presentations), of the truth of which it is

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manifestly impossible to doubt; as for example, that I am in this place seated by the fire, clothed in a winter dressing-gown, and I hold in my hands this piece of paper, with other intimations of the same nature. But how could I deny that I possess these hands and this body, and withal escape being classed with persons in a state of insanity.....

Though this be true, I must nevertheless here consider that I am a man and that consequently, I am in the habit of sleeping, and representing to myself in dreams those same things, or even sometimes others less probable, which the insane think are presented to them in their waking moments.... Nevertheless it must be admitted at least that the objects which appear to us in sleep are, as it were, painted representations which could not have been formed in the likeness of realities: and therefore that those general objects at all events, - namely, eyes, a head, a/ hands, and an entire body, - are not simply imaginery, but really exist.....

And on the same principle, although these general objects, viz. (a body), eyes, a head, hands, and the like, a/ be imaginery, we are nevertheless absolutely necessitated to admit the reality at least of some other objects still more simple and universal than these, of which, just as of

certain real colours, all those images of things, whether true and real, or false and fantastic, that are found in our consciousness (cogitatio), are formed."

It should be noted that in the first paragraph Descartes asserts the actuality of his bodily experiences. It is by abstracting from the total bodily experience and reflecting upon certain aspects of it in isolation that Descartes is able to assert the truth of the 'cogito' while denying the reality of other forms of experience regarded in abstraction. In asserting the 'cogito' he should also assert the actuality of the external world. The body and all sentient experience originates from some form of interaction with the physical material environment.

In the second paragraph, in asserting his grounds for doubt, Descartes introduces two new elements. One is the idea of temporal duration and change. As a man he alternates between waking and sleeping. The other is the introduction of visual imagery. The objects which appear to us in sleep are "painted representations which could not have been formed unless in the likeness of realities". This supposes a perceptual and realist basis for judging the reality of these objects. But in the third paragraph Descartes makes a different assertion concerning the reality of objects. Even

if our sensory experience be imaginary we must admit the reality of other objects still more simple and universal than these. This view is an appeal to the composition theory which treats all data as static and atomic, and to the Medieval notion of substance as something existing by itself in which qualities inhere.

This quotation is interesting as it reviews in brief the development of Descartes' perceptual theories. Firstly he accepts the view that we have direct contact with "realitas objectiva" and considers changing, organic feelings. Later, on account of his acceptance of dualistic notions, he concentrates his attention upon the structure of the content of experience. Vision does not appear to be temporally organised. Its content is more detached from subjective factors and is representative of the environment in a way in which tactual and auditory perception are not. Descartes concentrates his attention upon sight rather than upon the concrete bodily senses in his later references to perceptual experience and its importance for knowledge.

In his earlier statements about perceptual experience Descartes outlines a view similar to that attributed to tactual philosophers. Had Descartes worked out the implications of accepting total bodily experiences as the basis of his epistemological theory he would have been forced to

amend his two-substance cosmology, and to realise the falsity of seeking mathematical certainty in questions relating to existence. Furthermore he could not have classified himself as a thinking substance qualified only by universal attributes. A representational view of perception is not possible without these presuppositions. Representative perception is essentially the outcome of accepting visual experience as the model for all types of perceptual and mental processes.

In the second Meditation Descartes describes the wax in terms of visual experience. He seeks to explain his notions of it in intellectual terms which are not found in the earlier discussion of sensory experience by means of which he establishes his method of doubt.

> "The perception of it [the wax] 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, which may be imperfect and confused, as it formerly was, or very clear and distinct, as it is at present, according as the attention is more or less directed to the elements which it contains, and of which it is composed..... We say, for example, that we see the same wax when it is before us,

and not that we judge it to be the same from its retaining the same colour and figure: Whence I should forthwith be disposed to conclude that the wax is known by the act of sight, and not by the intuition of the mind alone, were it not for the analogous instance of human beings passing in the street below, as observed from a window. In this case I do not fail to say that I see the men themselves, just as I say that I see the wax; and yet what do I see from the window beyond hats and cloaks that might cover artificial machines, whose motions might be determined by springs? But I judge that there are human beings from the appearances, and thus I comprehend, by the faculty of judgment alone which is in the mind, what I believed I saw with my eyes."

In this passage Descartes tacitly assumes that all perceiving and thinking processes are analogous to seeing. Few later theorists have questioned this assumption. Descartes is not doubting the actuality of the perceptual process and its contents, but their ability to function as elements in the metaphysical schema which he has presupposed. It is not their actuality but their metaphysical status which is in doubt. Instead of questioning the validity of the presuppositions on which his metaphysics and cosmology is based, Descartes doubts the reality of every form of experience which

can not be explained in terms of them. It may be noted that Locke explicitly adopts the opposite attitude towards the relative importance of metaphysical theory and empirical evidence.

At the end of the second Meditation Descartes is certain only of his own existence as a self conscious being. The existence of every other thing is doubtful. If this position is tenable then Descartes should adopt a radical scepticism as the final outcome of his speculations. Instead he inconsistently suggests that the analysis of the process of doubting, by which he became certain of his own existence, will provide a 'method of becoming certain' by the use of which we may prove the existence of other entities.

In the third Meditation, therefore, a different account of the basis of true knowledge is given. To be accepted as true a thing must be known "clearly and distinctly", - note the visual metaphor. Descartes does not explain the relationship between 'clear and distinct ideas' and the state of intellectual clarity on the one hand, or the reality of the existing external object on the other. The tenability of the view depends upon our accepting the notion that the content of thought is a series of visual pictures presented to the percipient independently of his volitions. Their

relation to external objects can only be asserted by appealing to God as the undissembling originator of ideas which attain perfection, hence also veracity, as they become more distinct. Perception, on this view, becomes a passive state. We ascertain the reality of things not by a direct inspection but indirectly by considering the contents of our mind. The whole emphasis is now placed upon the percipient's subjective state of mind. This is a natural corollary of the view that the human person is essentially a mental substance whose whole essence consists in thinking. Thus Descartes is led to assert that we have a clearer conception of thinking substance and secondarily of extended material substance than of their modes and accidents, - in one sense material substance may be accepted as a mode of thinking. The initial statement of this view is contained in the third Meditation.

> "If ideas are taken in so far as they are certain modes of consciousness, I do not remark any difference or inequality among them, and all seem, in the same manner, to proceed from myself; but considering them as images, of which one represents one thing and another a different, it is evident that a great diversity obtains among them. For without doubt, those that represent substances are something more, and contain in themselves, so to speak, more

objective reality (that is, participate by representation in higher degrees of being or perfection) than those that represent only modes or accidents; and again, the idea by which I conceive a God ... has certainly in it more objective reality than those ideas by which finite substances are represented."

The same dualistic and visualistic presuppositions are evident in the discussion of corporeal objects which follows. This position is discussed in greater detail in the Principles. In I,xi, and I,xlviii ff., Descartes associates all knowledge with his notion of substance, relating perception, volition, and all modes of knowing and of willing to thinking substance. He mentions things including sensations which 'ought not to be referred to the mind of itself, or to the body alone, but to the close and intimate union between them". Descartes does not attempt this analysis. In I,lxvi, Descartes states that we only have a clear knowledge of sensations when we consider them as thoughts, or the immediate content of consciousness. Elsewhere he gives a mechanical explanation of sensation in which motion, which he is forced to import into his system from without, plays a distinctive role. In places Descartes confuses the mind with the brain. This is another aspect of the inadequacy of his dualistic presuppositions to

explain perceptual experience. Descartes has no grounds for appealing to physiological data. These require an awareness of forms of perception not recognised within his theoretical postulates. Thus Descartes, like so many perceptual theorists since his day, bases his explanation of perceptual phenomena on the testimony of those very aspects of experience which theoretically he considers to be the least reliable.

In conclusion we may consider what elements in Descartes' philosophy influence subsequent theories. Firstly there is the dualism between mental and material substance, which, along with the acceptance of a substance-attribute schema for analysis, preserves the subject-object, and subject-predicate dichotomy. Although evolution is accepted as a basic concept in other spheres, perception continues to be analysed in sensationalist terms, and the composition theory, in which complex ideas are regarded as compounded out of a mass of simple ideas, is tacitly accepted. Such presuppositions are necessary to make the representational view of perception seem tenable. Theorists use vision as a perceptual paradigm since sight is the only sensory experience which lends itself to this mode of analysis.

Secondly, durational factors are absent from the data upon which constructive theories of perception are based. It should be noted that durational factors play a significant

part in establishing the unreliable nature of sensory experience, although they are excluded from constructive theories relating to perception.

Thirdly, the external world is analysed as pure extension and happenings in it are described in terms of a mechanistic theory from which all forms of value are rigidly excluded.

Fourthly, there is the identification of the human percipient with an abstract subject existing at an isolated spatial point in an instant of time. Reference to the personal identity of the percipient saves many sensationalist accounts of perception from complete breakdown.

Fifthly, the tacit appeal to feeling, and through it to the durational element in natural happenings, rescues the sensationalist theory from an absolute scepticism.

These points are not intended as a complete list of the factors which are common to Descartes' theory and to later perceptual theories. The various headings are not mutually exclusive, nor are they arranged in order of importance or generality.

The real greatness of Descartes as a thinker resides not in the coherence of his views, but in the insight into methodological procedures which enables him to raise fundamental epistemological issues. It is a notable fact that

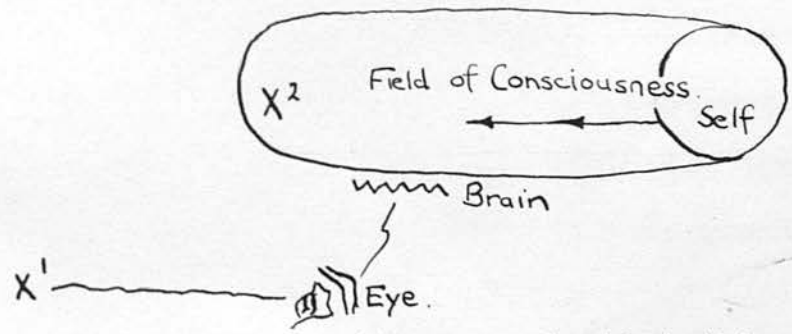
neither Descartes nor Locke develops perceptual and epistemological theories which refer only to visual experience. It has been illustrated that many of Descartes' views have a visualist bias which is the unconscious outcome of his holding certain metaphysical presuppositions. Both Descartes and Locke consider types of perception which directly refer to the protensive unity of experience, and to what Whitehead has called the "witness of the body". Their commentators, however, stress their sensationalist theories to the exclusion of all else, and sometimes make them appear to be what we might term 'Visual Positivists'. This emphasis upon the sensationalist elements and upon visual data is useful as it enables commentators to give a simple and coherent account of one aspect of these thinkers' works. It is of interest in this context, because it demonstrates the extent to which visualist modes of thought dominate our inquiries into perceptual matters. Consider as an example Professor Kemp Smith's commentary on Descartes' view of representative perception.

> "If, then, we picture the self, as Descartes virtually did, as standing over against the sensations and as apprehending them, the following diagram, in which the self, as befits a self-centred existence, is pictorially represented by a circle, will illustrate crudely, but not

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altogether incorrectly, the cognitive situation, as Descartes thus conceived it. In ordinary consciousness the self seems to itself to look out through the eye at X^1; what alone it directly experiences is X^2; and X^2 is a copy, image, or representation of X^1, constructed by the self, in the light of past experience, out of the sensations that X^1 arouses by acting on the eye, and through the eye, on the brain. X^1 is invisible. What alone can be seen is X^2; and it is not a material body, but a mental image in the field of consciousness. It may be called a representation; it represents, as by deputy, the outer, independently existing material body."[1]



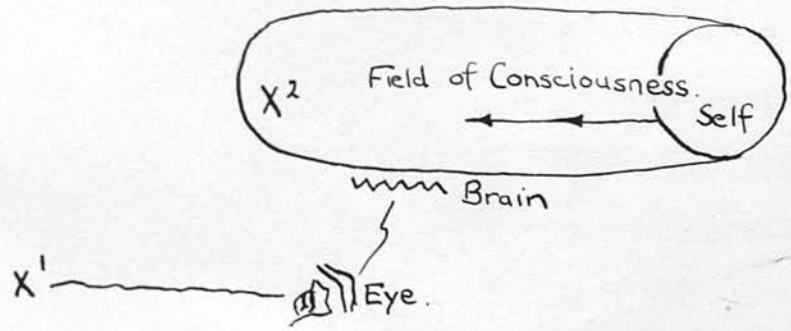
Professor Kemp Smith suggests that this statement of the doctrine of representative perception emphasises what was mainly influential in determining Descartes' attitude to metaphysical problems, especially to the mind-body problem.[2]

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[2] ibid. p.20.

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Descartes' writings do not provide evidence in support of this view. It appears that it is Descartes' metaphysical attitude which forces him into making statements about perception which can only be interpreted in visualistic terms. The passage quoted from the first Meditation is proof of the fact that Descartes himself does not start from an avowedly visualistic outlook. If however we read only the commentaries and not the original texts of Descartes and Locke we should regard the study of visual perception as one of their main preoccupations. Their theories are often based upon what is in fact a visualist interpretation of phenomena, but they do not consciously limit themselves to the study of this one type of perception.[1] Many later theorists appear to be convinced that vision is the only type of perceptual experience worthy of attention. This attitude is probably the cumulative effect of the insistent emphasis upon vision in interpreting of seventeenth century philosophy.

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[1] cf. Descartes, Principles IV,xiv. "We greatly wrong human reason, however, as appears to me, if we suppose that it does not go beyond the eyesight."

THE CONTENT AND DEVELOPMENT OF LOCKE'S THEORIES.

The chief difference noticeable between the philosophical systems of Descartes and Locke is that Locke aims at a greater degree of concreteness. He cannot consistently pursue this, on account of his acceptance of a starting-point almost identical to that of Descartes. Those parts of his work which differ markedly from the views contained in the writings of his philosophical predecessors indicate an attempt to achieve emancipation from too great a dependence on set intellectual categories and abstract notions. The main virtue found in Locke's writings is his freedom from attempts to reorganise his evidence to fit a preconceived theory. His work lacks internal consistency, but it sets a standard of empirical veracity that has seldom been rivalled by later empiricists.

Locke is the first philosopher who regards epistemology as a main philosophical issue. It is significant that he regards the problem of knowledge as a question of how we know the external physical world. This is very natural, since he is attempting to work out an empirical philosophy, in distinction from Descartes' intellectual system, in which the problem of method is considered to be the crux of epistemological

theory. The study of the problem of knowledge in relation to physical things has, however, been developed by Locke's successors, to the exclusion of every other form of experience.

Locke's account of the initial data of knowledge rests upon a dualistic interpretation of mind and matter. He connects them by tacitly accepting a form of inter-actionism. He also accepts a sensationalist view of perception. His whole purpose in the first two books of the Essay (with the exception of the last chapters which are a later interpolation), is to prove that ideas, which he accepts as the initial data for knowledge, depend upon experience. He here accepts the 'composition theory'. This places emphasis upon the discovery of the true nature of the simple constituents of experience, as complex ideas are thought to be merely a summation of simple components. In this he is following Descartes who seeks these simple natures firstly in intuitions and later in his clear and distinct ideas. Locke, however, discards Descartes' intuitionist theory and adopts a psychological and empiricist approach. His unanalysable initial data are ideas which are described as "Whatever it is which the mind is employed about in thinking" or "The object of understanding when a man thinks". These include sense-data, memories, images, abstract and general logical concepts.

This definition of ideas is highly ambiguous. Its most common interpretation is to treat ideas as being analagous to the visual images which many persons appear to use in thinking. Such an interpretation leads to much obscurity both in epistemological and perceptual theory. If we treat ideas as analagous to visual images, then we must determine the relation in which they stand to the mind on the one hand, and to physical objects on the other. This leads to the acceptance of a representational view of the content of knowledge. If such a view is accepted, then the sensory content of visual perception is analysed in terms of subjective mental functioning. This theory amounts to treating ideas not as analagous to visual images but as being visual images. Locke's doctrine of primary and secondary qualities is the outcome of holding, and at the same time attempting to escape from, the implications of such presuppositions.

Locke's doctrine of primary and secondary qualities can be interpreted in four different senses.

(1) We know primary qualities directly (i.e. solidity, extension, figure, motion, or rest, and number), and secondary qualities (i.e. colours, sounds, smells, etc.), through empirical evidence which gives us ideas, i.e. representations of them.

(2) We know primary qualities directly, and secondary qualities merely as ideas in the mind.

(3) We have ideas which resemble primary qualities and ideas of secondary qualities.

(4) We have ideas of primary qualities directly, and ideas of secondary qualities which represent powers possessed by external things which cause us to have these ideas. Those powers depend upon the primary qualities of the minute and insensible parts of the objects thus represented.

This ambiguity comes from Locke's failure to distinguish between qualities and ideas of qualities. In the end he seems to adopt the view that the ideas of primary qualities are exact representations of the qualities of external objects, whereas the ideas of secondary qualities are not direct representations of objectively existing states.

In II,viii,15 Locke states that 'Ideas of primary qualities are resemblances of them and their patterns do really exist in the bodies themselves.' He does not prove this important principle, which appears to be a development of the Medieval interpretation of Aristotle's view that tactual qualities are the fundamental elements in experience. This attitude is still tacitly held by many present-day writers upon perceptual topics.

Locke's demonstration that there are no qualities in

things resembling the secondary qualities is based upon the mutability of visual percepts. Moreover the fourth interpretation of the distinction between primary and secondary qualities, which embodies the view to which Locke seems finally to accept, depends upon his 'Doctrine of Powers'. This is not consistent with his sensationalist starting point, nor with the composition theory, upon which his original definition of ideas is based.

Although Locke is seeking for an empirical basis for his theory of knowledge he tacitly accepts much that is endemic in the intellectualist tradition and culture of his time. Thus he accepts not only a dualism, but the distinction between ideas of sensation and ideas of reflection. This ultimately leads to his acceptance of the Cartesian view of self-consciousness. He thus treats feeling as dependent upon sensations. Sensations are derived from a self-conscious mental process, being the 'object of understanding when a man thinks'. Such an explanation cannot, as Locke realises, account for all the facts. The definition which he gives of knowledge at the beginning of Book Four of the Essay as 'the perception of the connection and agreement or disagreement and repugnancy of any of our ideas" is not wholly consistent with his sensationalist starting point. On the sensationalist view ideas are absolutely distinct entities of thought which do not display

any relational connection. Ideas of sensation are universals which can be related to particular objects, or to one another, only by an intellectual analytic process. When Locke admits that such universal ideas involve relational elements, and depend upon a faculty of judgment, he has developed his epistemological theory beyond the bounds of his sensationalist starting-point.

Most commentaries upon Locke's theory deal only with its sensationalist content and with a visualist interpretation of perception and thought. This material, which forms but a small part of the Essay as a whole, is taken to be typical of Locke's contribution to epistemological and perceptual theory. An example of this is the attitude of commentators towards Locke's acceptance of the doctrine of representational perception. Many imply that Locke is the originator of this doctrine, and base their whole interpretation of his philosophical theory upon this erroneous assumption. Thus they are enabled to discuss the whole of Locke's theory in terms of visual perception and to treat ideas as analagous to visual images. Writers who attempt to describe Locke either as a realist, or, - on account of his occasional use of the term 'perception' to refer to the process of perceiving, - as an idealist, are merely reacting negatively to this visualist point of view. Such interpretations of Locke's theory are

based not upon what is most original in his works, but upon the interpretation which Berkeley put upon certain parts, and these the more conventional parts, of Locke's writings.

Locke is hindered in working out his later and more original theory by the prevailing intellectualist bias of seventeenth century thought. It is interesting in this connection to note that when Locke deals in II,xiv & xv with duration and its simple modes, he analyses the idea of duration as 'the idea we have of perishing distance, of which no two parts exist together, but follow each other in succession'. He writes:

> "It is evident to anyone who will but observe what passes in his own mind, that there is a train of ideas which constantly succeed one another in his understanding as long as he is awake. Reflection upon these appearances of several ideas one after another in our minds, is that which furnishes us with the idea of succession; and the distance between any parts of that succession, or between the appearance of any two ideas in our minds, is what we call duration. For whilst we are thinking or whilst we receive successively several ideas in our minds, we know that we do exist; and so we call the existence or the continuation of the existence of ourselves, or anything else commensurate to the succession of any ideas in our

minds, the duration of ourselves, or any such other thing co-existing with our thinking."[1]

This passage demonstrates the presuppositions upon which a view of time as being equivalent to linear space is based. To reach such a conception of temporal duration necessitates treating the content of thought as a successive apprehension of discrete ideas. Such a view of time is closely associated with the notion that the percipient subject can only be certain of his own existence. Existence implies continued endurance throughout a period of time. Since we can only know sensations as discrete entities apprehended instantaneously, their perception is no proof of their continuing existence. It is remarkable how this view of time based upon a sensationalist theory, has continued to be accepted as a background to perceptual theory.

Let us now compare Locke's account of time with his description of the doctrine of powers.

"The mind being every day informed, by the senses, of the alteration of those simple ideas it observes in things without, and taking notice how one comes to an end and ceases to be, and another begins to exist which was not before; reflecting also, on what passes within itself,

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[1] Locke, "Essay on the Human Understanding", II,xiv,3.

> and observing a constant change of its ideas, sometimes by the impression of outward objects on the sense, and sometimes by the determination of its own choice; and concluding, from what it has so constantly observed to have been, that the like changes will for the future be made in the same things by like agents, and by the like ways; considers in one thing the possibility of having any of its simple ideas changed, and in another the possibility of making that change; and so comes by that idea which we call 'power'.....
>
> Power thus considered is two-fold; viz., as able to make, or able to receive, any change:"[1]

The doctrine of power is not consistent either with Locke's earlier remarks on the structure of ideas of sensation and reflection, or with his analysis of temporal duration. The notion of relatedness is now made the central concept. The mind observes the alteration and constant change of its ideas. The ideas are treated as relational elements which are more fundamental than the mind-entity which cognises them. They cannot therefore be interpreted as qualities of the mind. In Locke's doctrine of powers we find the first vague approach to the notion that an act of construction is implicated in the transformation of data into subjective and objective

components. The unitariness of the mind requires to be explained, and also the unitariness of the experience which correlates successive perceptions and combines them in such a manner that we have an apprehension of discrete objects. Locke, and many of his successors, are hindered from solving such problems mainly because they treat self-consciousness as an element essential to every perceptual process, - an assumption which is based upon the notion that ideas of sensation are more fundamental than ideas of reflection and relation - . Also they accept Locke's account of duration, which is inadequate to account for perceptual experience.

Locke could have avoided having to assert the subjectivist character of secondary qualities had he related his doctrine of powers to the ideas of reflection. Instead he tries to explain our direct contact with the external world in terms of static extensive entities and disregards durational and relational properties. He discovers that the mind as a unity arises out of the active and passive powers whereby it correlates diverse impressions to create a concrete unity. But his acceptance of the Cartesian dualism and the subject-predicate form of statement, drives him to accept a representational theory, and to adopt the criterion that logical simplicity is identical with incipience in the perceptual and epistemological process. Hence he makes intellectual

words are names for simple ideas, and that the word signifies the idea. Thus he associates linguistic analysis with an analysis of the ideational content of mental experience. This refers to the second use of language which Locke recognises, the recording of our thought for our private use. Had Locke taken the social significance of language seriously, he might have realised that to correlate individual words with simple ideas can not explain the communication which spoken language achieves. It is noticeable that Locke's discussion of words is based upon his earlier sensationalist view of knowledge. This is unfortunate as linguistic study suffers from a similar defect at the present day. Had Locke emphasised the importance of spoken language as a means of communication and associated it with his Doctrine of Powers, emphasising the fact that words in use have the power to make or receive subtle changes in their ideational content, the development of linguistic theory might have been very different. We might by now have achieved some fairly adequate means of discussing the structure and content of verbal speech.

BERKELEY CONSIDERED AS A VISUAL PHILOSOPHER.

It is characteristic of Berkeley's position that all our ideas are reduced to the immediate impressions which things make upon the mind of the percipient. This is the sensationalist point of view which Locke accepts at the beginning of the "Essay on the Human Understanding". Locke analyses these impressions as pure sensations which have no durational character and are apprehended instantaneously. Ideas follow one another successively in the mind. It should be noted that this phrase 'in the mind' is never explicitly examined by Locke or by Berkeley. It is obviously a visual metaphor. They tend however to regard it as a statement about the structure of knowledge. It accords with the subject-object, subject-predicate dualism which their metaphysical views on substance require. The mind is the subject and ideas are the objects which can be predicated of it. From an other point of view the mind may be regarded as the active agent in perceiving. Metaphorically it is the place in which ideas exist, and to which external physical objects may be contrasted. By accepting this metaphor as a statement of the actual structure of knowledge, we separate

the ideas from what they represent. We thus impose upon our theories of perceiving the necessity of analysing all data with reference to spatial extension.

There are two distinct points of view which are based upon such a theory. The one starts from the assumption that the ideas are literally 'in the mind' and represent external objects symbolically. The problem is then to explain how the ideas can represent the extended data. Locke states the other point of view in his "Examination of Malebranche" § 18. Ideas are said to be 'in the mind' in the sense of being seen by the mind. The ideas are then accepted as a 'tertium quid' between the mind and external objects. The problem then is to state the dual relation between the ideas and the mind on the one hand, and between the ideas and the physical objects on the other. This ambiguous phrase 'in the mind' interpreted in visualistic terms, is essential in Locke's sensationalist theory and in Berkeley's idealism.

It is significant that for a considerable period prior to 1709 when his "Essay towards a New Theory of Vision" was published, Berkeley was engaged upon a study of visual perception. It would appear that at the time of the publication of the Essay Berkeley had already formulated the idealistic principle which forms the central crux of his later metaphysical writings. The Essay, however, is based upon the assumption that in tactual perception we have a direct knowledge of

actually existing, external, physical objects. As one commentator has written,

> "It is a characteristic feature of the Essay that, while one of its main designs is to show that visible objects, in the strict sense, "exist only in the mind", it is taken for granted that tangible objects "exist without the mind", and that in tactual perception we can and do become aware of external things."[1]

Professor Hicks suggests that Berkeley was not deliberately withholding the conclusion that tangible objects are as subjective as visual objects, but that "the position taken up in the Essay represents a veritable stage in the development of Berkeley's reflexion." It seems very probable that Berkeley began the Essay whilst entertaining the belief that the objects of touch exist independently of being perceived. Such a view makes the task of analysing visual percepts more simple. It can then be assumed that in vision we are dealing with "pictures" of external objects, the reality of which can be established by tactual means.

When he deals with the magnitude of objects Berkeley contends that neither this nor any other property of a

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[1] G. Dawes Hicks, "Berkeley" (Leaders of Philosophy Series, published by Ernest Benn Ltd., 1932), p.39.

material thing is immediately given in visual perception. Only colours, and not extended things, are the proper objects of sight. He assumes Locke's distinction between primary and secondary qualities, and asserts that the secondary qualities exist only 'in the mind'. The extended objective world is known by its resistance and extendedness, according to Berkeley's initial position. These are both tactual properties. Since visual experiences are habitually correlated with tactual experiences, they refer by association to properties of the external physical world. This is Berkeley's account of our visual perception of distance, magnitude, and the situation and shape of objects.

The development of Berkeley's theory of vision, as evinced in the Essay, is interesting because it runs parallel to the development of his metaphysical position. Locke took for granted that ideas and things are causally related. Material substance is the originating cause of the occurrence of ideas of sensation. Primary qualities resemble the objective world directly. Secondary qualities are effects caused by the action of constituent primary qualities upon our senses. This is, implicitly, an acceptance of the view that tactual perception gives us a direct contact with the real natures of external physical things. Berkeley's metaphysical starting point is the critical review of Locke's

notions of the relation between ideas and material substances. Locke uses ideas of sensation to mediate between the mind and the external real physical object. Berkeley's belief that ideas do not represent anything beyond themselves, is reached by his critical review of Locke's theory, and not by a constructive theory based upon empirical evidence. The initial theory is tenable only if we assume what Berkeley is now prepared to deny, namely that there is a dualism between the material and the mental factors of experience.

The parallelism between the development of Berkeley's theory of visual perception and the development of his metaphysical position may be schematically represented thus:

Visual theory.

Stage I. Acceptance of external world.

Explanation. Subjective percipient sees visual percepts. Visual percepts represent really existent external objects known immediately by tactual experience.

Stage II. Denial of external world.

Explanation. Subjective percipient sees visual percepts. Visual percepts can be correlated with tactual percepts but both are equally subjective. Such ideas are the only data of perception and all

experience consists only of such data and their relations.

Metaphysical theory.

Stage I. Acceptance of external material world.

Explanation. Knower (or percipient) knows ideas.

Ideas represent really existent material objects.

Stage II. Denial of external material world.

Explanation. Knower (or percipient) knows ideas.

Ideas are the immediate and only data for knowledge.

It should be noted that these schemes are couched in subject-predicate form. This is very important. It is the reason why Berkeley cannot work out a coherent system of seeing and knowing in terms of his later idealistic theory. He has to imply a separation between the activity of seeing or knowing, and its content.[1] Thus a shadowy 'external world' of a static visual type remains as the alternative world to which ideas which are not purely mental-states belong.

The extent to which[a] subject-predicate dualism dominates perceptual theory is illustrated by considering common-sensical notions about auditory perception, and our theoretical

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[1] cf. Luce, A.A., Berkeley's Immaterialism (Nelson 1945, p,126.

description of it. Sounds are regarded as being immaterial. It follows from this that they are independent of spatial extension and other spatial attributes. Theoretically we analyse sounds as significant of the spatial positions of visual objects. We define them, in terms of pitch, intensity, and timbre. These are all qualities which affect the distance at which a sound can be discriminated. Thus we are treating sounds as objective data existing externally to the percipient. Since sounds cannot be further associated with spatial and static data they do not receive further analysis in philosophical terms. Auditory data cannot be adequately analysed in subject-predicate form, and philosophers have no other schema in which to analyse perceptual experience.

Any specific form of perception can be studied in dualistic terms if we tacitly accept the evidence of some other perceptual experience from that which is the ostensible content of our investigations, as giving direct contact with non-mental substance. When we study hearing we use visual experience to link it with material phenomena. When we study vision we use tactual experience as a means of bridging the gap between mental and material phenomena. If we consider tactual experience we have to explain away the distinction. It should be noted that originally the distinction

depends upon a distinction between seeing and the seen content. Berkeley starts by transforming the seen content into a mental phenomenon while retaining the objective world through an appeal to touch. Later he realises that such an argument is indefensible. He then retains his conclusion without revising his premises. He has to start by accepting a mind-matter dualism in order to be able to assert that all phenomena are mental.

Berkeley's visualistic bias is evident in his criticism of Locke's theory of abstract ideas. Basically the criticism is justified, but Berkeley's criticism of Locke's theory appears to depend upon a visualistic interpretation of the term 'idea' which is not to be found in Locke's writings. It is significant that Berkeley's first attack upon abstract ideas is contained in his "Essay towards a New Theory of Vision" §122-126. and refers to visual and tangible sensory qualities. This attack on abstract ideas, if consistently pursued, would make the perception of space an impossibility. Another example of Berkeley's visualistic bias is tha fact that although he begins by accepting Locke's division of ideas into simple ideas of sense, simple ideas of reflection, and complex ideas, in his own theory he stresses the distinction between ideas of sense and ideas of imagination. This distinction makes the term 'idea' equivalent to visual image. The same is true of his dictum "esse is percipi".

I am not suggesting that Berkeley only considers visual experience, but that he analyses every form of perceptual experience as if it were analagous to vision.

There is another aspect of Berkeley's thought which is of importance for the development of perceptual theory. In his acceptance of subjective idealism he presupposes that the content of what is known is a mere succession of independent percepts. The ideas are not internally related to one another, nor are they temporally organised. Berkeley's insistence that 'esse is percipi' is a tacit recognition of the fact that no adequate account of the objective world, or of our perception of it, can be given in purely static terms. Since the content of perception is, on his view, static, he has to appeal to subjective psychological experience to introduce the factor of duration and continuity. His discussion of cause and effect illustrates this. He writes:

> "All our ideas, sensations, notions, or the things which we perceive, by whatsoever names they may be distinguished, are visibly inactive, there is nothing of power or agency included in them. So that one idea or object cannot produce or make any alteration in another."[1]

Such a view obviously depends upon accepting visual images as the content of ideas. This comes out more clearly

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[1] Berkeley's "Principles of Human Knowledge" §XXV.

in Hume's discussion of causation. We do not visually apprehend the cause of change, but merely a changing sequence of discrete visual images. These images and our ideas of them cannot be thought to occupy different lengths of time, since Berkeley defines time as the succession of ideas in our minds. He says "the duration of any finite spirit must be estimated by the number of ideas or actions succeeding each other in that spirit or mind."[1] Hence the ideas themselves are not temporally extended. It is only the manner in which they are successively presented that is temporally significant.

It would appear that no adequate account of time can be given so long as a dualism between material and mental substance is presupposed; that any account of perception in non-temporal terms is necessarily visualistic in character; and that no adequate account of experience can be given in sensationalist terms which deny its temporal aspects.

The dualism between mental and material substance, which in Berkeley's theory becomes a difference between spirit and idea, breaks down even within Berkeley's own system. Berkeley states that ideas taken as "the unthinking objects of the mind agree, in that they are entirely passive, and

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[1] Berkeley, op.cit. § XCVIII.

their existence consists only in being perceived; whereas soul or spirit is an active being, whose experience consists not in being conceived, but in perceiving ideas and thinking."[1] Berkeley therefore is driven to admit,

> "After what has been said, it is I suppose plain, that our souls are not to be known in the same manner as senseless, inactive objects, or by way of idea. Spirits and ideas are things so wholly different, that when we say they exist, they are known, or the like, these words must not be thought to signify any thing common to both natures. There is nothing alike or common in them: and to expect that by any multiplication or enlargement of our faculties, we may be enabled to know a spirit as we do a triangle, seems as absurd as if we should hope to see a sound.... We may not, I think, strictly be said to have an idea of an active being, or of an action, although we may be said to have a notion of them. I have some knowledge or notion of my mind, and its acts about ideas, inasmuch as I know or understand what is meant by those words. What I know, that I have some notion of."[2]

If we can have a notion of the soul or self why not also of space and time? This admission of a knowledge of the mind

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[1] Berkeley, op.cit. § CXXXIX.

[2] ibid. § CXLII.

which is not a knowledge of an idea nullifies Berkeley's account of time. It is also an admission of the fact that we cannot analyse the process of knowing or perceiving as merely an awareness of a succession of static objects. He has to go beyond such a visualistic analysis to account for a knowledge which is not the mere apprehension of the surface of things. Hume criticises Berkeley's doctrine of notions using the arguments which Berkeley had used in dismissing Locke's abstract ideas. Let us now inquire if Hume could justifiably force home this criticism.

HUME'S ATTEMPT TO GIVE A CONSISTENT ACCOUNT OF EXPERIENCE IN SENSATIONALIST TERMS.

The criticisms which Berkeley brings against Locke are made more explicit by Hume. Hume develops and clarifies those aspects of Locke's sensationalist theory which are the basis of the mechanistic, pseudo-scientific, modern-empiricist, and positivist perceptual theories. Hume adopts a sensationalist starting-point similar to Locke's. In so far as he ~~is~~ consistent to it, he implies that the mind is wholly passive in knowing and perceiving. The notion of a mind which passively receives impressions and ideas underlies Hume's entire system, despite his formal rejection of such an entity. Like his predecessors Hume fails to work out a wholly consistent theory of perception, without taking into account the dynamic durational elements both in the subjective and in the objective components of perception.

The data from which all our experience is said to originate are impressions of sensation. Hume alleges that we have no information of any kind regarding the origin of these impressions. Yet elsewhere he stresses the fact

that we see by means of our eyes, and hear by means of our ears, etc.. This would suggest that although the ultimate causes of impressions may be unknown they are not so completely mysterious that no attempt to analyse them is possible. Hume and his followers, however, disregard this evidence and presuppose the impossibility of analysing impressions of sensation. Presuming that this initial assumption is valid, - and reasons for rejecting such an analysis have already been suggested, - the point at issue is the discovery of whether or not Hume can work out a coherent theory without introducing mind, or durational features.

Hume states that as well as (a) impressions of sensation, we have (b) ideas of these impressions of sensation.

It may be questioned whether there are grounds for asserting any distinction between impressions and ideas if we disregard the functioning of the senses as physiological organs. The distinction is most clearly apprehended as a distinction between what we apprehend with our eyes and our idea of colour. A similar distinction can be made between what we feel with our hands and our idea of, for example, smoothness, but it is not applicable to all forms of tactual experience. Nor is it applicable to auditory experience, in which the impression and the idea are inseparable. It is

significant that we have no conscious awareness of the ears as mediating sense organs in auditory perception.

We have also (c) impressions of reflection derived from the antecedently derived ideas of impressions of sensation, and (d) ideas of impressions of reflection.

Hume starts from atomic impressions of sensation and describes substance as nothing but a collection of simple ideas united by imagination. He is forced however to introduce a principle of union relating his simple atomic data. He does not discuss the nature of this principle. In this connection, as in his treatment of complex impressions, and ideas, Hume does not distinguish between the notions of :

(a) the order constituting the complex

(b) the external efficacious cause of the order

(c) the multiplicity of simple perceptions which constitute the content or matter, as opposed to the form of the complex whole.

Hume's inability to distinguish between these arises from the fact that he has only the notion of serial order. Even this depends upon a form of awareness which is not a simple impression of sensation. In terms of serial order no demonstration of any real coherence between parts and whole can be given. The notion of serial order is, therefore,

not sufficient for an account of the inner structuring of a complex impression or idea. Hume confounds the discrete elements in terms of which we analyse complex impressions with the formal process by means of which the data are arranged to form a unique whole. So long as Hume regards the impressions as self-contained units, his complex impressions and ideas are mere agglomerations of simple entities loosely held together by some external and unknown cause. No valid account of the constitution of complex entities, - which are necessary elements in his system, - can be found, starting from, and remaining consistent to, an atomic sensationalist theory.

Whitehead describes Hume's philosophy as a search for manners of unity whereby many simples become one complex impression, and a search for a standard of propriety by which to criticise the production of ideas. The latter Hume finds in repetition.

Repetition, like the notion of cause and effect, falls outside Hume's original theory because the relationship holding between the data is not itself an impression. The use which Hume makes of repetition as an explanatory principle amounts to the assertion that perceiving is a process of construction. This same notion is found in Locke's doctrine of powers. In introducing the notion of repetition Hume is

really giving an account of the mental factors in perceiving and knowing substituting sensationalist terms for psychological concepts. In the end he has to appeal directly to a psychological phenomenon, namely to memory. However Hume proceeds to distinguish memory from imagination by drawing attention to the superior force and vivacity of the impressions presented in memory. The introduction of repetition and its psychical correlate, memory, plays the same part in Hume's theory as the doctrine of powers in Locke's, and the doctrine of notions in Berkeley's. Each introduces temporal relational factors into an otherwise static theory.

In Hume's theory the introduction of temporal considerations is thinly concealed by a consideration of the fact that the contents of memory are atomic ideas reminiscent of the series of impressions which constitute our immediate apprehension of the data. The fundamentally important notion is our awareness of temporal process. By this means we recognise that our present memory-experience is a repetition of a former experience. Hume seeks to give his theory the semblance of being consistent by introducing repetition in place of experienced duration which requires the acceptance of the essential togetherness of things. He relates repetition to memory and accounts for memory in

static, visualistic terms. Nevertheless Hume's theory is open to criticism similar to that which he applies to Berkeley's doctrine of notions. Memory presupposes the existence of a mind which unifies the successive experiences so that they are comparable, and able to be recalled. But such an entity is not conceivable in terms of Hume's theoretical suppositions.

Hume's difficulties in accounting for cause and effect, repetition, habit, and also of space and time, - he deals most superficially with time, - arise from the fact that he starts from mere observation of the phenomena. He sees his billiard balls, and the recurring percepts which are the content of memory experience. In observation nothing more than bare sequence, and a contiguity of coloured surfaces, is manifested. These may bear resemblances one to another, if we are prepared to admit some form of temporal extension in the ordering of the subjective experience, but nothing further can be inferred from this. If we accept a visualistic interpretation of phenomena then causality and every form of agency becomes merely a belief. We observe the spatial and temporal contiguity of certain discrete impressions, nothing more.

There is much more in Hume's works than merely a discussion of sensationalist principles. A general summary of

his position however may be given by saying that he demonstrates conclusively that a static, visualistic interpretation of phenomena is not adequate as a basis for the analysis of human experience. Even if temporal successivity be accepted as given with the initial data, thereby introducing a temporal dimension, a radical scepticism is the only consistent theory which can be deduced from such data. If we start by concentrating upon the exterior aspects of phenomena there is no coherent method of passing to a discussion of their internal necessary relations. Hume's 'sand-pile of sensations' cannot be used, as he well realises, as the corner-stone for an idealist or a realist theory of experience.

WHAT INSIGHT INTO PERCEPTION CAN WE GAIN FROM THE STUDY OF THESE THEORIES?

What can we learn from this investigation of the perceptual theories of Descartes, Locke, Berkeley, and Hume? Firstly we may observe that the term perception becomes synonymous with the notion of seeing, including both the act of seeing and the content seen, as these philosophers make successive attempts to work out a consistent perceptual theory in sensationalist terms. An inquiry into the relationship between visual images and other aspects of experience comes to be accepted as the chief problem for perceptual investigation. Such an interpretation of the perceptual situation is admirably adapted to a two-substance metaphysic with its attendant dualistic interpretation of phenomena in terms of a subject-predicate, and subject-object dichotomy. The fact that these two theories are reciprocal is an important factor in the development of European philosophy. Both the metaphysical view and the perceptual analyses presuppose that temporality is a trivial factor in experience.

The perceptual theories of these philosophers may be regarded as a demonstration of the fact that no adequate

account of perception can be given either in static terms or in terms of a serial view of time. The latter is a legacy from the old 'composition theory'. It cannot account for the production of complex entities. If we start by attending to discrete sensations which have only external relations such as those observed in the spatial ordering of visual percepts, it is not possible to infer any internal relations existing between them without recourse to a new set of data. Thus we ought to reconsider what place sensations, isolated percepts, and the conception of discrete physical objects should have in perceptual theory.

In a non-temporal mechanistic approach to the study of perception no distinction is made between perceiving and a second factor in experience which may be referred to as "thought-about-perception". It is a fundamental rule governing mental processes that they seek simplicity and coherence in their data. There must be some form of stability in the material presented for investigation, before a rational analysis of it can be attempted. When studying visual perception this is obtained by considering the perceptual data as simple unities having definite locations in space at an instant of time.

Theorists tend to interpret all experience, including the subjective factors in perception and knowing, in the

spatialised, detemporalised categories which are effective for stabilising the data of visual perception. The application of such an interpretative schema gives the experiences the semblance of being amenable to analysis in terms of static dualistic metaphysical concepts similar to those found in the Medieval interpretation of Aristotelian categories of thought. These refer to the structure of systems of classification. In this manner perceptual data become identified with abstract logical categories and are abstracted from temporal considerations. Such an interpretation of perceptual material leads to the belief that the realm of thought is wider than perception, since it comprises both the static data of perception and the relational elements which combine them in a unitary synthesis of experience. In such an analysis the data are thoughts-about-perception. They bear little resemblance to the initial material of perceptual awareness which is vague and changing.

The absolute separation of space from time in classical philosophy results from the effort to simplify and stabilise experience by considering it as an instantaneously given content. Only spatial attributes are then inherent in the data which are apprehended as clearly discriminated sensa. Such a theory fails to take account of the fact that it is

the relatedness of sensa which gives them individual significance. If they existed in abstraction from one another in a non-temporal world there would be no criterion upon which to select certain aspects of the totality presented in perception, as more important than the rest of the given material. Sensa are abstractions formed from the data of perception by a mental process of reflecting upon the perceptual material. They are not inherent in the perceptual process.

When perceptual theorists study vision in relation to physical objects, they have to presuppose the non-delusive character of visual data as the ground upon which to question the validity of the visual perceptual process. It is only by accepting the end-products of perceptual experiences that we can doubt their validity as representations of existing physical entities. The fact that some visual percepts do not represent physical objects is no criterion for dismissing the percepts themselves as delusive. Such representation, or the lack of it, depends upon an epistemological theory. It should not form a part of perceptual investigation. For example, we may doubt whether or not what we see is a boulder on a hillside. It might be a mirage or a stage back-cloth. We may satisfy ourselves that it is a boulder by approaching

it, kicking it, sitting upon it, feeling the texture of its surface, etc.. To connect the visual and the tactuo-muscular sensations some extra-sensory form of experience must be introduced. The use of tactuo-muscular perception to establish the physical reality of visual sensa cannot affect the content of visual perception as such. It can only affect our beliefs about the significance of visual data for other forms of experience. The blind person could equally well make these tests of the physical reality of the boulder. His concept of the physical object would, however, be very different from that of his sighted companion. To identify the surfaces of physical objects with visual sensa is a useful convention. There is no necessary connection between them.

Visual sensa and the thought-object to which they relate appear to have a peculiarly intimate association. If I 'see' a black object of a certain size and shape I KNOW that there is a cat in the room. No process of inference seems to intervene between the entertainment of the visual percept and the belief that there is a cat present. If, however, I feel a soft furry warm object brush against me and at the same time hear a meaow I infer that there is a cat under the table. If either the tactual or the auditory percept is presented in isolation, this inference is less assured. It

is because visual sensa appear to have a stabilised objective form not dependent upon any process of subjective synthesis that they can be identified with thought-objects and thus appear as suitable material to be analysed in terms of static logical categories.

The identification of visual sensa with the surfaces of physical objects has fascinated perceptual philosophers to such a degree, - probably on account of the possibility thereby introduced of connecting mental and material substances, - that so-called discussions of perception are often nothing more than discussions of the prima facie warrant for holding such a view. The acceptance of the information given in tactual perception as proof of the reality of visual percepts is important. The main argument for holding that visual perception is more directly connected with the real things of the external world than is auditory perception, depends upon it.

If material objects exist in independence of the percipient throughout a duration of time, then in theory we must either compromise their externality in order to account for our perceptual knowledge of them, or we must accept some purely fictitious account of how our perceptions come to 'mirror' these independent entities.

The study of the works of Descartes, Locke, Berkeley, and Hume has, therefore, both a positive and a negative importance for perceptual theorists. Positively it illustrates the difficulties into which perceptual theorists are led by accepting a visualistic analysis of perceptual experience, and interpreting it in sensationalist terms. Negatively it illustrates that a two-substance metaphysics raises insoluble problems for perception, and that a static interpretation of data is not capable of accounting for the whole content of perceptual experience.

Temporal experience must be accepted as a central concept for any adequate perceptual theory. If, however, we take time seriously, the dualistic modes of analysis, common to all the thinkers whose works we have studied, lose their tenability. Moreover, the static world of extended geometrical space dissolves, leaving a kaleidoscopic welter of changing forms in its place. It is natural to attempt to bring order to this by imposing upon it the concepts of Euclidean geometry, and analysing the changing forms with reference to their approximate outline shapes. But this is merely to reassert the dominance of static, spatial categories. What is required is a schema in which to analyse the temporal characteristics of experience. If

sight is accepted as the perceptual paradigm, such an investigation is hindered because of the intrusion of classical, Newtonian spatial concepts. The recent development of 'field theories' in psychological research appears to be the result of a partial recognition of the necessity of including temporal factors in the data of perceptual investigation. There is, however, a tendency among psychologists to accept sensationalist and dualistic presuppositions in the analysis of their initial data even in such a setting. It appears, therefore, that an attempt to give an alternative account of perception has more chance of success if a different type of data is used. We shall accordingly substitute auditory for visual data. Before embarking upon such an inquiry, however, a brief summary of some of the more important works dealing with perception written in the twentieth century will be given, in order to establish the fact that the dominance of vision in perceptual theory is not a peculiarity of seventeenth and eighteenth century thought. It will also illustrate the fact that no major clarification of the general perceptual situation has been achieved. There has been much useful discussion of isolated topics which depend for their cogency upon the acceptance of the sensationalist view of perception and the metaphysical presuppositions upon which

it is based. Further research has been vitiated by the inadequacy of these theoretical assumptions.

MODERN DISUCSSIONS OF PERCEPTION.

The ambiguity inherent in the term 'sensation' is the starting point of many modern discussions of perception. Professors Ward, Moore, and Stout demonstrate that 'sensation' may refer either to the process of apprehension or to the object apprehended. They then reject the Berkeleian interpretation of sensation as being mind-dependent and seek to establish perceptual theories in realist terms. Thus they make the activity of perceiving almost equivalent to that of knowing. Both consist in a subject's awareness of data which have an existence external to the subject. Such theories are obviously visualistic in their acceptance of a "subject-apprehending-sensa" account of the structure of the act of perceiving. At no point do such theories conflict with the metaphysical presuppositions of earlier sensationalist theories.

Professor Prichard, on the other hand, upholds the Berkeleian view that the objects of perception are mind-dependent secondary qualities. He is one of the few perceptual theorists who mention auditory data in perceptual theory. Professor Prichard criticises those who identify perceiving with the knower-known relation. He asserts that

the content of perception depends on our perceiving. He often reiterates the dogma, which he accepts as a self-evident truth, that any sound which we hear depends upon our hearing it. Thus Professor Prichard wishes to assert the unitary nature of the act of perceiving. Only in analysing the act of perceiving does he discard dualistic metaphysical assumptions and a subject-predicate analysis. He accepts a static interpretation of all other phenomena and insists that perceiving is an instantaneous act of awareness. Some of his statements about hearing thus become extremely involved and appear to be self-contradictory. Consider for example the opening paragraph of his paper entitled 'The Apprehension of Time'.

> "We should ordinarily be said to <u>hear</u> certain noises, e.g. the sound of a bell or the note of a bird. But any sound has some duration, however short. If so, how can it ever be true that we really <u>hear</u> a sound; for to hear is to hear at a moment, and what we apprehend by way of hearing - or more generally perceiving - can only exist at the moment of hearing, and <u>ex hypothesi</u> at least part of the sound said to be heard is over at the moment of hearing, and strictly speaking it is <u>all</u> over. For all the sound up to the moment of hearing in question is over.

> And the difficulty seems a double one. For since a sound has duration, it cannot exist *at* the moment of hearing, and therefore we cannot hear a *present* sound - for there is no such thing. And if it is over and so not existing at the moment when we are said to hear it, it cannot be *heard*. Therefore, it seems, it is impossible to hear a sound."[1]

This is an excellent example of the difficulties which arise from holding a sensationalist theory which makes perception into a succession of discrete instantaneous acts of awareness. When Professor Prichard asserts that we hear sounds, and that any sound has duration, we expect him to infer that hearing is a perceptual activity which has a durational content. Instead he reasserts the Cartesian point of view even when this drives him to the assertion that although, by definition, sounds are what are heard, it is impossible for us to hear sounds. He is in the same predicament as that in which Hume finds himself. Having accepted a sensationalist account of perception, he has to appeal to something not inherent in the perceptual process to relate the discrete instantaneous elements which he accepts as the initial data of experience. Thus he separates

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[1] Prichard, H.A. "Knowledge and Perception" (Oxford University Press 1950), p.47.

perceiving from knowing. Perceptual apprehension becomes the awareness of discrete, unrelated, primary sensations. He writes:

> "The immediate moral which I want to draw is that what is called hearing a sound - a sound having as such a duration - and in general what is called perceiving anything which has a duration - is absolutely ultimate and cannot be resolved into anything else."[1]

This really amounts to a denial of the temporal elements in experience. One might state it thus. Since, in sensationalist terms, we cannot satisfactorily account for the durational content of perception, we must confine our attention to reflecting upon the content of instantaneous acts of perception which are suitable data for inclusion in our analytic system. It is Professor Prichard's complete lack of appreciation of temporality which leads him into such difficulties in his attempts to account for our perception of sound and apprehension of time. His essay might more suitably be entitled "A Denial of the Apprehension of Time".

In an essay entitled "Perception", Professor Prichard admits that he finds the topic very puzzling. He puts

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[1] Prichard, op.cit., p.48.

forward two contentions which, he says, run counter to current perceptual views.

> "The first is that perceiving is not a special way or kind of knowing, as we seem usually to imply that it is; and the second is that in the special cases of seeing and of feeling or touching, what is ordinarily called perception consists in taking, i.e. really mistaking, something that we see or feel for something else."[1]

We should agree with Professor Prichard that perception is not a special instance of a knower-known relationship and that external physical objects are not the objective content of an act of perceiving. But we should disagree with his assertion that the content of perception is therefore mind-dependent and is essentially an assemblage of sensations. It is because he does not admit the reality of process and duration within the act of perceiving, and within the content perceived, that Professor Prichard has to hold such a paradoxical view of the nature of perception. He cannot admit durational factors because he retains a sensationalist account of the data of perception based upon the classical metaphysics which cannot account for temporality. Thus

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[1] Prichard, op.cit., p.52.

Professor Prichard cannot give an adequate account of hearing. He refers to auditory perception only to support his subjectivist interpretation of sensory phenomena. He demonstrates that if we use a static, subject-object mode of analysis, and accept a philosophic dualism, sounds must be regarded as being mind-dependent. He also shows that if a sensationalist account of perception is accepted, then our idea of a physical object is a conjunction of perceptual material with logical and linguistic constructive elements. This synthesis has made thinkers, including Professor Prichard himself, accept the objectified entities of the completed act of perceiving as the primitive perceptual material. Those who analyse the content of perception as a series of sense-data also stress this aspect of the perceptual situation. Such accounts are only further developments of the original sensationalist theory, and are based on the same metaphysical presuppositions.

The genesis of the sense-data theory from sensationalist presuppositions may be traced in Earl Russell's Lowell Lectures entitled "Our Knowledge of the External World" which Professor Prichard comments upon.[1] Both the original and the commentary are good examples of the difficulties which a perceptual philosopher must face if he accepts a non-temporal metaphysic.

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[1] Prichard, op.cit., p.1. See also Russell's "Problems of Philosophy".

They also illustrate the extent to which vision alone is accepted as the perceptual paradigm. When Professor Price asserts that the term 'sense-data" is a neutral term which does not imply the acceptance of any particular theory,[1] he means that it does not imply any particular interpretation of the two-substance metaphysic, ~~analysed~~ interpreted in subject-object terms with reference to the classical view of space and time. Sense-data terminology begs various fundamental questions, but does not commit us to any specific interpretation of the dualistic metaphysic.

To accept sense-data as the initial data of perception is to imply that discrete, static objects, which correspond to the units of linguistic logical analysis of experience, are the most simple elements in perceiving. This implies that all perception is a conscious awareness of individualised entities. Moreover the sense-data theory does not include any reference to relational elements. We appear to perceive sense-data as unique and self-subsistent. Analysis of perception is made in subject-object terms, as "subject perceiving sense-data". Sense-data are the objective content of our sensations and not necessarily factors in the actual physical world.

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[1] Price, H.H. "Perception", p.19. (Methuen and Co. Second Edition, Revised 1950).

In terms of the sense-data theory each moment of sensory experience must be studied as an immediate isolated fact, unrelated to any temporal process. Time can only be the serial ordering of successive sense-data. It does not affect the sensed content. When Professor Price asserts that 'sense-datum' is a neutral term, he means that the ontological status of the individual entities thus designated is not determined. They may be events, substances, the attributes of substances, or secondary qualities. Their cause may be either physical or mental. The one thing that a sense-datum cannot be is a durational complex. Thus the problems which the sense-data theory was constructed to solve at the level of 'knowing external physical objects' invade the subsistence theory as well. So long as we accept the classical view of time as mere succession, and a subject-object, knower-known dualism, it makes no fundamental difference what we accept as the objective content of perception. The initial problems remain unsolved. Theorists continue to state them in terms of such presuppositions because these terms seem to fit the data presented to us in visual experiences. Thus the use of sense-data terminology is one reason for the predominance of vision in modern perceptual theories.

Those who adopt the sense-data theory appear to be making

the best of two separate and mutually exclusive systems. Compare for example two statements from the first chapter of Professor Price's book on perception.

> "Eventually we must go back to something which is a datum simpliciter, which is not the result of any previous intellectual process."[1]

> "It is true that what is given now to a certain mind depends to a surprisingly large extent upon what has been given to that mind in the past. But this, so far from disproving the existence either of present or of past data, asserts the existence of both, and enables us to describe their nature in a way we could not do before."[2]

When theorists wish to uphold the elementary nature of sense-data, they appeal to the immediacy of the act of apprehending and to the definition of the term 'datum'. When they wish to use sense-data as elements in a general theory of perception they attribute to them temporal and relational connections. But our experience of a primitive sense-datum, or a succession of them, cannot make us conceive anything beyond the bare awareness that we are experiencing this datum now.

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[1] Price, op.cit., p.4.
[2] ibid., p.11.

In his definition of 'the Given' Professor Price re-introduces the relational elements which he has excluded from his definition of sense-data as primitive elements in perceptual awareness. By identifying 'the Given' with what is a 'datum simpliciter', he connects his sense-data with the relational elements in experience. Hence it appears that other things may be inferred from the existence of sense-data. To accept colours, sounds, and other sensory qualities as the content of sense-data depends upon the identification of relational temporal factors with a purely atomistic theory. Colours and sounds are related to other sensuous impressions given in our durational awareness of phenomena. The illicit shift in meaning from an atomic, disjunctive description of a datum as something directly present to my consciousness, to a description of a datum as exhibiting relational factors may be illustrated by quoting Professor Price's definition of the Given.

> "The Given is by definition that which by being itself actual and intuitively apprehended, makes it possible for something else to seem to exist or to have a certain quality."[1]

In this definition of 'the Given' we are reminded of Locke's Doctrine of Power, Berkeley's notions, and Hume's

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[1] Price, op.cit., p.10.

appeal to the feeling and habitual elements in experience. All are similar in that they represent attempts to introduce temporal factors into theories based upon a non-temporal metaphysic.

It is significant that Professor Price mentions two methods of differentiating sense-data from other data. Firstly he states that the only describable differentia of sense-data is that they lead us to conceive of, and believe in, the existence of certain material things, whether there are any such things or not. Secondly Professor Price mentions their 'sensuousness' as a possible differentiating feature. He immediately dismisses this factor from his discussion on the grounds that it is not describable. Sensuousness is certainly not describable in the atomic terms which are the stock-in-trade of classical theories of perception and of modern theories based upon the same metaphysical presuppositions. These atomic terms should, therefore, be regarded as unsuitable for describing the facts of perception. To assert that there are some fact which are obvious on inspection but indescribable is to put a gloss on the inadequacy of the theoretical presuppositions, and the terminology, which are accepted.

In a later discussion of perception referring to touch and organic sensation Professor Price comments upon sense-datum

terminology. He states that sense-data are not as rudimentary in perception as Empiricists, who are invariably visualists, assume. This paper amounts to a refutation of his earlier theory contained in "Perception". Professor Price writes:

> "Now I would suggest that the sense-datum terminology fits those sense-experiences in which objective reference is clear and sharp, and fails to fit those in which objective reference is dim or confused or absent altogether. That is why the sense-datum philosophers are most at home in the central portion of the normal visual field. But organic sensation baffles them, and even normal marginal vision is not easily amenable to their terminology - to say nothing of abnormal visual experiences like dazzlement or the period of "confused" vision which precedes or follows a fainting fit. For in all these cases objective reference is either absent, or at any rate it is relatively confused and indeterminate. And why is it either absent or at any rate confused? I answer because of the "totalistic" character which these experiences have. They are all cases in which the content of sensation has this tiresome feature which we are tempted to call "inter-penetration", and refuses to break itself up into a set of sharply differentiated and sharply individualised units,

in the way in which the central portion of the normal visual field so obviously does."[1]

Why should theorists find the "interpenetration" and totalistic character of almost all types of sensory material tiresome? It is because they accept dualistic metaphysical presuppositions, and a subject-object, knower-known, interpretation of experience, which excludes relational and temporal factors from being integral dynamic elements in perceptual theory. A theory which accounts for the "interpenetration" and the totalistic character of sensory material must analyse time as an experienced duration.

Someone may object that theories of perception which start from a consideration of visual experience, analysed in sense-data terminology, are capable of dealing with the temporal aspects of experience. As an example, Professor Ayer's adverbial account of perception might be cited. An examination of this view shows that it, no less than the sense-data theory, is merely a reinterpretation of earlier perceptual views, and that it exhibits the inadequacies characteristic of theories based upon classical metaphysics.

Professor Ayer adopts Berkeley's phenomenalism, replacing Berkeley's "ideas" by the term "sense-content". He denies

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[1] Price, H.H. "Touch and Organic Sensation". Aristotelian Society Proceedings, 1943-44, p.IX f. See also infra p.129 .

that sense-contents are mental phenomena. Professor Ayer asserts that it must be possible to define material things in terms of sense-contents, because it is only by reference to the occurrence of sense-contents that the existence of any material thing can be verified. Verifiability for Professor Ayer, as for his fellow Positivists, means not only 'able to be reduced to sense-data' but 'able to be reduced to visual sense-data'. It is interesting to trace the close connection between Professor Moore's appeal to common-sense and the unreflective manner in which we all accept the content of normal visual perception. As William James pointed out long ago, it is doubtful if the empiricists have ever been sufficiently empirical in outlook. When the Logical Positivists state a preference for the denomination 'Scientific Empiricists', they unconsciously underline the fact that their philosophy is essentially based upon a visualist analysis of experience.

All forms of modern critical philosophy[1] which stress the necessity for analysis and clarification depend upon a visualist interpretation of experience. They are, in fact, merely more abstract statements of the same point of view as that found less clearly expressed in the Cartesian system.[2] When these

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[1] N.B. The works dealt with in this section are merely a representative sample from the writings of modern philosophers.

[2] For the debt which modern philosophical analysis owes to the older sensationalist theories see Barnes, W.H.F., "The Philosophical Predicament" (A & C Black, London 1950).

theorists claim to be abandoning metaphysics, they still retain the structural framework which the interpretation of phenomena in dualistic terms has made implicit in our language and thought. To the extent to which a dualistic schema fits in with a visual interpretation of the content of experience it is possible to substitute single terms for the simple elements in experience. Such substitution promotes the discovery of a logical form in the experience, if it is granted that the ultimate facts of experience are simple elements united by simple relations. Such a view would appear to be a recrudescence of the 'composition theory' which seventeenth century thinkers use in place of an evolutionary theory. The clearest statement of this point of view is probably Wittgenstein's declaration in the "Tractatus Logico-philosophicus" that statements 'picture' facts, and that if one thing 'pictures' another then the two must be identical in form or structure. The use of the word 'picturing' seems to be more than a vague metaphor. The ultimate facts with which he and other analytical philosophers deal, may be described as visual images from which the visual content has been abstracted. No other forms of sensory data provides a similar structure.

Professor Ayer's views appear to have some similarity to Professor Prichard's, except that Professor Ayer is not

concerned with the ontological status of his sense-contents. We find in Professor Ayer's theory a static analysis of sense-contents as they relate to material things, and an adverbial analysis of them as they relate to sense-experience. Professor Ayer is anxious to establish that the 'act of sensing' is not a knower-known relation. He writes:

> "To begin with, we must make it clear that we do not accept the realist analysis of our sensations in terms of subject, act, and object. For neither the existence of the substance which is supposed to perform the so-called act of sensing nor the existence of the act itself, as an entity distinct from the sense-contents on which it is supposed to be directed, is in the least capable of being verified. We do not deny, indeed, that a given sense-content can legitimately be said to be experienced by a particular subject; but we shall see that this relation of being experienced by a particular subject is to be analysed in terms of the relationship of sense-contents to one another, and not in terms of a substantival ego and its mysterious acts. Accordingly we define a sense-content not as the object, but as part of a sense-experience. And from this it follows that the existence of a sense-content always entails the existence of a sense-experience.

It is necessary at this point, to remark that when one

says that a sense-experience, or a sense-content, exists, one is making a different type of statement from that which one makes when one says that a material thing exists. For the existence of a material thing is defined in terms of the actual and possible occurrence of the sense-contents which constitute it as a logical construction, and one cannot significantly speak of a sense-experience, which is a whole composed of sense-contents, or of a sense-content itself as if it were a logical construction out of sense-contents. And in fact when we say that a given sense-content or sense-experience exists, we are saying no more that that it occurs. And, accordingly, it seems advisable always to speak of the "occurrence" of sense-contents and sense-experiences in preference to speaking of their "existence", and so to avoid the danger of treating sense-contents as if they were material things."[1]

If the sense-content is really a part of a sense-experience and not an object, what constitutes its individuality whereby we recognise it as a unity? Unless we accept a logical analysis of the whole of experience, it does not seem possible to account for the discrete nature of individually recognisable sense-contents, which forms the basis of the theory. The individualised sense-contents cannot be given through our apprehension of material objects, since,

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[1] Ayer, A.J. "Language, Truth and Logic" (Victor Gollancz Ltd. 1936), p.188.

by definition, we know material objects only through the mediacy of sense-contents. Hence sense-contents must be prior in experience. Professor Ayer accepts sense-contents as the elementary data for perception, without questioning whether they could have the character, at a primitive level of experience, which he attributes to them. He states that a sense-content must be defined "not as an object but as part of a sense-experience". In the next paragraph he remarks that one cannot significantly speak of a sense-experience, which is a whole composed of sense-contents, as if it were a logical construction out of sense-contents. Both the sense-experience and the sense-content exist only in the sense that they occur. This is the basis for Professor Ayer's adverbial account of perception. But if sense-contents do not exist except as occurrences, is there adequate ground for treating them as discrete elementary data similar to sense-data and correlative to static logical entities? The idea of discrete sense-contents appears to be the hypostatisation of logical and linguistic entities discriminated at a high level of integrated conscious experience.

The difficulties inherent in this view are due to a lack of appreciation of the temporal factors which influence the content as well as the subjective process of experiencing.

Professor Ayer's theory amounts to an attempt to relate temporal occurrences, i.e. sense-experiences and sense-contents to static logical entities, i.e. material objects. The problems of verification remain unsolved, because the data which are to be verified represent two irreconcilable interpretations of phenomena. It is the old dualism between mind and matter, the dynamic and the static elements of a dualistic philosophy, reasserting itself in a more subtle form.

Professor Ayer rightly asserts that perceptual theorists have always accepted the description of the relation of perceptual entities to material things as their main problem. He solves this problem by defining the nature of the spatial relations holding between sense-contents. Thus he gives a purely spatial analysis of sense-experience, based upon logical considerations which imply the traditional views of the perceptual situation.

The general trend in twentieth century perceptual theory is towards a more abstract, precise, logically consistent theory based exclusively upon a consideration of the data given in visual experience. Perhaps the most striking example of the inability of modern theorists to consider perceptual problems in any but visual terms is Professor Broad's discussion of how the statement "I am hearing a bell" can be analysed.[1] The same acceptance of the structure of classical

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[1] Broad, C.D. "The Mind and Its Place in Nature", pp.140 ff.

metaphysics as a basis for discussion is present in the writings of Wittgenstein's pupils and in other Neo-positivist theories. These thinkers have renounced the content of classical metaphysics but still hold convictions about logical structure, and the organisation of data, which imply the acceptance of the Newtonian view of time and space and the metaphysical presuppositions upon which it is based.

Psychologists as well as philosophers study perceptual experience. Gestalt theorists have made a notable contribution to the literature dealing with perception. They appear to replace the static atomic interpretation of perceptual phenomena by a dynamic theory. It is interesting to note that although the bulk of the work done by the Gestalt theorists is concerned with visual phenomena, the fundamental problem was first propounded by von Ehrenfels in relation to musical data. Wertheimer has stated the fundamental formula of Gestalt theory thus:

> "There are wholes, the behaviour of which is not determined by that of their individual elements, but where the part-processes are themselves determined by the intrinsic nature of the whole. It is the hope of Gestalt theory to determine the nature of such wholes."[1]

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[1] Quoted from Ellis, W.D. "A Source Book of Gestalt Psychology" (Routledge Kegan and Paul, reprinted 1950), p.2, para.43.

Von Ehrenfels considers a melody which, when heard again in a different key, is recognised as the same melody although the elements which compose it are different. He concludes from this that the melody is something apart from the sum of its individual component tones. This he calls 'Gestalt-qualität', the form-quality.[1] It seems strange that the investigation of auditory data was not further developed. Few Gestalt theorists mention the fact that the theory was first propounded with reference not to visual but to auditory experience. This is possibly because the later theory is not suitable for discussion of auditory data. Later Gestalt theorists are unconsciously influenced by sensationalist philosophical presuppositions. This is noticeable in their preoccupation with visual experience and also in the type of data which they select for analysis. They examine the form of two-dimensional images such as the figures which we draw on paper. Their theories are based upon observations of these abstract static figures presented in isolation in a controlled test-situation. The results gained from such investigations are interpreted as applicable to normal visual perception of three-dimensional objects in the environment.

Gestalt theorists study visual perception in isolation from the temporal factors implicated in the process of

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[1] See reference Humphrey, G. "Thinking" (Oxford University Press 1952), p.150 ff.

perceiving. Theorists study either spatial or temporal Gestalten and imply that their forms are similar. Thus later Gestalt theory tends to approximate to the visual pattern.[1]

Gestalt theory represents an advance on the sensationalist accounts of visual perception, and much valuable research has been done in terms of it. But Gestalt theorists fail to grasp the full significance of the perceptual problem. The apprehension of Gestalt qualities implies duration. Duration cannot be defined as a mere temporal successivity. The Gestalt theorists tacitly accept a subject-object dichotomy. Thus they analyse time as pure succession and visual space as two-dimensional when they consider the structure of visual experience. A recent work on visual perception[2] criticises Gestalt theory in so far as it deals with laws of organisation which have been discovered only in relation to arrangements of points and lines on a two-dimensional surface, and which are applicable therefore only to some kinds of abstract drawings and paintings and not to visual perception in normal environmental circumstances. Mr. Gibson writes:

"Form, as we refer to it here, means projected form - a silhouetted shape as contrasted with a shape in depth.

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[1] See von Hornbostel, E.M. "The Unity of the Senses"; quoted in Ellis, op.cit., p.210 ff.

[2] Gibson, J.J. "The Perception of the Visual World" (The Riverside Press, Cambridge. Mass. 1950).

This abstract geometrical form is not, we have argued, a primitive spatial impression at all. The primitive impression is a form-in-depth, and its two aspects of projected form and depth as such are abstractions never experienced in isolation. What we are concerned with is a conceptual experience represented by outlines on paper.

"The main stumbling block in the whole history of our efforts to understand perception, one might venture, is the tendency to think of form as two-dimensional only. The form-on-a-plane, the geometrical form, the drawn form - such forms are literally nothing but the shadow of things, that is to say their projections. Although Gestalt theorists have recognised that depth is as fundamental in perception as mere extensity, their central problem and guiding concept was the shadowy form, not the substantial one. Might it not be that the dynamics of projected forms, so diligently studied, consists not in the laws of form as such but in the laws that relate them to solid objects - the laws of projection and transformation."[1]

If this contention is correct then we may say that what vitiates Gestalt theory as an explanation of visual experience

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[1] Gibson, op.cit., p.190 f.

is the fact that it is designed to explain our visual apprehension of physical objects, and starts from a too intellectualist interpretation of the initial data. The latter is inevitable in any theory which overlooks the importance of the durational components in experience. The interpretation of Gestalt theory is difficult because form is analysed as something inherent in spatial shapes, rather than as the outcome of a temporal synthesis. In so far as Gestalt theorists stress the importance of structured protensive unities as the fundamental elements which we perceive, they provide a necessary antidote to the atomistic theories offered by the Positivistic philosophers. In relating their research to a two-dimensional visual field, Gestalt theorists restrict its relevance to perceptual theory as a whole.

Mr. Gibson's theory of visual perception appears to escape the cramping influence of classical philosophical doctrines, because he has a specific practical problem to solve.[1] The theory which he presents has features which are consonant with the views on perception which the study of auditory data imposes. The more general philosophical implications of his theory do not form any part of Mr. Gibson's exposition. It would appear that the fundamental temporal schema can be more clearly defined with reference

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[1] Gibson, op.cit., p.6.

to auditory experience. Nevertheless this work on visual perception may be cited as proof that the same analytic concepts are applicable to visual and auditory perceptual experience.

In his paper entitled "Touch and Organic Sensation" Professor Price draws attention to the inadequacy of the study of the content of the central portion of the normal visual field for the formation of a general theory of perception. He discusses the visual and tactual interpretations of causation; the inveterate visualistic habits of Empiricists; the limitations of sense-data terminology; and those factors, absent from the classical interpretations of visual perception, which are of importance in analysing organic sensation. Organic sensation displays that peculiar kind of wholeness in which data outstand from the total field without destroying its unity. It has what Professor Price describes as a 'protensive' as opposed to an 'extensive' unity. Over a period of time we can discriminate phases within the whole, but each phase enters into those that follow it. There is a kind of interpenetration of each by all.[1] It follows from this that such data cannot be analysed in terms of exact spatial locations. They have a vectorial character. They 'emanate from' a particular place, but cannot be said to be

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[1] See supra p. 117.

situated in any particular region of space. To sustain such an analysis, a theory of temporal relations which makes duration a more fundamental concept than pure succession would be necessary. Professor Price does not discuss the implications of accepting the idea of 'protensive unity' as a central concept in analysing experience, but it represents a very different view from that accepted in the classical analysis of visual experience.

In this paper Professor Price overlooks the importance of auditory experience because he examines perception only as it relates to our knowledge of physical objects.[1] Moreover he classes hearing with vision as a distance-receptor thereby implying that it can be described as a form of knowledge-by-acquaintance. He explicitly states that he thinks that hearing can be analysed in these terms. Such a view is really the outcome of spatialising auditory phenomena. Sounds signify spatial distance because we habitually associate them with visual experiences. Their relevance for visuo-spatial extension is an acquired characteristic. Professor Price is misled by the fact that because visual and auditory experiences are always interrelated ~~in experience~~ we interpret auditory clues in visual terms. Sounds have a protensive unity and resemble organic sensations much more closely than they resemble visual perceptions. They interpenetrate and

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[1] See supra p.7 f.

display that tiresome totalistic character which is also inherent in organic sensation. We can localise the origin of sounds, - which incidentally are not sounds themselves but some form of sounding-body, - only by reference to visual and tactual experiences. Auditory experience as such gives us no idea of a sound emanating from a particular place, but only as coming from a certain direction. Sounds have a vectorial character similar to the vectorial character of organic sensation. By analysing auditory experience as a distance receptor Professor Price is commiting himself to the view that it is analysable in the static spatialistic terms used for the analysis of perception in the central visual field.

This view of auditory perception is more explicitly stated in Professor Price's discussion of perceptual illusions in his earlier book.[1] He there suggests that there could be illusory sounds and smells parallel to the illusions of sight and touch. Firstly it may be noted that it is only when we interpret touch in visual terms and not as a form of organic sensations, that we can speak of tactual sense-data and identify them with the surfaces of physical objects. Thus we have illusions of sight described in terms of the classical accounts of visual perception and are inquiring whether this

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[1] "Perception", p.27 ff.

nption of illusoriness applies to sensory data which exhibit a protensive unity.[1] Professor Price suggests that just as illusory visual and tactual percepts can be explained as mistaking a perceptual datum for part of the surface of a material object, so auditory and olfactory illusions may be explained by substituting 'emanating from' for 'being part of' the surface of a material object. This is merely a way of giving a semblance of a parallel. In visual or tactual awareness spatial extendedness is inherent in the perceptual data. In hearing and smelling it is an external relationship indirectly related to the data. We can hear and smell without having any notion of spatiality. If Professor Price's statement that illusory sounds and smells are parallel to illusions of sight and touch were valid, then we should have to explain why we do not build up our extended physical world out of the data collected from these sensory experiences, instead of from the data given in sight and touch. The so-called illusions of sound arise either from an uncertainty as to the relations holding between the sound and something external to the field of auditory sense awareness, or from the uncertainty as to the relation of the

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[1] A certain negro tribe are said to have a special word for 'see' but only one general word for 'hear', 'touch', 'smell', and 'taste'. Such a state of affairs would represent the prevailing notions about perception current in our culture much more accurately than the view that we recognise five senses.

auditory datum to another sound, or to some harmonic structure. In the former case it is an error in interpreting the significance of one set of sensory data for our experience as a whole. In the latter case the problem becomes one of meaning.

This whole discussion is nullified by Professor Price's later remarks on the structure of organic sensations. The elements which he attributes to organic sensations should also be used in the analysis of auditory data, instead of analysing them in spatial terms because they can be substituted for visual sensa in giving us clues concerning distance. In his discussion of tactual and organic sensations Professor Price stresses the necessity for a complete revision of perceptual theory to account for all types of sensory awareness, with the possible exception of seeing as it is experienced in the central visual field. Although he may intend to exclude hearing on the grounds that it too is a distance receptor, this does not seem to be a defensible position. There are two possible classificatory schemes for sensory experiences. We may take direct spatial awareness as our criterion. Sight and touch are then distinguished from smell, hearing and taste. If we take protensive unity, or some criterion which can be stated in temporal terms, sight as experienced in the central visual field is distinguished from the other senses.

In "Psychology and Art of the Blind" Professor Revesz starts by drawing attention to the fact that in the study of haptics, theorists have always presupposed that tactual sensations are inferior to visual perceptions and should be studied with reference to their visual counterparts in visualistic terminology. Professor Revesz rightly deplores this tendency to analyse all perceptual processes in visualistic terms.[1] In his book there are some most interesting discussions of the haptic recognition of empty space and of the space in which physical objects are situated. He illustrates that successive perceptions are an integral element in haptic recognition. But Professor Revesz's formal argument is based upon the concept of the external physical object, and is dominated by sensationalist principles and a static, dualistic metaphysic. Thus his own theory completely fails to achieve a coherent account of haptic perception which is not visual in character.

The extent to which Professor Revesz is unconsciously influenced by classical perceptual theory and a dualistic metaphysic, which is essentially visualistic in type, can best be judged by attending to his discussion of the haptics of form.[2] The influence of our visual awareness of physical

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[1] Revesz, G. "Psychology and Art of the Blind", translated by Dr.H.A. Wolff (Longmans, Green & Co.1950), Part I, B I,i, (p.24 ff.).

[2] ibid. Part I, B IV,i,(p.70 ff.).

objects on his theory is also apparent in the second part of the book. Professor Revesz concludes that there is no specifically haptic form of aesthetic appreciation because the haptic inspection of pieces of sculpture which are aesthetically pleasing to the eye does not produce aesthetic reactions. Surely an aesthetic experience based upon haptic perception should be sought not in the examination of objects which were created to be looked at, but of objects made to be handled. The distinction between a work of art and an artefact, it may be noted, is essentially based upon visual experience. As an example of an aesthetically pleasing haptic perception one might cite the handling of a perfectly balanced violin bow. Any person who has handled a Tourte bow has surely experienced a purely aesthetic enjoyment arising from a haptic source. Such considerations illustrate the extent to which Professor Revesz is influenced by visual notions, despite his explicit rejection of this form of approach to haptic experience.

The extent to which Professor Revesz is influenced by static sensationalist modes of thought is evident in his discussion of form and structure. He writes:

> "The emancipation of Haptics from Optics can only be achieved by dropping the traditional assumption of the absolute hegemony of the optic principle of form. To that

end it is, however, necessary to establish certain ideas and to draw definite lines of distinction between them. These distinctions concern first the notions of form and structure, which are of utmost importance for our basic problem.

Two fundamental tendencies are operative in the mode of perceiving objects. The result of one of these represents the figure-image (i.e., the form), the other one the organisation of the whole in its geometrical connections (i.e., the structure).

We therefore mean by the form of an object the unity of its parts as emerging out of the process of being perceived, a unity leading to complete fusion of its elements in the total impression."[1]

Could any theory be more securely based upon a static visualistic interpretation than this? The author may state that by form we mean 'an object the unity of its parts emerging out of the process of being perceived', but if he bases his distinction between Optics and Haptics upon a consideration of the figure-image, as distinct from the geometrical connections between discrete parts of an object, it is obvious that it is not the process of being perceived,

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[1] Revesz, op.cit., Part I, B IV,3,(p.77).

but the static perceived content, that is the dominant concept. He is excluding temporal succession from his formal scheme of analysis. Thus his discussions of the importance of movement and successive perceptions for haptic recognition become extraneous to his main argument.

Professor Revesz's main position amounts to a re-assertion of the sensationalist tenet that perception is an immediate intuition of discrete sensa. Whatever displays any structural relations requiring some temporal duration for its apprehension must then be explained as a form of cognitive awareness. This attitude is exemplified in his discussion of what he terms "the receptive attitude" and "the purposive attitude" in perception.[1] If one accepts a knower-known, subject-object dichotomy, and a sensationalist analysis of the content of perception, then perception can be analysed as a passive, contemplative awareness. If perception requires a period of time in which to synthesise its data, and if such a process is inherent in perceptual awareness and not a mental addition, then perception must be regarded as active.

Professor Revész seeks to compare the organisation of visual and tactual forms of perception. When he analyses them in terms of the differences between form and structure

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[1] Revesz, op.cit. Part I, B V 5, (p.100 ff.).

it appears that the two are not comparable. They are not even both instances of perception. The reader is not very surprised to learn that 'the intention of structural recognition is an expression of the mainly cognitive nature of the haptic sense'.[1] It is only on reflection that it seems strange to discover that cognition is more closely associated with haptic perception than with vision.

There is much genuinely interesting material relating to haptic perception in Professor Revesz's book, but his formal attempt to separate the investigation of haptic experiences from the dominance of visualistic modes of thought is far from successful. Why has this genuinely sincere attempt to discover an autonomous haptic theory of perception failed? The answer is given, in part at least, in Professor Price's analysis of Touch and Organic Sensation. Professor Revesz fails to take account of that 'tiresome feature of interpenetration' exhibited by all forms of tactual awareness. He attempts to analyse the data without paying attention to their protensive unity. Thus he is forced back into a visualistic analysis. The same set of problems which have always harassed sensationalist philosophers has dogged his theorising.

What, we may inquire, is fundamentally lacking in this attempt to describe the essential structure of Haptic Perception?

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[1] Revesz, op.cit., Part I, B IV 3, (p.83).

It is not that he lacks an awareness of the dominance of visual modes of thought in perceptual theory as a whole. This is well stated in the opening chapters of Professor Revesz's book. It is the lack of an adequate theory of time, and his failure to appreciate the importance of durational factors in every type of perceptual activity, which vitiates much of his argument. There is a tendency to treat time as a mere succession and to exclude temporal concepts from the analysis of the objective content of perception. Motion is admitted to be an essential element in the subjective activity of the percipient. What he perceives is accepted unquestioningly as being static, discrete, unitary physical objects. Yet it is admitted that such objects do not form an integral part of the experiences of blind persons. Professor Revesz writes:

> "In everyday life, too, the blind show very little interest in form. No blind person, for example, will ever be found to subject the objects of his immediate environment to a close tactile scrutiny. He will be content with a general orientation to the objects that surround him without paying attention to their individual appearance.... It is characteristic that blind children have to be specially taught to examine objects accurately

by touch. Without such tuition they would do so only in quite exceptional cases. Blind children have altogether much less contact with objects than we with sight imagine them to have. Most objects do not seem to interest them at all."[1]

Surely this admission does not merely concern blind persons' absence of interest in 'form'. It states quite clearly that objects are not significant factors in their environment. Why then attempt to analyse haptic experience in terms of objects? Convention and lack of an adequate alternative schema seems to be the only answer. Whenever we deal with spatial material it appears to be almost impossible to escape from giving a static visualistic analysis of the content of our perceptual awareness. For this reason auditory experience appears to be a more suitable medium for the investigation of the essential structure of the durational and relational elements in perceptual experience. Visual concepts have always been dominant in the analysis of space, and time does not appear to be an important factor for visual awareness. The remainder of this paper will deal specifically with an analysis of auditory perception. It should be remembered, however, that the discovery of an adequate schema

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[1] Revesz, op.cit., Part I, BIV 2, (p.75 f.).

for the analysis of the durational factors in perceptual experience will affect not only theories of hearing but also the analysis of visual and tactual perceptual experiences.

P A R T II.

THE IMPORTANCE OF TIME FOR PERCEPTUAL THEORY WITH SPECIAL REFERENCE TO WHITEHEAD'S PHILOSOPHY OF ORGANISM.

SUMMARY OF THE PRESUPPOSITIONS OF CLASSICAL THEORIES OF PERCEPTION.

Earlier theories of perception are based upon an investigation of the material presented in the central visual field. They presuppose the dualistic metaphysics which accepts as basic the contrast between substance and attribute, subject and object, mind and matter. Taken in conjunction with the notions which Descartes introduced into philosophy with his subjectivism, these distinctions give rise to many of the most pressing problems in modern philosophy. Originally these distinctions were accepted to facilitate discussions of our knowledge of the nature of the external world. Descartes changes the emphasis of philosophical discussion from a consideration of objective data to that of the subjective experiences of the percipient. He attempts to explain subjective experience in the terms of the old substance metaphysics however. As Whitehead points out, "the relation between individual substances create metaphysical nuisances".[1] Using such a metaphysical schema it is impossible to explain the experience of the percipient subject knowing the external world, or the fact of causation.

Attempts to explain subjective experience in terms of a

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[1] "Process and Reality", p.192.

metaphysics based on the idea of independent substances and interpreted in subject-object terminology led to the formation of the sensationalist principle. This is the basis for all modern explanations of perception. Sensa are accepted as the only data of consciousness. Theorists then require some form of representational view to explain our knowledge of the external world, or they must deny its independent existence.

A perceptual theory based on a substance metaphysics and couched in subject-object terminology is adequate, up to a point, to explain visual perception. It is wholly inadequate as a theoretical basis for the analysis of any data which are not composed of static, atomic, entities. This is partly due to the fact that the theory of independent substances presupposes an abstract theory of time. Time is then viewed as a succession of discrete durations successively ordered. The classical theories of space, time, and substance are closely interrelated. They underly what Whitehead terms the "baseless doctrine of undifferentiated endurance" and the "fallacy of misplaced concreteness". Such doctrines lead to the discussion of perception at the level of conscious experience of a high-grade type. Thus investigators who use these concepts are forced to accept as their initial data perceptual experiences of a similar high grade of integration and complexity, which can be treated in an equally abstract manner.

In ordinary speech whatever does not lend itself to analysis in terms of the sensationalist principle is referred to as being emotional. Moreover this term implies a certain disapprobation. Much of interest is omitted from discussions of experience, or is summarily dismissed as being only an emotional overtone, or the like. This omission of feeling and emotional elements from discussion is partly due to the fact that the classical doctrine of discrete substances, presupposing a theory of time as a pure succession, makes it impossible to describe the non-static elements in experience. One reason why investigators into perceptual problems confine their studies to the content of the central visual field is that vision is the sense which appears to be furthest removed from the shifting play of emotional reacions. Its content can be treated, without seeming distortion, as belonging to the settled objective structure of the environment which we passively apprehend. This fits in with Descartes' view of space and material substance as a form of pure extension.

The data given in our visual apprehension of discrete objects are the most intellectual type of perceptual awareness. Hearing, on the other hand, is inextricably bound up with subjective feelings, and the emotional reactions of a percipient. When one considers this dichotomy between the intellectual and

emotional factors, it appears that material which can be analysed statically in logical terms is suitable for intellectual assimilation, according to the classical theory. Material which exemplifies dynamic temporal processes, because it does not fit the classical schema, is designated as emotional and relegated to the oblivion of chaotic changeful material with which analysers of visual perception will have no truck.

In the past theorists have treated sensations as part of the data presented in fully conscious experience. This enables them to apply logical intellectual categories to sensory material. But experience does not presuppose consciousness. Consciousness presupposes experience. Thus to study the fundamental aspects of sensory experience by considering the data of fully conscious, highly integrated types of sense-awareness, analysed in terms of a logical subject-predicate dichotomy, leads to a falsification of the perceptual situation. We ought not to generalise a universal attribute of conscious experience, such as the awareness of discrete entities in the environmental field, so that it appears as an attribute of primitive sensory experience. If we are to escape from the domination of these long-accepted intellectualist prejudices, a drastic reform must be made of our metaphysical presuppositions and of the nature of the space and time as they apply to perceptual experience. The

adequacy of analysing the data of experience in terms of a substance metaphysic to which dualistic, static, subject-object categories are applied, must be investigated, also the relative importance of feeling and intellectual components in sentient experience.

It might be maintained that classical theorists in their perceptual investigations deal only with abstract notions concerning the contents of the real world and our experience of it. They view as abstract that which is concrete in experience, i.e. the fact of change, process, and feelings derived from, and constituting, the real stuff of the universe. As regards space and time, classical theorists accept as concrete that which is only an abstraction. Thus they arrive at a notion of "continuous stuff with permanent attributes enduring without differentiation and retaining its self-identity through any stretch of time however small or large."[1] By starting from fully matured, intellectual experience these investigators are led to an inversion or misapprehension of many of the salient features of primitive experience. Perception is a more primitive type of experience than thought, fully conscious analytical awareness, or any form of apprehension which is modified by our use of linguistic material. Any coherent explanation of perception

[1] "Process and Reality", p.108.

given in terms of feeling-content and change should be more acceptable than an explanation in terms of an experience which is known to be derivative from the perceptual process. The problem is, therefore, to discover a metaphysical system which denies the universality of the classical metaphysical postulates, and which does not analyse temporal duration as a pure succession. Whitehead's philosophy of Organism appears to be such a system.

WHITEHEAD'S ALTERNATIVE THEORY.

Whitehead makes temporality and change his central concepts. He abandons the Cartesian view of substance as that requiring nothing but itself in order to exist, in which qualities inhere. Theorists who retain this schema analyse perception in sensationalist terms without reference to the feeling content of experience. They hope thereby to escape from the subjectivist predicament. Such a procedure makes it impossible to account for the experience which we refer to as a subject perceiving, or knowing, external data. Causation becomes inexplicable if one starts from discrete sensa inhering in individualised substances. Whitehead accepts the subjectivist principle, but he rejects the commonly accepted statement of it in terms of a subject-object dichotomy. In so doing he has to revise philosophic terminology changing it from a subject-object static form of explanation to that in which process is the central concept. Each element, although individually recognisable, interacts with every other element. Whitehead, by postulating the interaction of his basic substances, which he calls 'actual entities', destroys the distinction between material and

mental substances, and solves at one stroke the problems which have their origin in the separation of individual substances, i.e. the problems of causation and how a subject can perceive extended objective material things. These problems probably arise from confounding the patterning of the data under review, which is made definite by means of verbal definition, with linguistic structure.

In hearing there is no clear distinction between outer stimulus and inner percept similar to the distinction between physical objects located at some spatial distance from the percipient and the visual image. An auditory percept does not present itself as a physically existing entity in the external world. To ascribe to it a physical manifestation one has to relate the heard sound to a system of entities of quite a different kind, namely vibrations which we apprehend as visual or as tactual percepts. In other words, sound phenomena can only be made to fit into the usual perceptual schema of analysis by substituting for them inter-sensory relata. The problem of how it is possible to reach a satisfactory analysis of sound data by using such substitutes material has not been investigated and will require attention. If one retains a subject-object, mind-body dualism, it is possible to describe an auditory percept as belonging to

either class, depending upon whether one interprets the dualistic schema in terms of a realist or an idealist theory.

If we reject, as Whitehead does, the dichotomy between subject and object, we must guard against the acceptance of a view which tacitly implies subjective monism and leads to solipsism. Whitehead takes it as a given fact that in having experience we gain information about something 'other than' ourselves. This presupposition, together with his employment of the ontological principle, which states that the reasons for things are always to be found in the composite nature of definite actual entities, i.e. "No actual entity then no reason," is the basis of his metaphysical theory. Whitehead accepts the subjectivist principle in that he holds that we experience real particulars. His analysis of this position is very different from that found in the older subjectivist theories, which are based on the notion of discrete, individual, unchanging substances. These individual substances are apprehended as universals. Hence, on the classical views, the percipient apprehends universal attributes and cannot perceive particular existents. No explanation can be given of how the individual substances, which are perceived as universal attributes, interact to form particular entities.

Whitehead replaces these individual substances by actual entities. Actual entities are the final real things of experience. They are particulars and must not be thought of in abstraction from concrete experience. Each actual entity can enter into the nature of all other actual entities by a process of feeling, which Whitehead calls a 'prehension'. This process of feeling, or prehending, is the actual entity's perceptual awareness of the fact of causation. It constitutes the ultimate internal relatedness of the actual constituents of the universe. Simple prehensions, i.e. the subject's awareness of simple causal feelings are the fundamental type of awareness for Whitehead. They are not necessarily consciously apprehended.

Whitehead has therefore taken the contents of some of the most difficult problems in modern philosophy and transformed them into the basic presuppositions of his theory. He is boldly claiming that even in the most primitive forms of perceptual activity we have a direct awareness of particular entities, and a perceptual demonstration of the facts of causation. We not only perceive things which exist in the external world, but we perceive them in their objectivity as being related to us as external existents. Perception, Whitehead thinks, leaves us no room to doubt the ultimate reality of the content of what we perceive. Ultimate reality

does not reside merely in being the semblance of an object, in a visual or tactual presentation of sensa. It is the capacity to enter into actual experience, to feel and be felt. Hence, what an actual entity experiences at the primitive level of awareness is actual, and the reality of that actual entity as a constituent of the world is assured by the fact that it is an experiencing agent.

There may appear to be a difficulty in so far as each actual entity is real in being an experiencing agent, but the reality of its experiences depends upon the integrity of its feeling for, i.e. its prehension of, the nature of other actual entities. How, we may ask, is this possible, when individual experiences are essentially private? The answer would appear to be that below the level of consciousness we have no grounds for claiming privacy for individual experiences.[1] Every actual entity as a prehending agent may pervade every other in such a manner that it is only the difference in focal centre, a difference of emphasis, that creates the individuality of the actual entities concerned. In other words, an actual entity is not a thing with boundaries but a patterned process, a focal region. This patterning of actual entities, however, must not be thought of merely on the analogy of a pattern of visual shapes spatially differentiated. It

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[1] Cf. "Process and Reality" (Cambridge University Press 1929), p.411.

has a temporal significance such that patterns may have a common material content but be differentiated by what may be termed their rhythmic continuity and emphasis. This aspect of the organic theory will be discussed in detail in Part III.

If the total nature of an actual entity in its full actuality is concerned with its awareness of other actual entities, then a full description of any one actual entity will be possible only in terms of the inter-relationship between it and every existing entity in the entire universe. It is sometimes objected that such a description cannot be given, and that Whitehead does not demonstrate how the individualised entities can become elements in experience in the absence of such an understanding of the totality of entities comprising the universe. Such an objection is a re-assertion of a dualistic mode of thought. Whitehead points out that we cannot feel without feeling in some determined manner. The fact that we prehend A in a particular manner, depends upon relationships existing between A and a selection of factors common to our environments. It does not depend upon our knowledge of all the possible relationships into which we, or A, may enter. We may assert the latter view if we attend not to the positive relations between us and A, but to the fact that these relations exclude innumerable others. It is the negative judgment, in this sense, which

makes experience possible. In the analysis of our experience A is an entity of our awareness because A has a specific structure which stands in a definite and demonstrable relation to the structure which is the prehending subject throughout the duration in which it is aware of A. A is an entity for you because you prehend A in a determinate manner. This is not an instantaneous relationship between exclusive entities, but a relationship between unitary processes. The entities of Whitehead's theory are not static, abstract, logical entities, but actual entities which develop. Thus Whitehead can say that the being of an actual entity is its becoming. When it obtains its satisfaction i.e. its status as an entity in the ordinary sense, the actual entity ceases to be. Thereafter it can only 'enjoy objective immortality'. Whitehead makes the Principle of Relativity a central concept, instead of accepting a static, spatialised interpretation of the 'thinghood of things'. But in illustrating his theory with reference to experience, Whitehead allows the classical view of time, and sometimes also of space, to dominate the discussion, although such an interpretation is not consistent with the Principle of Relativity. Much of the difficulty in interpreting Whitehead's Philosophy of Organism arises from this source. He fails to give an adequate account of the temporal factors of experience in terms of his relativity

theory. Most of the criticisms that are levelled against the Philosophy of Organism are made in terms of the classical view of the nature of space, time, and objectivity. Such criticisms stress the fact that Whitehead's perceptual theory does not fit the classical concepts. These criticisms do not, as their authors intend, prove that Whitehead's theory is untenable or internally inconsistent.

An actual entity is a "drop of experience", fully concrete, without differentiation in kind between experiencing subject and data experienced. It is not static, but is a constant process of becoming. This process presupposes an ever-changing relationship between the experiencing actual entity and other constantly developing actual entities. Thus an actual entity remains concretely real, and defies exact description. Any attempt to define it is necessarily abstract.

Whitehead states his basic presuppositions in terms of actual entities, prehensions, eternal objects and three metaphysical principles. These are the ontological principle, - "No actual entity then no reason", or alternatively stated, "Everything is positively somewhere in actuality and in potency everywhere";[1] - the principle of relativity, - "Every item in the universe, including all other actual entities, are

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[1] Whitehead, op.cit., p.75 and p.55. Compare also p.33.

constituents in the constitution of any one actual entity", or alternatively stated, "It belongs to the nature of a 'being' that it is a potential for every becoming"[1]; and the principle of process, - "That how an actual entity becomes constitutes what that actual entity is: so that the two descriptions of an actual entity are not independent. Its 'being' is constituted by its 'becoming'".[2]

These metaphysical principles presuppose a different theory of time from that found in the classical Newtonian explanation. Unfortunately Whitehead does not give his attention to the problem of defining temporal experience in terms of his organic philsophy. He writes:

> "It is fundamental to the metaphysical doctrine of the philosophy of organism, that the notion of an actual entity as the unchanging subject of change is completely abandoned. An actual entity is at once the subject experiencing and the superject of its experiences."[3]

Whitehead does not consider what type of temporal theory is required to make the elucidation of such a view possible. He criticises the notion of time as a unique seriality, but does not replace it by a constructive theory. Thus he discusses process, becoming, and prehension in relation to

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1 Whitehead, op.cit., p.205 and p.30.
2 ibid., p.31.
3 ibid., p.39.

our experience of spatial phenomena. His theory is limited by his tacit acceptance of concepts proper only to the classical description of such experience. For example, when Whitehead states that "the ultimate metaphysical truth is atomism",[1] he seems to be committing himself to the view that time is an external relationship holding between atomic entities, not an element necessary for their structural individuality. He goes on to assert "But atomism does not exclude complexity and universal relativity. Each atom is a system of all things". He does not however give a clear notion of the relation between his atomism and a temporally ordered universe in which the most important factor is process.

A problem which must be considered in discussing Whitehead's theory is the extent to which it is possible adequately to describe a dynamic temporal process and its constituents in linguistic terms. Any verbal discussion of such material can only be an approximation to the truth. Language is shot through with the metaphysical notions inherent in philosophical dualism. It is impossible to rid it of unwanted associations in this respect. Moreover language is by nature a conceptual instrument which must aim at the exactitude of precise definition, if it is to fulfil its proper function. It is,

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[1] Whitehead, op.cit., p.48.

therefore, diametrically opposed to the type of material and structure which Whitehead accepts as the primitive content of our experience.

In Whitehead's theory there is no absolute disjunction between the physical and the mental components of experience. Not only do we experience the flux and process of a physical transference of feeling, there are also definite recurring patterns exemplified within the process. These, when labelled linguistically, tend to be regarded as transcendent mental forms externally imposed upon the physical process. Thus the epochal view of time becomes transformed into a mechanical view in which form is imposed upon matter in accordance with a pre-ordained static pattern. Temporal succession is then regarded as a one-dimensional series in which these static objects which are the result of the synthesis of form and matter, are arranged in the order of their appearance as data for consciousness.

Whitehead bases his theory on concrete experience, but he starts by analysing the smallest individualised segment of experience which we can abstract from the flux of process. This is the prehension of a number of actual entities by some specific actual entity. In considering perception Whitehead takes account of the temporal elements in the content experienced but he tends to analyse the subjective act of

perceiving as an instantaneous awareness of data. He builds up his more complex theory by relating immediate experience to happenings in the past and to potential future experiences. But Whitehead does not illustrate how the percipient subject as an ever changing and developing organism is organised. He stresses the interaction between different phases of the material under investigation, but seems to assume that the percipient subject is adequately described as a mere succession of prehending occasions.

Let us briefly examine how Whitehead builds up his explanation of the structure of conscious intellectual experience by starting from a discussion of the structure of simple physical feelings. So far we have mentioned actual entities, prehensions, and the three metaphysical principles, as the main elements in Whitehead's organic theory. In defining concrete experience, however, one must attend not only to the actual elements presented in an analysis of the data, but also to potential elements which can only be described as 'conceptual' in distinction from the actually presented physical data. This distinction between the physical and conceptual elements in experience should not be mistaken for a re-assertion of the mind-matter dualism of the older metaphysics. 'Conceptual' here refers only to 'that which is not physically present', not to any spiritual epiphenomenon.

The physical content of any concrete experiene is describable in terms of efficient causation as a responsive stage in the evolutionary process. The conceptual content refers to the superjective character of the actual entity which is striving towards a form of definiteness within a wider unity. It is describable only in terms of final causation.

Actual entities are completely concrete. Hence they can only be analysed in terms of some abstraction. They are composite and do not change. They can be analysed in terms of four constitutive stages, termed datum, process, satisfaction, and decision. Whitehead states that "in Cartesian language the essence of an actual entity consists solely in the fact that it is a prehending thing (i.e. a substance whose whole essence or nature is to prehend)".[1] A prehension "reproduces in itself the general characteristics of an actual entity: it is referent to an external world, and in this sense will be said to have a vector character."[2] A positive prehension is termed a feeling, and the simplest form of prehension is described in terms of simple physical feelings.

A simple physical feeling is the outcome of the prehension of one actual entity by another. Although Whitehead states that an actual entity is a concrete process, he analyses it in terms of a succession of single, abstract, instantaneous acts

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[1] Whitehead, op.cit., p.56.

[2] ibid., p.25.

of awareness. Sometimes he loses sight of the dynamic structure of the phenomenon under investigation. This is because he lacks an adequate theory of temporal experience, and is forced to describe his data with reference to spatial phenomena.

Whitehead stresses that in analysing the subjective form of the actual entity which is prehending, we must consider its past history, in so far as this accounts for the subjective form which is exemplified by its present act of prehending. But the actual entity is not merely the passive recipient of feelings which are conformal with the environment and with its own past experiences. It is not merely a subject, but also a superject. It is 'causa sui'. It is an individual arising out of a settled past, which integrates this with its own subjective aim. Its individuality is expressed in the manner in which it unifies these various constituents of its experience. Hence the actual entity integrates actual with potential factors in its concrete experience. The subjective form under which any single act of prehending must be analysed is described by Whitehead as the 'perspective' from which a prehending actual entity prehends the datum. The use of the term 'perspective' is misleading in this context. A perspective in the visual field is dependent upon the position of the percipient in relation to other external factors in

the total field. The 'perspective' for prehending depends upon subjective factors. It is independent of the external environment in which the percipient is now placed. [redacted]

A simple physical feeling is analysable as any act of prehending in which the percipient subject prehends some external datum. It may be described as a direct perception of causal efficacy. The percipient subject, as it is concerned in this specific act of awareness, is analysed in terms of some specific subjective form. The initial datum which it prehends is also only a partial aspect of the total actual entity which is the real object of the prehension. Both subject and object are, therefore, viewed under an abstraction. The 'objective datum' is a feeling with a two-way transference. It refers to the initial datum as its original object, and to the prehending actual entity which feels it. If the feeling felt, i.e. the content of the 'objective datum' is equally applicable to the structural unity of the initial datum and of the percipient subject, then the transfer of feeling is described as a simple physical feeling. We cannot feel in an indeterminate manner. A feeling has always a certain form of definiteness. It is these forms which Whitehead terms 'eternal objects'. The realisation that every physical prehension has some form of definiteness, i.e. that it is governed by some eternal object, is a conceptual prehension

and is present to some extent in every act of prehending. Whitehead writes:

> "In the world there is nothing static. But there is reproduction; and hence the permanence which is the result of order and the cause of it. And yet there is always change; for time is cumulative as well as reproductive, and the cumulation of the many is not their reproduction as many."[1]

This view embodies the notion of time as a succession of discrete events plus an awareness of the content of its earlier phases. But the permanence which we experience is not the result of mere reproduction. There must be some structural unity in the experience which is being reproduced, before its reproduction can give us the notion of permanence. Whitehead analyses the content experienced in abstraction from the temporal features inherent in the subjective form of the percipient activity. Thus he fails to achieve a coherent view of the manner in which organic concepts can be applied to perceptual investigation.

The same static objectification of the material under discussion is evident in Whitehead's treatment of conceptual prehensions. In a conceptual prehension the physical factors

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[1] Whitehead, op.cit., p.337.

and the form inherent in the 'objective datum' are recessive factors. The dominant feature of the total experience is the form of definiteness introduced by the subject's specific apprehension of the particular datum, i.e. what Whitehead has termed the 'perspective' of the sentient subject. By attending to the manner of interaction between the eternal object which represents the form of definiteness manifested by the 'objective datum' and the eternal object which represents the subjective form assumed by the percipient, Whitehead describes various forms of hybrid prehensions. If the content of a single feeling-process is a plurality of data, the process by which they are unified is known as transmutation. This is the origin of the concept of nexus by means of which the world is felt as a unity divisible into parts. From these two variables, - i.e. the relative dominance of physical and conceptual elements, and the various forms of unification of primitive physical data by conceptual processes, - Whitehead works out a definition of subjective valuation, conceptual reversion, physical purpose, propositional feeling, and intellectual feeling including conscious perceptions and intuitive judgements.

This whole schema appears rather as a discussion of the components found in experience than a discussion of the experienced process. This is because Whitehead starts from

atomic data, and constructs experience by a method which seems similar to that used by earlier theorists when they compound complex ideas from a summation of simple elements. Whitehead stresses the fact that creativity or process is the basic concept upon which his whole theory depends. There are many penetrating remarks on the importance of change and of a dynamic interpretation of phenomena throughout his works. Nevertheless the manner in which he builds up his organic account out of discrete elements makes the idea of process external to his theory as it is formally presented. This is because he starts by describing the contents of instantaneous acts of perceiving, thus opening the way for a mechanistic explanation of the subjective factors in experience. He is forced to adopt this method because he still tacitly accepts the classical view of time as a pure succession in which discrete events can only be externally related. Thus he must state their essential internal relatedness in spatialised terms. Whitehead states:

> "The philosophy or organism is mainly devoted to the task of making clear the notion of 'being present in another entity'. This phrase is here borrowed from Aristotle: it is not a fortunate phrase, and in subsequent discussion it will be replaced by the term 'objectification'. The Aristotelian phrase suggests the crude notion that one

actual entity is added to another simpliciter. This is not what is meant. One role of the eternal objects is that they are those elements which express how any one actual entity is constituted by its synthesis of other actual entities, and how that actual entity develops from the primary dative phase into its own individual actual existence, involving its individual emjoyments and appetitions. An actual entity is concrete because it is such a particular concrescence of the universe."[1]

This notion of objectification, together with his analysis of the past, the present, and the future as a continuous succession of temporal events which may be analysed "in the one plane", makes Whitehead's theory seem inconsistent with his organic starting point in which process is the dominant factor.

Professor Dewey comments upon the difficulty of reconcilin the two aspects of Whitehead's theory, namely the logical framework and the temporal passage of events.[2] Professor Dewey tends to consider only one aspect of Whitehead's theory at a time. This does less than justice to Whitehead's position, for Whitehead obviously regards the two as complementary

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1 Whiteahead, op.cit., p.69.

2 "Whitehead's Philosophy", Philosophical Review, XLIV, 1937, p.170, and "The Philosophy of Whitehead", (Library of Living Philosophers, edited by P.A. Schilpp, Vol.III, 1941), p.643.

When Professor Dewey asks Whitehead to choose between the 'genetic-functional' interpretation of first principles and the 'mathematical-formal' interpretation, Whitehead declines to make the decision. Whitehead states:

> "The historic process of the world, which requires the genetic-functional interpretation, also requires for its understanding some insight into these ultimate principles of existence which express the necessary connections within the flux."[1]

As we have stated Whitehead tends to look for the necessary connections not merely in 'mathematic-formal' relations, but in a spatialistic interpretation of these types of connection. We all tend to use the 'mathematical-formal' schema because it is more easily handled and discussed, it gives a certain precision and clarity, and it is found to give practically useful results, in many situations. Whitehead wishes to treat the 'genetic-functional' and 'mathematical-formal' principles as being of equal importance in his theoretical study, but nowhere does he show how the two are to be related within a single abstract schema. He does not even sufficiently establish a basis for his 'genetic-functional'

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[1] "Remarks", Philosophical Review, XLIV, 1937, p.179. Read before the Eastern Division of the Americal Philosophical Association, Cambridge, Mass., 1936. Reprinted in "Essays in Science and Philosophy" (Rider and Co.,1948), p.94.

interpretation. He appears to consider that the classical theory of time is an adequate background for a genetic analysis. His own formal theory demonstrates that this belief is erroneous. The lack of an adequate theory of time forces Whitehead into analysing data in a spatial manner which are not thus related. For example, he describes the total relationship between the percipient and his environment in terms of 'strain loci' and other geometrical concepts, although he does not intend to confine the discussion to our physical experience of space.[1]

The basic problem may be stated thus. Is it necessary, in the interpretation of all phenomena, to introduce the space-time continuum, which makes spatial categories dominant, as a 'tertium quid' between the abstract logical framework, which the 'mathematical-formal' mode of analysis presents, and the experienced data? If we make time the central concept for our interpretation of empirical experience, is it not possible to interpret the abstract logical schema in relation to some forms of experience without reference to spatial categories? When Whitehead stresses the 'genetic-functional' analysis, and in his metaphysical theory emphasises the importance of creativity, process, and the theory of prehensions, he is tacitly admitting that static spatial concepts

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[1] Cf. "Process and Reality", p.177 ff.

are not so pervasive and ultimate as has been theoretically assumed. When, however, he gives a more detailed statement of his position, he lapses into a 'mathematical-formal' spatialistic interpretation of experience and of his own terminology.

In a paper on Whitehead's speculative philosophy Dr. Mays inquires:

> "If this notion of creativity or process is to be taken as a metaphysical first principle how can it be spoken of as coherent, logical, and necessary (i.e. having the properties of a deductive system) since in its essence it seems to have a temporal character?"[1]

If time as well as space is an extensive continuum, as Whitehead is willing to admit, then there is no reason why it should not exhibit a coherent pattern which can be represented in abstract terms. Dr. Mays writes:

> "Whitehead emphasises that in our actual world the (abstract extensive) schema is given a content by the creative advance of nature. In other words, we deal with concrete events illustrated by specific characteristics and related together in one S-T structure. It would therefore seem that the metaphysical situation (the actual

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[1] "Whitehead's Account of 'Speculative Philosophy' in Process and Reality", Aristotelian Society Proceedings, 1945-1946, p.19.

world) to which our speculative philosophy must apply has two sides to it - (a) the logical framework of order, and (b) the temporal process which actualises it (or gives it a factual content), transforming the abstract scheme into the S-T structure of events. A comparison might be drawn with his earlier view. "There are two sides to nature, as it were antagonistic the one to the other and yet each essential. The one side is development in creative advance, the essential becomingness of nature. The other side is the permanence of things".[1]

The point at issue is whether or not it is possible to interpret the metaphysical situation (the actual world) to which speculative philosophy must apply as (a) a temporal process exhibiting coherent relations, and (b) a spatial, or other form of sensory experience, which actualises it (or gives it a factual content). There does not appear to be any inherent contradiction in holding such a view. It is merely not consistent with classical philosophical presuppositions, and is difficult to state in linguistic terms. That some such view is necessary for an adequate analysis of forms of experience which are not spatially organised will become evident when we discuss sound phenomena. At present

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[1] Op.cit., p.21. Inset quotation from "The Principles of Natural Knowledge" (Cambridge University Press, 1919), p.98.

we shall examine Whitehead's discussion of time as it is given in his earlier writings, with a view to establishing the possibility of making temporality a central concept not only in speculative philosophy, but also in the metaphysical interpretation of the actual world and our experience of it which gives a factual content to the abstract schema.

THE RELATIONSHIP OF TEMPORAL DURATION TO A ONE-DIMENSIONAL TIME SERIES.

Whitehead opens his discussion of time by drawing a distinction between two factors which he terms 'the discerned' and 'the discernible'.[1] These two factors are not antithetical. The discernible is the more inclusive term which includes discerned factors. The discerned are elements in the directly perceived field which are discriminated with their own individual peculiarities. In Whitehead's later theory the discerned are equivalent to the data of the mode of presentational immediacy. There are, however, other entities known merely as relata with reference to the discerned elements. These entities stand in a definite relation to some determinate entity or entities in the discerned field. The discernible is the complete general fact comprising both the discerned elements and their relata.

The discerned elements and their relata have two forms of association. They may refer to the same type of sensory experience, or they may refer to inter-sensory experience. Whitehead gives as an example of the first type, the world beyond the room to which our sight is confined. This

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[1] Whitehead, "The Concept of Nature" (Cambridge University Press, 1920), p.49.

completes the spatial relations of the entities discerned within the room. One might take also an example from the auditory field. When we attend to musical sounds we may be aware perceptually of their first and second harmonics, which constitute the discerned elements. There are, however, other relata which affect our hearing of the sound, e.g. by altering its timbre and quality, but these higher harmonics are not directly and individually perceived by us. The existence of these higher harmonics is necessary to complete the pitch spectrum in terms of which we classify the discerned elements as elements within a harmonic system.

The other type of relata, which we have termed intersensory, is perhaps of greater importance for a discussion of the association of discerned and discernible factors. Whitehead writes:

> "Every type of sensa has its own set of discriminated entities which are known to be relata in relation with entities not discriminated by that sense."[1]

He cites things which we see and do not touch. Also the world beyond the room to which our visual perception is confined is disclosed to us by our sense-awareness of sounds and other subtler factors. We might also take as an

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[1] Whitehead, op.cit., p.50.

example the sound of a note and the sight or feel of its vibrating material source.

In his discussion of time Whitehead takes as the material content of his investigation visuo-spatial experience. In attempting to escape from a mechanistic analysis of temporality he still uses spatial concepts to distinguish the various 'epochs' of time one from another. He can thus demonstrate why the attention of perceptual theorists has been concentrated upon space and happenings in space to the exclusion of temporal experience. When, however, he wishes to construct a positive theory his use of visuo-spatial phenomena exercises a restrictive influence on his thought.

Whitehead discusses the relationship between the discernible and the discerned with reference to spatial relations and our notion of place. He writes:

> "An entity merely known as spatially related to some discerned entity is what we mean by the bare idea of 'place'. The concept of place marks the disclosure in sense awareness of entities in nature known merely by their spatial relations to discerned entities. It is the disclosure of the discernible by means of its relations to the discerned.
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> "This disclosure of an entity as a relatum without further specific discrimination is the basis of our concept of

significance. In the above example the thing seem was significant in that it disclosed its spatial relations to other entities not necessarily otherwise entering into consciousness. Thus significance is relatedness with the emphasis on one end only of the relation.

"For the sake of simplicity I have confined the argument to spatial relations; but the same considerations apply to temporal relations. The concept of 'period of time' marks the disclosure in sense-awareness of entities in nature known merely by their temporal relations to discerned entities. Still further, this separation of the ideas of space and time has merely been adopted for the sake of gaining simplicity of exposition by conformity to current language. What we discern is the specific character of a place through a period of time. This is what I mean by an 'event'. We discern some specific character of an event. But in discerning an event we are also aware of its significance as a relatum in the structure of events. c/ This structure of events is the complex of events related by the two relations of extension and cogredience. The most simple expressions of the properties of this structure are to be found in our spatial and temporal relations. A discerned event is known as related in this structure to other events whose specific characters are otherwise not

disclosed in that immediate awareness except so far as that they are relata within the structure."[1]

Whitehead apologises for his use of spatial relations which depend upon visual and tactual perception for their empirical content. It is for the sake of simplicity and conformity to current language that he chooses this form of significant phenomena. He asserts that the same considerations apply to temporal relations. This is because both space and time are partial expressions of the more fundamental relation of extension. Whitehead defines extension thus:

"Space and time are each partial expressions of one fundamental relation between events which is neither spatial nor temporal. This relation I call 'extension'. The relation of 'extending over' is the relations of 'including', either in a spatial or in a temporal sense, or in both. But the mere 'inclusion' is more fundamental than either alternative and does not require any spatio-temporal differentiation. In respect to extension two events are mutually related so that either (i) one includes the other, or (ii) one overlaps the other without complete inclusion, or (iii) they are entirely separate. But great care is required in the definition of spatial and temporal elements

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[1] Whitehead, op.cit., p.51 f.

from this basis in order to avoid tacit limitations really depending on undefined relations and properties."[1]

Whitehead suggests that fallacious definitions can be avoided by taking account of two elements in experience which he terms the 'observational present' and the 'percipient event'.

The 'observational present' contains the discerned with reference to which other entities can be discerned as relata. It is thus the empirical basis from which the concept of a 'period of time' can be built up. It refers to what psychologists have termed the 'specious present'. It is a duration, that is, a period of time not abstracted from the events which occur in it. It is defined with reference to our immediate awareness of some datum or event as a unitary whole presented to us as an individualised entity. A 'duration', for Whitehead, is not an abstract stretch of empty time to be measured in terms of a definite number of discrete instants, but is wholly concrete. It consists of everything potentially present in experience throughout some temporal span. This temporal span which is the 'observational present' for the percipient is defined with reference to the actual present content of consciousness. It is my 'here and now' which is a 'perpetual perishing'.

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[1] Whitehead, op.cit., p.185.

The 'percipient event' unlike the 'observational present' is defined in relation to non-temporal extension. Whitehead states that the relation of 'extending over' is the relation of 'including' either in a spatial or a temporal sense, or in both, but that it is more fundamental than either. The distinction between spatial and temporal extension appears to reside in the fact that spatial extension is relatively stable, hence predictable within any given time system. It is nonsense to speak of predicting the form of temporal extension, since the notion of prediction itself implies some presupposition concerning the nature of time. The 'percipient event', is defined in relation to the awareness of place. It is the 'locus standi' for mind in nature, that in nature from which the mind perceives. This definition implies a view of the mind as an embodied entity. The mind becomes a kind of universal percipient standing apart from that which it comprehends. This definition makes the 'percipient event' depend upon the embodied mind's spatial position. This is the first suggestion in Whitehead's theory of the restrictive influence which the use of visuo-spatial data has upon temporal theory. This definition of the 'percipient event' implies that our actual experience of time can only be understood by attending to the position and motion of entities in the spatial continuum. Thus it

imposes upon us a formal, mechanistic analysis of temporal experience.

We find this same assumption dominating Whitehead's discussion in "Process and Reality" of the correct analysis of the relation between the percipient and the data experienced. He writes:

> "Each entity is essentially bipolar, physical and mental, and the physical inheritance is essentially accompanied by a conceptual reaction partly conformed to, and partly introductory of, a relevant novel contrast, but always introducing emphasis, valuation, and purpose. The integration of the physical and mental side into a unity of experience is a self-formation which is a process of concrescence, and which by the principle of objective immortality characterises the creativity which transcends it. So although mentality is non-spatial, mentality is always a reaction from, and integration with, physical experience which is spatial."[1]

On account of this belief that mentality is always a reaction from, and integration with, physical experience which is spatial, Whitehead proceeds to work out how his organic theory relates to perceptual experiences in terms of strain-loci which define the systematic geometrical relations between

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[1] "Process and Reality", p.151.

the embodied percipient and the presented locus. This is tantamount to making the 'percipient event', spatially interpreted, the central concept in perceptual theory. We may agree with Whitehead that the character of an actual entity is governed by its datum, but not when this statement is interpreted as referring only to the spatial properties of the datum. The character of an actual entity is not governed solely by its spatial relations to other data. When Whitehead describes perception in such terms he is tacitly accepting a visualistic account of all perceptual data.

The absence of apparent temporal factors in the 'percipient event' when analysed with reference to visuo-spatial experience is a significant factor in Whitehead's perceptual theory. We do not apply temporal factors to material which does not appear to be temporally organised. By describing the 'percipient event' in non-temporal terms Whitehead tacitly accepts the view that temporality is an unimportant factor in experiences cogredient with the 'percipient event'. Thus he gives a static, logical analysis of the subjective content of experience. This leads to the analysis of two modes of perceptual experience. In the mode of presentational immediacy temporal factors are irrelevant, and they are not adequately discussed in relation to the mode of causal efficacy or in relation to symbolic reference. Throughout his later

metaphysical works Whitehead appears to accept the classical view of time as a one-dimensional pure succession. He only rejects the notion that there is one single time system relevant to the entire universe. The lack of an adequate theory of time, together with the spatialistic analysis of perceptual experiences in terms of strain loci, makes Whitehead's philosophy of organism difficult to interpret, except possibly in relation to visual experiences and to the doctrines of modern physics.

In "The Concept of Nature" Whitehead discusses the importance of the concept of instantaneousness and its relation to sense-awareness. This discussion illustrates why temporal factors have been dismissed from theoretical discussions of experience. Whitehead writes:

> "Instantaneousness is a complex logical concept of a procedure in thought by which constructed logical entities are produced for the sake of the simple expression in thought of properties of nature. Instantaneousness is the concept of all nature at an instant, where an instant is conceived as deprived of all temporal extension..... It is a very complex idea so far as concerns its connexions with the immediate facts of sense-awareness. What sense-awareness delivers over for knowledge is nature through a period. Accordingly nature at an instant, since it is not

itself a natural entity, must be defined in terms of genuine natural entities.... What is directly yielded to our knowledge by sense-awareness is a duration. Accordingly we have now to explain how moments are derived from durations, and also to explain the purpose served by their introduction.

A moment is a limit to which we approach as we confine attention to durations of minimum extension. Natural relations among the ingredients of a duration gain in complexity as we consider durations of increasing temporal extension. Accordingly there is an approach to ideal simplicity as we approach an ideal diminution of extension."[1]

Exactness is an ideal of thought to which concrete experience can only approximate. Sense-awareness is inherently vague and indeterminate. Thus we cannot analyse temporal experience in terms of a succession of atomic individual happenings without detracting from the essential homogeneity of different aspects of temporal passage. It is usual to discuss time with reference to happenings in time. When we isolate any single happening we are abstracting from the concrete actuality of the experience and of the process by means of which we apprehend it. Whitehead's account of the essential nature of extension, which exhibits one aspect

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[1] "The Concept of Nature" p.56 f.

of the ultimate passage of nature, has already been quoted. Every event extends over and is extended over by other events. Likewise the temporal durations in which these events are situated are closely inter-connected. Thus there is no atomic structure of events or of temporality. To distinguish an individual temporal span whether it be of minimum or maximum duration is an arbitrary postulate of thought based on what Whitehead terms 'the selection of routes of approximation'.

The relationship between temporality and the atomic entities with which an intellectual logical analysis of experience deals can be understood by considering Whitehead's 'Method of Extensive Abstraction' as it relates to temporal phenomena. Since the relation of extension is transitive, if a duration X is included in a duration Y, and the duration Y is included in the duration Z, then the duration X is included in the duration Z. This relation of 'including' is asymmetrical. Families of durations may be formed such that of any two durations either there are durations which are parts of both, or the two are completely separate. If two durations are contained by another duration all three are said to belong to the same family.

If we have a set of durations such that, of any two of its members the one contains the other as a part, and there is a common part of every member of the set, they form a

one-dimensional series. This is how Whitehead defines an abstractive set in relation to temporality. The abstractive set converges to the ideal of all nature at an instant with no temporal extension. It is, in fact, the ideal of non-entity. It is by the use of the notion of an abstractive set that we can derive moments, - i.e. the concept of nature at an instant, - from durations. An abstractive set is the entity to which we refer when we consider an instant of time without temporal extension. The purpose of such an analysis, by means of which temporally extended phenomena are conceived as static data, is "to guide thought to the consideration of the progressive simplicity of natural relations as we progressively diminish the temporal extension of the duration considered."

We can give a definite meaning to the concept 'the properties of nature at an instant' by considering abstractive sets which have routes of approximation to the same moment. A moment may be thought of as a class of abstractive sets which converge upon it. This explains how we can correlate different time systems, and the various geometrical analyses of space, which are dependent upon diverse analyses of temporal extension.

If we define the instant of time as the end term of an abstractive set, we can obtain a definite, quantitatively

measurable content in place of material which is presented to sense-awareness as temporally extended and is only vaguely differentiated. But we also require to have some means of dealing with temporal passage, so that we can accurately refer to certain portions of it to the exclusion of the rest of the temporal continuum. This necessitates the discovery of a means of defining time as a series of moments.

Consider a given duration in relation to its associated family of durations, and the family of moments with which this family of durations may in turn be associated. In any family of moments associated with a family of durations there are moments which lie within the given duration, moments which lie outside it, and two moments which are the boundary moments of it. Moreover any two moments of a family of moments are the boundary moments of a duration in the associated family of durations. We can thus analyse the three-termed relation of 'lying between' which is the basis of our analysis of temporal passage as a one-dimensional serial order. Whitehead writes:

> "Such an ordered series of moments is what we mean by time defined as a series. Each element of the series exhibits an instantaneous state of nature. Evidently this serial time is the result of an intellectual process of abstraction. What I have done is to give a precise

definition of the procedure by which the abstraction is effected. This procedure is merely a particular case of the general method which in my book I name the 'method of extensive abstraction'. This serial time is evidently not the very passage of nature itself. It exhibits some of the natural properties which flow from it. The state of nature 'at a moment' has evidently lost this ultimate quality of passage. Also the temporal series of moments only retains it as an extrinsic relation of entities and not as the outcome of the essential being of the terms of the series."[1]

This explains why time as we measure it scientifically does not accord with our actual subjective experience of temporal passage. It also illustrates why any discussion of time which starts from our apprehension of space and bodies in space cannot give a true account of experienced duration. When we conceive time as constituted by the successive apprehension of individual sensations, whether these be visual, auditory, or tactual, we are basing our analysis upon our apprehension of 'the properties of nature at an instant'. The only method of constructing temporal experience from such data is by considering a succession of discrete instants, that is by defining time as a one-dimensional series. That time as

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[1] Whitehead, op.cit., p.64 f.

experienced is not a one-dimensional series will be illustrated by the subsequent discussion in which we shall attempt to build up a constructive theory of time.

The explanation of time as a one-dimensional series is the view of time current in the eighteenth and nineteenth centuries upon which philosophical materialism is based. In terms of this theory nature is considered as an aggregate of material which exists throughout a series of extensionless moments as a configuration of objects in a persistent and unbounded space. Such a view implies a radical separation of mental and physical substances, since time, conceived as a measurable series, can only apply to material entities in the physical world. Thus thought, perception, and sense-awareness must, on this view, be considered to exist in some sense beyond nature and beyond temporal passage.

It is still common to accept two views of time. One explains time as it relates to the processes of perception and thought. The other explains time as it relates to material objects. Only the latter is measurable. Psychologists, and other research workers, by making use of inter-sensory relata, have attempted to apply the measurable time series accepted for our scientific investigations into physical phenomena, to account for the temporal content of mental and perceptual processes. But the concept of instantaneousness is not

applicable to mental or perceptual activity. The attempt to apply a measured, one-dimensional time system to mental phenomena only causes a distorted view of the structure of thought and perception. Only the flux of the material in the physical world, - that is the termini of sense-awareness from which the duratienal content may be abstracted, - is open to analysis in the exact measures of a scientific, mechanical account of time. In other words the physical content of experience is analysable, by use of the method of extensive abstraction, as a one-dimensional temporal series, but its conceptual content cannot be encompassed in an abstract, one-dimensional measured time series. Thus such an explanation of time only accounts for its phenomenal structure in relation to material entities in the physical world.

THE ANALYSIS OF TIME AS WE EXPERIENCE IT.

Time is analysed for practical purposes as a one-dimensional serial order in which data appear successively. This forms the fourth dimension of the spatio-temporal continuum with reference to which scientific analyses of physical phenomena are constructed. In scientific investigation a more complex analysis of time would cause confusion. This abstract analysis of temporal passage is adequate within the limitations of the scientific field. Some people have assumed that it is therefore acceptable as an analysis of temporality as such. A one-dimensional schema cannot be expanded to account for time as we actually experience it. In "The Concept of Nature" Whitehead points out that serial time does not refer to the processes of sense-awareness or thought, but is an abstract theory about the temporal passage of natural events. He writes:

> "The lapse of time is a measurable serial quantity. The whole of scientific theory depends on this assumption and any theory of time which fails to provide such a measurable series stands self-condemned as unable to account for the most salient fact in experience. Our difficulties only begin when we ask what it is that is measured. It is

evidently something so fundamental in experience that we can hardly stand back from it and hold it apart so as to view it in its own proportions.

We have first to make up our minds whether time is to be found in nature or nature in time. The difficulty of the latter alternative - namely of making time prior to nature - is that time then becomes a metaphysical enigma. What sort of entities are its instants or its periods? The dissociation of time from events discloses to our immediate inspection that the attempt to set up time as an independent terminus for knowledge is like the effort to find substance in a shadow. There is time because there are happenings, and apart from happenings there is nothing.

It is necessary however to make a distinction. In some sense time extends beyond nature. It is not true that a timeless sense-awareness and a timeless thought combine to contemplate a timeful nature. Sense-awareness and thought are themselves processes as well as their termini in nature. In other words there is a passage of sense-awareness and a passage of thought. Thus the reign of the quality of passage extends beyond nature. But now the distinction arises between passage which is fundamental and the temporal series which is a logical abstraction representing some of the properties of nature. A temporal series, as we have defined it, represents merely certain properties of a family of durations

- properties indeed which durations only possess because of their partaking of the character of passage, but on the other hand properties which only durations do possess. Accordingly time in the sense of a measurable temporal series is a character of nature only, and does not extend to the processes of thought and of sense-awareness except by a correlation of these processes with the temporal series implicated in their procedures."[1]

Whitehead has written, "There is time because there are happenings and apart from happenings there is nothing." This aptly summarises one of the main difficulties for any attempt to excogitate an adequate theory of time. Namely we cannot discuss time by itself in abstraction from the happenings situated in it. It must be recognised, however, that the converse of Whitehead's statement is equally true. "There are happenings because there is time and apart from time there is nothing."

In the past it has been customary to discuss every event in terms of its non-temporal ingredients, and to analyse it in terms of the qualities exhibited by its static material content. This habit has extended to the discussion of events in which temporal factors are dominant. In musical analysis,

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[1] Whitehead, op.cit., p.65 f.

for example, pitch, frequency, intensity, tonal 'colour', timbre, and sonance receive more attention than, and are analysed in abstraction from, the consideration of speed, phrasing, and rhythm. In the analysis of speech, emotions, states of mind, other mental and bodily feelings, and sensory processes, we pay attention to the material content principally. We analyse them in terms of static qualities, replacing qualitative analyses by quantitative measurements wherever this is possible. The temporal aspects of these experiences if we mention them at all, are treated in isolation. When we are dealing with the structure of physical objects and with data which are predominantly spatial in character the abstraction of temporal factors gives a necessary simplification. But in types of experience which are predominantly temporal in character, the application of such an analysis distorts the material of the inquiry. In such investigations it is necessary to make time the central focus of attention. The inadequacy of an abstract description of it as a one-dimensional series is then apparent. It may even be doubted whether it is possible to have successivity in a one-dimensional series. We must have something which succeeds and is succeeded. A one-dimensional view of time must presuppose the existence of some other data in terms of which its successive character may be observed.

The difficulty of discussing time arises principally from the fact that we must refer to happenings in time. We are then faced with the possibility that characteristics which we attribute to the temporal nature of the experienced data are due to some extra-temporal characteristic, and are not inherent in temporality as such. As Whitehead has pointed out, "Time, in the sense of a measurable temporal series is a character of nature only." The difficulty of isolating temporal from other factors seems insuperable if spatial data are used as the material by reference to which we observe temporal passage.

In the past space has been analysed as a purely intellectual categoreal schema, but time has always been studied in relation to empirical data. We must now inquire whether it is possible to give an analysis of time without directly referring to our experience of entities succeeding one another in serial order. In his description of 'extension' Whitehead states that it applies equally to space and to time. If this statement is true, then it should be possible to construct an abstract temporal schema referring to temporal experience, by attending to the extensive relations which temporal experiences manifest. In a recent paper entitled "Whitehead's Theory of Abstraction" Dr. W. Mays states:

"In this sense, extension taken by itself, is not something

actual, it is not an event nor made up of events but is a relation between them, and in abstraction it is mere potentiality, a logical framework in which events can be inserted just as values can in a function.

Hence, when Whitehead refers to the realm of eternal objects, he is not dealing with particular qualitative characteristics (or even class concepts such as redness or greenness), but with groups of unspecified entities in definite patterns of connection. He is interested in the logical structure of our experience rather than in its qualitative detail. According to Whitehead these extensive relationships are expressible without reference to any particular colour, sound, etc., just as a propositional function $\phi\hat{x}$ may be expressed without reference to any proposition.....

This links up directly with his analysis of an eternal object as having (i) an individual essence, and (ii) a relational essence; (i) is its specific characteristic, such as colour (or shape) as it appears in the perceived sensory pattern; (ii) is its pattern of connection, which in the event manifests itself as a definite spatio-temporal pattern (an individual shape enduring through a lapse of time) but which, considered abstractly, merely has the character of a logical form, holding for a variety of sensa.[1]

[1] "Aristotelian Society Proceedings", 1951-1952, p.96 ff.

Dr. Mays goes on to consider the precise connection between the spatio-temporal continuum and the realm of eternal objects. He quotes Whitehead's statement that "the spatio-temporal relationship in terms of which the actual course of events is expressed, is nothing else than a selective limitation within the general systematic relationships among eternal objects."[1] The question then arises of how the spatio-temporal continuum, made up of particular events, can be a selective limitation within what seems to be merely an abstract framework. It is a selective limitation in the sense that it can be thought of as a particular value given to this abstract scheme. Dr. Mays continues:

> "It will be seen, that by "the general systematic relationship among eternal objects," Whitehead is really referring to the extensive relations which he assumes underlie every epoch; the fact that events no matter when and where they appear, must be thus ordered or extensively connected. Hence, this unlimited extensive scheme can be said to be limited by events which reduce it to the four-dimensional continuum. The difference between these two schemes of order will readily be noted. Whereas the extensive scheme has, owing to its complete generality, the possibility of spreading in a variety of dimensions (or forms of order),

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[1] "Science in the Modern World" (Cambridge University Press, 1928), p. 200.

the spatio-temporal continuum on the other hand, may be described as a selective limitation, since it has certain definite characteristics, e.g., three dimensions of space and one of time. The reason for considering the actual spatio-temporal relationship as a limitation, lies then in the generality of the extensive scheme, since it defines an infinite range of schemes of order - the spatio-temporal continuum being one of them. When this limitation is imposed upon the abstract system of events, other alternatives are excluded, just as when a function is determined, other possible values are eliminated."[1]

It has always been assumed that of the infinite range of schemes of order inherent in the generality of the extensive scheme only one, the spatial-temporal continuum, applies to the world as we actually experience it in the present cosmic epoch. We accept a four-dimensional geometry for the analysis of physical events, composed of three spatial dimensions by means of which we determine the exact spatial location of the objective datum, and one temporal dimension. If we examine some event which is not inherently spatial in character, for example the hearing of a sound sequence,[2] we can still retain

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1 Arist. Soc. Proc. 1951-1952, p.100 f.

2 Reasons for holding the view that sounds are not intrinsically spatial are given below (Part III, p.246 ff.).

the view that events should be analysed in terms of a four-dimensional schema, but there will then be no point in interpreting this schema as referring to three spatial dimensions and one temporal dimension. Whitehead himself is aware of the arbitrariness of defining time as a one-dimensional series. The following note is inserted in a chapter which contains spatial illustrations of the principles of the method of extensive abstraction.

> "Note that spatial diagrams, such as the one above, are to some extent misleading in that they emphasise the spatial character of events at the expense of their temporal character. The temporal character is very far from being represented by an extra dimension producing an ordinary four-dimensional euclidean geometry."[1]

In dealing with time Whitehead never considers it merely in terms of extensive relations, but always as it refers to the actualisation of entities in the physical world. When he discusses extension he states that it is "the relation of 'including', either in a spatial or in a temporal sense, or in both."[2] But he does not attempt to define time as an extensive form similar to space. He always discusses it as a type of order subsidiary to spatial extension. Thus Whitehead states:

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1 "The Principles of Natural Knowledge", Para.29.3, p.103.

2 Cf. "Process and Reality", p.93.

"Thus, in some sense, time, in its character of the adjustment of the process of synthetic realisation, extends beyond the spatio-temporal continuum of nature. There is no necessity that temporal process, in this sense, should be constituted by one single series of linear succession. Accordingly, in order to satisfy the present demands of scientific hypothesis, we introduce the metaphysical hypothesis that this is not the case. We do assume (basing ourselves upon direct observation), however, that temporal process of realisation can be analysed into a group of linear serial processes. Each of these linear series is a space-time system. etc."[1]

Thus Whitehead retains a serial view of time based upon the observation of the manner in which time integrates events in our spatial physical environment. His view differs from the classical theory only in that he accepts a group of linear serial processes in place of a single series of linear succession. Whitehead proceeds further to analyse temporality in relation to enduring objects which display a realised pattern. This discussion concludes:

"Thus a duration is spatialised: and by 'spatialised' is meant that the duration is the field for the realised

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[1] "Science in the Modern World", p.156.

pattern constituting the character of the event. A duration, as the field of the pattern realised in the actualisation of one of its contained events, is an epoch, i.e. an arrest. Endurance is the repetition of the pattern in successive events. Thus endurance requires a succession of durations, each exhibiting the pattern. In this account 'time' has been separated from 'extension' and from divisibility which arises from the character of spatio-temporal extension. Accordingly we must not proceed to conceive time as another form of extensiveness. Time is sheer succession of epochal durations. But the entities which succeed each other in this account are durations. The duration is that which is required for the realisation of a pattern in the given event. Thus the divisibility and extensiveness is within the given duration."[1]

This epochal view of time is that which underlies Whitehead's theory in "Process and Reality". As can be observed from the above quotation this is not an analysis of time 'sui generis' but merely a working hypothesis which gives a useful definition of time as it is represented as the fourth dimension for the analysis of the spatio-temporal continuum. Let

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[1] Whitehead, op.cit., p.157 f. (The underlining is not in the text.).

us now consider time as it appears related to some event which is not spatially organised.

Our problem is to determine whether or not there is some form of experience similar in structure to the spatio-temporal continuum in being analysable as a four-dimensional continuum, which has a different content. In other words we are suggesting that there may be some other selective limitation of the extensive scheme inherent in our actual experience. Our apprehension of sounds seems to be a possible content of such an alternative selective limitation. It is customary to analyse sound-data in visuo-spatial terms, but such analyses are not adequate. This topic will be fully discussed in Part III. Meanwhile it is necessary to anticipate parts of this later discussion in order to facilitate the analysis of temporality in relation to the extensive scheme. Sound phenomena are essentially dynamic and exhibit that tiresome characteristic of 'interpenetration' or 'protensive unity' which perceptual theorists working in visuo-spatial terms find so awkward since they cannot be explained in static terms. Since sounds are essentially temporally related one to another, it would seem natural that they should be analysed in temporal terms, and that such an analysis should be suitable to describe their dynamic character. But it is customary to analyse and describe sounds with reference to their pitch differences, i.e.

in static measurable terms. A great deal of investigation has been carried out along such lines. Apart from the solution of some practical problems relating to the physical reproduction of sounds, this research has not been productive. It has not suggested any original lines for further research, or afforded the means of a more adequate phenomenological analysis of auditory data.

Why should we analyse space in terms of three dimensions? So far as extensiveness is concerned there might be any number of dimensions. The three dimensional analysis is used because this is the minimum number of measurements which we require in order to localise some definite point in the spatial continuum. The fourth dimension - time - is necessary to define the totality within which a definite position can be discriminated. We cannot definitely locate a spatial point by defining three spatial dimensions in an infinitely extended space. We can thus define it within the spatio-temporal continuum. In the spatio-temporal analysis of the physical world the temporal dimension is treated as the limiting dimension which itself is analysable as a totality of measurable segments, that is, of one-dimensional time-spans. Thus the selective limitation of the extensive scheme is composed of events which reduce to a four-dimensional continuum.

If we attempt to analyse sound-data in terms of a four-dimensional continuum, the distribution of the dimensions relating to static and dynamic attributes is the inverse of that found in the spatio-temporal continuum. We require three temporal dimensions and one static scalar dimension. The latter supplies the additional notion which must be superimposed upon the notion of pure temporal extension to convert it into a measurable series in terms of which we can analyse the patterning of actual events. We must exclude all temporal factors from this fourth dimension. Pitch presents a suitable content for this fourth 'dimension', in the analysis of sound-data. Pitch must be regarded merely as determining the position of sounds in a scalar series. It is, by definition, unrelated to any dynamic attribute of sound. Pitch is thus equivalent to time as it is analysed as a one-dimensional series. Both are the phenomenal content of an abstract, logical, one-dimensional series with reference to which any datum of a given sensory modality can be described as occupying a definite position. Pitch thus functions as a means of identifying auditory data. It does not present any features by means of which auditory phenomena can be further analysed.

Temporality, by itself, does not present the idea of totality and finitude. It can, however, impose such limitations when considered in conjunction with infinite space,

since we cannot perceive spatially except in a duration of time. Time, considered in isolation from spatial concepts, is infinite. In relation to auditory data the infinitude of time is bounded by the finitude of the pitch spectrum which is a definite totality. Our awareness of succession, simultaneity, duration, and other temporal attributes, is manifested by our awareness of finite pitch elements which we discriminate perceptually. Pitch represents an ideal zero of temporal extension. Sound data are thus individually discriminated with reference to pitch, by means of which we can refer to any single sound datum in a complex auditory experience.

Having defined the fourth dimension, which is equivalent to the temporal dimension in the space-time continuum, as pitch, we must now investigate the empirical content of the three 'dimensions' of time using auditory data as a paradigm of a non-spatial type of actual event. It should be noted that the term 'dimension' is not particularly suitable for the description of non-spatial data as it has spatial associations although etymologically it refers only to measurement. We shall however continue to use it placing the term in inverted commas to signify that it is not being used in a spatial sense.

It is obvious that we do experience time as a succession, a 'flow of events', a 'perpetual perishing'. This has always been accepted as the fundamental characteristic of temporal experience. The notion of time as irreversible and unidirectional depends upon the acceptance of this form of analysis of it. Yet if we try to imagine temporal experience 'in vacuo', there is no criterion for ascribing successivity to it. In it nothing is, hence nothing changes, nothing succeeds.

In being empirically aware of time we are not merely aware of passage, but also of durations in which passage is not apparent. Our awareness of time consists in the comparison between these two aspects of it. If we had an awareness only of succession we should have no experience of time. We must have some unity to which temporal endurance, the persistence of a recognised pattern, is essential, before we have the notion of time as a 'perpetual perishing'. In distinction from our awareness of the unity or epochal character of time we experience its other attribute, successivity. This is what Whitehead is stressing in his epochal theory of time when he states that an event, in realising itself displays a pattern which requires a definite duration determined by a definite meaning of simultaneity. Unfortunately however, Whitehead in discussing this view of time relates it

to spatialised actual entities and states it in a form which presupposes the absolute theory of time. Hence, though Whitehead is really putting forward a new theory concerning the relationship between time spans he says that the pattern displayed by events requires a duration which involves a definite lapse of time. But the whole point is that the apprehension of such a pattern takes place without the awareness of any lapse of time. Thus to describe it in terms of temporal successivity is to apply the older mechanistic view of time to the experience, instead of replacing it by the more adequate durational interpretation. Another example of the same relapse into the older manner of interpretation is Whitehead's description of a duration as 'spatialised'.[1] To exhibit a duration as the field for a realised pattern constituting the character of an event does not necessarily require a reference to spatialised material. The realised pattern may be auditory in character, in which case pitch-differences constitute the material content which characterises the event. These have no direct spatial relations.

In our experience, an awareness of time as persisting and an awareness of time as successive are so closely related that one cannot be considered to be any more fundamental than the other. Theoretically the successive attribute of time is the

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[1] Cf. second quotation, p.199 f. supra.

more important for analysis. This is because we tend to consider the element which may be termed 'persistence' or 'endurance' as an attribute of the material apprehended in time, not as itself representing a temporal 'dimension'. This attitude makes necessary a mechanistic account of temporality. Time is then considered as a series of non-extensive, successive, instants diversified by the happenings which take place in time, but standing in a purely external relationship to them. This view is naive and does not account for the facts. If we reflect upon any temporal experience, we discover that we do not apprehend it as a mere succession. In a situation in which some auditory phenomena are presented at exactly equal intervals of time, such as the tick of a well balanced clock or the beat of a metronome, we organise the data into complex units which exhibit accent and phrasing not present in the physical stimulus. Such organisation would suggest that in the absence of some durational organisation which marks the persistence or endurance of time-phases, we do not experience temporal successivity but mere nothingness or boredom. The demarcation of exactly equal temporal intervals does not give us the notion of temporal successivity, but of a lack of 'onwardness' in the data. Thus it would seem that we must admit a 'dimension' representing temporal persistence as well as a 'dimension' representing temporal successivity.

If we consider musical experience we find that this problem of conveying the 'onwardness' of the rhythm of any musical phrase is one of the major problems of performance. The musical score, written in notes representing beats and fractions of a beat might be compared to the mechanical analysis of time. The melody as played, then becomes analagous to time as we actually experience it. In playing a stringed instrument on which notes are not merely mechanically struck by a hammer, the inter-relations between the durational factor and the successivity of these durations is the basis of the meaningful interpretation. Each sound has, as it were, a centre of gravity. It is internally phrased according to its position in relation to the sounds which precede and succeed it. Insensitive treatment of the intensity of the beginning, middle, or end of any sound may completely destroy the rhythmic flow of a phrase, although the successive sounds are presented at the correct moments of time, with reference to the exact mathematical formulae given in the score which represents time as mechanically measured.

This discussion has been confined to single sounds, for simplicity. The same holds true about the duration and successivity of a phrase within a musical sentence, or of the

sentence within a paragraph, or even of a first movement within a sonata.[1] This phenomenon is referred to as musical dynamics. Nevertheless it is always analysed statically. A polydimensional[2] theory of time should provide a more adequate analysis of such data.

The necessity for a 'dimension' representing persistence as well as one representing pure successivity is apparent if we attend to our subjective experience and not merely to its content. The notion of past, present, and future depends upon the fusion of enduring and successive elements in experience. Whitehead writes:

> "But our immediate past is constituted by that occasion, or by that group of fused occasions which enter into experience devoid of any perceptible medium intervening between it and the present immediate fact. Roughly speaking it is that portion of our past lying between a tenth of a second and half a second ago. It is gone and yet it is here. It is our indubitable self, the foundation of our present existence."[3]

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[1] The same type of problem is found if we compare the written text of a poem or piece of rhythmical prose, and its recitation in speech or song. Music is used as the paradigm in this study of auditory experience because spoken language introduces many complex symbolic factors associated with verbal connotation and denotation.

[2] The term 'polydimensional' is used rather than 'multidimensional' to remind the reader that the term 'dimension' in its usual spatialised sense is not adequate to describe temporal extensiveness.

[3] "Adventures of Ideas" (C.U.P.1933), p.233.

In this passage Whitehead is drawing attention to the fact that the serial ordering of time must be taken in conjunction with an epochal view before a true conception of our actual experience of past, present, and future can be formed. There is no definite boundary between the past and the present such as the serial view of time postulates. In a paper entitled "Time" Whitehead writes:

> "Time requires incompleteness. A mere system of mutually prehensive occasions is compatible with the concept of a static timeless world. Each occasion is temporal because it is incomplete. Nor is there any system of occasions which is complete; there is no well-defined entity which is the actual world. This phrase "the actual world", means the past, present, and future occasions as defined from the stand-point of some present occasion. It is a demonstrative pronoun, analogous to "he", "she", "it", "tomorrow", and "yesterday". Its meaning is defined by its context."[1]

The present is not something instantaneous. No matter how brief any segment of time may be it will still have a durational content which can be analysed into before and after. Not only the phrase "the actual world" is a demonstrative pronoun. "The present" is also a demonstrative

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[1] "Time", Proceedings of the International Congress of Philosophy, 1926, Section III.

pronoun the meaning of which can only be defined by its context. It is necessary that we should find a means of defining this context in purely temporal terms.

The analysis of time as pure successivity, and its analysis in terms of the epochal theory may be regarded as an example of the Principle of Complementarity. One can either define the content of experience in terms of what Whitehead terms "presentational immediacy" or in terms of "causal efficacy". In "presentational immediacy" experience is analysed in terms of that which is simultaneously present for awareness. Two percipients experiencing the same sensory phenomena may be said to be having a simultaneous experience. The data given in "presentational immediacy" thus gives us a means of arriving at some awareness of a public time which can be assimilated to the temporal rhythms of our various private experiences. It is because theorists have ignored the factor of persistence in analysing time that they have found it impossible to explain the possibility of a public time which can be the same for all.

If we analyse experiences in terms of "presentational immediacy", and attempt to relate these experiences temporally without re-analysing the data in terms of "causal efficacy", we arrive at the idea of time as a mere one-dimensional series of pure successivity. When theorists consider our awareness

of temporal passage they ignore "presentational immediacy" and cannot find a basis for postulating some public time. When, however, they analyse time 'objectively', they start from a consideration of public time. Thus they analyse time as a one-dimensional successivity. The same form of faulty analysis is evident in the dichotomy between time as a mental factor and time as it relates to physical events. Both interpretations, which falsify the temporal structure of experience, depend basically upon the mistake of analysing time without paying sufficient attention to its durational as well as to its successive aspects.

Perception in the mode of "causal efficacy" does not refer to any universally accepted time system. The events which are analysable in terms of it relate to the causal factors implicated in the development of the content of present awareness. Time considered in relation to perception in the mode of "causal efficacy" is relative to the subjective experience of the percipient. The same event has various temporal positions in different causal schemes. If the doctrine of prehensions is valid these different schemes must be inter-related. It is only when we think of a percipient as a conscious individual enjoying a private experience that these causal factors appear as totally unrelated. This

factor is important for the discussion of that form of temporal experience which we call memory. Memory becomes a problem only when we attempt to define it in relation to a one-dimensional successive analysis of time. Whitehead writes:

> "Physical memory is another exemplification of the category of incompleteness. In occasion B there is a physical memory of each antecedent occasion, such as A. Since A is antecedent, B prehends A into itself as contributing a measure of determinate completion. This prehension of A into B is a relational functioning with an individual character expressible in terms of eternal objects. These eternal objects, thus functioning, determine the objectification of A whereby it becomes a constitutive element in the concrescence of B. This transaction exhibits A as relatively determinate, except for its indetermination arising from the indetermination of B in the converse anticipatory objectification of B in A. Thus the full transaction between A and B, consisting of the pair of objectifications, constitutes A and B, as poles in a linkage. A, in its function of a constituent member of this linkage, A and B, is more complete than A in abstraction from the linkage. For the indetermination of B in A, which clings to A in abstraction, is removed by the

actual concretion of B in the full linkage. Thus in the community, A and B, the incompleteness of A by reason of B is rectified by the completion of B in so far as its transaction with A is concerned: A has thereby an added meaning. Hence each occasion A is immortal throughout its future. For B enshrines the memory of A in its own concretion, and its essence has to conform to its memories. Thus physical memory is causation, and causation is objective immortality. Also conscious memory is that partial analysis of causation which is effected by the associate mental occasion."[1]

If we analyse time in terms of its durational content and not in purely mechanical terms as a mere one-dimensional successivity then the phenomenon of memory can be accounted for, since the structure of the durational 'dimension' of time is dependent upon past experience as well as upon the presented objective data. We shall discuss this topic more fully later. This digression has been inserted at this point in order to illustrate that the element of 'persistence' or 'endurance' is an important factor in any adequate analysis of temporal experience, and that many of the problems related to temporality have their origin in theorists' lack of consideration of this factor.

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[1] "Time", Section IV.

If time were a one-dimensional series composed essentially of pure successivity then we should have a different time series exhibited for each of our forms of perceptual apprehension. A similar difficulty arises if we accept a mechanistic and purely visual analysis of the spatial continuum. Since we do experience various forms of phenomena without being aware of varying temporal schemes theorists who accept the absolute view of time correlate these various forms of temporal passage in terms of an abstract mechanical theory which bears little resemblance to our subjective awareness of the passage of events. The mechanical analysis of time bears little relation to our perceptual awareness of the passage of nature as we experience it in visual, auditory, and tactual perception. Such experiences require to be analysed not in terms of the relationships in which their objective relata stand to physical time as measured by a chronometer, but with reference to the structure of the epochal phases in which no temporal successivity is apparent, and the rate of successivity of these epochs. In other words, the durational aspect of the experience, i.e. the genetic analysis of time, should be contrasted with the manner in which the epochs are temporally related one to another. The essential uniqueness of any temporal experience is thus a contrast between the structure of the epochs which arrest the

'onward flow' of experience, with their rate of successivity.

Perhaps this may be made clear by considering a musical example. Take a melody in compound time consisting of eight bars. Co-ordinately we can analyse it as eight bars, sixteen beats, or as forty-eight pulses, or as a certain number of notes of definite time values. Co-ordinate division can be made in terms of any available equal norm. It consists in accepting some genetic form of division, e.g. a bar which has some internal structure such as 6/8 time, then analysing the whole in terms of this unit, irrespective of other factors such as phrase, melodic line, cadence, etc.. In co-ordinate division the parts are thus only externally related one to another. Their internal structure is ignored except as a means of obtaining the division. Genetic division however depends upon the internal structure of the material under discussion. Thus in genetic terms it may only be possible to divide the melody into two phrases with the proviso that these be understood to be complementary to each other. In co-ordinate division we abstract from the essential temporal character of the experience as a whole, defining it in terms of identical units, and describing the relations holding between these units in terms of the order of their successive appearances. When we contrast such a description of the data, with our experience of the data as temporally organised, we are aware of obvious discrepancies between the actual experience

and the theoretical report of its structure.

In a genetic division of material we do not start by breaking up the data with reference to some pre-arranged unity of measurement. We define it in terms of the perceived sensory wholes which manifest themselves in its presentation. Its temporality is analysed not in terms of mere successivity but with reference to unitary wholes or epochs, and the contrast between their structure and the structure of the whole of which they form an integral part.

The necessity for a two dimensional analysis of temporality can be illustrated with reference to the combination of simple and compound times in music. To combine sets of four quavers with triplets depends upon the correlation of the units of the one time system with those of the other. We must treat both as a series of durations or epochs which fill the same period of time. This example is too simple. Any person with a reasonably good sense of rhythm can easily achieve their correlation. Also it can be easily worked out in terms of mechanical measurement. If one considers the types of complex rhythms produced with extreme accuracy and ease in, for example, African drum music, the necessity of defining time as an awareness of persisting units or epochs as contrasted with their successivity is apparent.

This example of combining diverse rhythms may be said to presuppose a definite measurable time in terms of which two or more time systems may be combined. No matter what the rhythmic content of any 'epoch' is, its combination with another system presupposes that its rhythm of successivity stands in some simple relationship with the rhythmic successivity of the system with which it is being combined. Thus critics may remark that in point of fact an absolute theory of time is being presupposed as the basis of a two dimensional theory.

The point at issue is how it is possible for two different time-systems to co-exist. If we accept the absolute theory of time then we have only two different attributes of time exhibited by different objective happenings. This is all that there can be on a one-dimensional theory of temporality. Moreover such a theory necessitates that we analyse all temporal experiences in terms of the spatial data which alter during a period of time, - but in terms of such a theory there can be no such thing as a period of time, there is only mere successivity. A one-dimensional, serial analysis of time in terms of pure successivity cannot account for the internal structure of the units which succeed and are succeeded by a given duration. A two-dimensional theory of time does present data relating to these units. It does not present a

means of correlating the diverse time-systems. This does not imply that an absolute theory of time must be accepted to explain the possibility of contemporaneous happenings in different time systems. The possibility of correlating diverse temporal series can be explained with reference to the third temporal dimension which is that in which different time systems co-exist.

It should be noted that the term 'time system' is here being used to refer to a temporality of which succession is only one amongst other attributes. Such a view makes the term 'time system' synonymous with 'rhythm'. Since these terms are distinct if we accept the classical view of time, it is necessary to inquire whether or not they can be identified in terms of a two-dimensional analysis of time.

We usually consider rhythm in relation to movement,[1] to that which is measured, rather than in relation to the temporal aspects of the whole. Rhythm is often defined as the combination of movement and accent to produce symmetry. Such definitions call attention to the material content of the experience rather than to essential attributes of its temporal organisation. Thus we very often find rhythm defined in spatialistic terms as if the 'rhythm' of a line were the correct paradigm and temporal rhythm merely an

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[1] Cf. the discussion of 'body-rhythms' as compared with musical 'rhythm', pp.331 ff.(Part III).

analogy.[1] If we define time as a one-dimensional series then rhythm becomes something added externally, which breaks the continuity of the succession. But we can orientate ourselves in time without reference to any non-temporal material by considering the structure of co-existent temporal events. Differences between time-systems depend upon the internal structure of the epochal and successive character of temporal experiences. In an absolute theory of time the epochal structure appears to depend upon the structure of the material apprehended. We are therefore left with diverse modes of successivity inhering in the one temporal scheme. In a two-dimensional analysis the epochal factor is internal to the temporality of the event, which can be analysed in terms of the relation between its epochal and successive structure as contrasted with other temporal series. It thus seems to be permissible to identify the idea of rhythm with the conception of a 'time system'.

If we reflect upon our awareness of time as an empirical phenomenon, it appears that not only do we experience it as epochal and as successive, but we also have an awareness of what might be termed 'temporal depth'. Whitehead speaks of comparative depths of actuality which each occasion only achieves by reason of its limitations and exclusions. This 'depth of actuality' achieved by exclusion is related to

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[1] Cf. Fogerty, E. "Rhythm" (Allen & Unwin 1936).

'temporal depth' for the excluded material affects the experience by reason of its negative prehensions. The positive connection between this excluded material and the material which is the actual content of awareness, is temporal in character. Thus the greater the 'temporal depth' the more pervasive or 'actual' is the content experienced. Although we select a particular form of temporal process as the dominant focus of our awareness, we still have some awareness of other diverse time systems. These we experience in contrast to the temporal span which determines our specious present. Empirically we experience time as something which is 'filled' to a greater or lesser extent. Time exhibits extensive qualities similar to space. One duration of time can extend over, and be extended over, by an infinite number of other durations. There is a 'dimension' of time, as we experience it, which gives us an awareness of these diverse durations which are simultaneous but not coextensive with the duration which is dominant in our present experience. This gives time an aspect of 'depth'.[1]

It may be objected that such a characteristic, if it exists, can only be discerned by analysing time in terms of its material content. This is not the case if we reject the

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[1] Cf. Whitehead's description of the 'unison of becoming', "Process and Reality", p.174 ff.

classical conception of time as a one-dimensional series. A study of the material content of some temporal experience, however, should help to clarify the notion of what is involved in this third temporal 'dimension'.

In discussing the notion of 'temporal depth' the idea of contrast is of importance. Intense concentration upon any one subject, for example, makes our temporal awareness seem very thin. Since such concentration is usually expended upon material which is extremely significant, this would suggest that 'temporal depth' is not correlated with significance. In a situation in which intense concentration is being expended upon some subject-matter, it is not the absence of an awareness of temporal factors, but a high degree of synthesis of many factors, which makes the 'temporal depth' of the experience appear 'thin'. In normal experience we are aware of a great number of temporal series coexisting in our manifold experience of ourselves and our environment. When we are not attending to anything in particular, these various temporal strands flustuate, now one then another becoming relatively prominent in our awareness. There is no dominant pattern which gives coherence to the experience as a durational whole. The experience is featureless, incoherent, and uncoordinated. Sir Walford Davies, who is one of the few writers on music who lay emphasis on its essentially temporal

nature, remarks that it is no mere fancy to speak of having a "thin time of it" or a "high old time" as well as speaking of "a long time".[1] This aspect of temporality is overlooked by theorists studying time. It is defined in relation to subjective psychological phenomena because it has a vital personal importance for us. This has obscured its temporal origin.

It is probably quite a common experience for persons to feel unaccountably ill at ease and emotionally disquieted for no apparent reason. Such a state may be described as unbalanced, agitated, perturbed, - all words which have a reference to the disturbance of regularity in rhythm or movement. All our sentient life is concerned with maintaining a rhythmic balance between varying temporal stresses. It would appear that the phenomenon which we have termed 'temporal depth' may be something which is quite a fundamental factor in the organisation of our emotional, sentient experience. The dominant materialist habit of analysing everything in terms of its content has made us associate this temporal dimension with the psychologists' description of states of mind, - the mind being conceived as a substance to which static categories may be attributed.

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[1] "The Pursuit of Music" (Nelson, 1935), p.68.

The fact that an exact measurement of various time spans is possible is one reason for maintaining the existence of this third dimension of 'temporal depth'. The possibility of such exact measurement depends upon our ability to discern congruent relationships existing between the diverse temporal series implicated in concrete experience. The novelty of Whitehead's treatment of congruence resides in the fact that temporal as well as spatial congruence is uniquely defined.

The congruence relationship depends upon our ability to abstract diverse systems of succession from concrete temporal happenings, and to compare these in such a manner that an exact unit of temporal measurement relating with equal exactitude to all modes of successivity is discoverdd. What is being measured in terms of these units is not temporal passage as such, but the rate of successivity of the changes in form or position of some material objects. We measure such abstract temporal series mechanically with reference to motion. Whitehead states:

> "Uniformity in change is directly perceived, and it follows that mankind perceives in nature factors from which a theory of temporal congruence can be formed."[1]

The direct perception of uniformity in change depends upon our simultaneous awareness of more than one time series. Such

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[1] "The Concept of Nature", p.137.

an awareness presupposes the third 'dimension' of time. Empirically our awareness of diverse time systems must include an awareness of duration, giving us the conception of uniformity: an awareness of successivity, giving us the conception of change; and an awareness of 'temporal depth', giving us the conception of congruence. If this analysis is correct then it may be claimed that apart from the spatio-temporal continuum there is another selective limitation of the extensive scheme given in speculative philosophy. This refers to a 'temporal-auditory' experience and has three temporal dimensions and one static scalar dimension, i.e. pitch. The fact that both space and time are analysed in terms of three dimensions does not arise from anything inherent in the notion of extensiveness. The three dimensional schema is merely a convenience for the analysis of our finite experience, since this is the minimum number of dimensions by means of which we can definitely locate some single unit of space and time.

If this analysis of temporal experience is tenable and it is possible to analyse auditory experience in terms of this four-dimensional schema, a new interpretation of the manner in which sound phenomena symbolise spatio-temporal experiences may be possible in terms of their relation to the

four-dimensional extensive scheme. The investigation of such a symbolism, however, lies outwith the scope of this discussion, which can only serve as a prolegomena to it.

A theory of time, if it is adequate, must be able to give a coherent explanation of our experience of past, present and future. These concepts are not attributes of time itself, but only of our experience of time. In terms of the absolute theory of time the present is described as a moving knife-edge which separates the past from the future. It is conceived as an instantsneous, non-extensive 'portion' of time which has no duration. This is an abstract theoretical account which is not descriptive of our sentient experience.

Whitehead's description of the actual world as constituted of the past, present, and future defined from the stand-point of some present occasion is significant in this respect. Time as experienced is always a duration and references to it are always demonstrative pronouns defining the stand-point of the percipient at the time of the utterance of the definition. On account of this theorists have attempted to escape from the particularity of the present by referring to temporality mainly as it concerns the past. Thus they discuss an other person's awareness of a certain phenomenon which they report as a datum given in their own past history.

Either they talk of time as it appears in the settled past, or they discuss it in abstract intellectualistic and static terms. What is required is a discussion of past, present, and future from the stand-point of the percipient's actual experience of the world here and now. Even psychologists who stress that the present is always a duration, which they call the 'specious present' still define this phenomenon either in terms of the absolute view of time, or in terms which relate the content of the 'specious present' to the structure that the experience exhibits when we reflect upon it as a past event.

In an actual awareness of present experience successivity is not absent, but it is a recessive factor. Take a musical phrase as an example. We do not hear it as a succession of discrete sounds but as a unity. The notes are presented successively but we hear them as if they were given 'all at once'. This means that the notes are not heard at all as independent unities, but merely as components of a more complex whole, such that the hearing of the first notes cannot be described as the awareness of unitary data but only as the awareness of an incomplete auditory percept. Thus the present and the future are closely interrelated. There is no such thing as a present awareness which does not hold within its own essence a reference to future experience.

Even when the content of the present perception is the final cadence of a phrase this is apprehended merely as the foundation from which we may embark upon some new perceptual experience. Whitehead discusses the relationship between the present and the future with reference to the category of incompleteness which he treats as an essential factor in time. He writes:

> "Thus the category of incompleteness means that every occasion holds in itself its own future; so that anticipation is primarily a blind physical fact, and is only a mental fact by reason of the partial analysis effected by conceptual mentality."[1]

There is no absolute distinction between past, present, and future. Each is a duration arising out of what has gone before and adding to it some definite form of novelty. In "Process and Reality" Whitehead writes:

> "In our experience, we essentially arise out of our bodies which are the stubborn facts of the immediate relevant past. We are also carried on by our immediate past of personal experience; we finish a sentence <u>because</u> we have begun it. The sentence may embody a new thought, never phrased before, or an old one rephrased with verbal novelty. There need by no well-worn association between

[1] "Time", Section III; cf. quotation p.210 supra.

the sounds of the earlier and the later words. But it remains remorselessly true, that we finish a sentence <u>because</u> we have begun it. We are governed by stubborn fact."[1]

The two antithetical notions of sheer 'onwardness' and the idea of complete unitary data are important in the investigation of time. We experience our present as incomplete, thus anticipating the form of the future in the experience of the present. We also experience the present as governed by the 'stubborn facts' which are the completed data of the past. What is the essence of the unitary 'facts' which thus arrest the 'even flow' of temporality? The answer must be given in terms of rhythm, of the apprehension of a unity in diversity. There are no stubborn facts as such. There are only facts relatively to our apprehension of a certain group of phenomena in a given context. The stubborn facts of the past are the outcome of an interaction between entity and environment in a situation different from the present situation. What the subject is now, is the result of what he has been, and the same is true of the actual entities which he prehends. Essentially, however, it is not the physical structure of the entities, or their physical and spatial

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[1] "Process and Reality", p.181.

relations to the percipient and their common environment, which are of importance. It is the manner in which the one prehends the other. This is best described in terms of temporal rhythms. Perception, feeling, and mental activity are all dependent upon time factors for their manner of synthesis. This is true of vision as well as of auditory and psychological phenomena. Consider a man walking along a country road, and some other persons traversing the same road at fifteen, thirty and sixty miles per hour. What appear as stubborn facts about the landscape to the pedestrian will probably not be noticed by the speedier traveller, and his sense awareness will present as outstanding features which the pedestrian ignores. The same is true on a less spectacular scale if we consider the slight variations in rhythm of physical or mental processes. What to one person is obviously a unitary whole is to another only a confused jumble because he has not the power to sustain attention across the span necessary to apprehend the whole of the unitary datum.

This discussion is of importance for our earlier remarks about the spatialisation of the concept of the 'percipient event'.[1] Every form of perception, apart from the visual awareness of a stationary percipient attending to the content of the central visual field, implies a synthetic, complex

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[1] Cf. supra, p.178.

apprehension of data which is achieved within a specific duration of time. Thus the 'percipient event' might more usefully be defined in relation to the dominant rhythmic 'set' of the percipient. The percipient as a concrescent, prehending entity, developing in a social environment, manifests a pattern of temporal development. This is partly determined by the manner in which he synthesises the various strands of rhythmically developing components which are a part of himself, - though the distinction between self and environment is not one that can be clearly delineated, - and partly by the manner in which this dominant temporal pattern modifes, and is modified by, external factors, which are also implicated in the concrescent process of the actual world developing as a social nexus. To define the 'percipient event' as the 'locus standi' of mind in nature is to imply an absolute view of space and time, and to treat the mind as a physical existent. For auditory experience the 'percipient event' must be thought of as referring to the integration of the percipient's auditory faculties with emotional and mental factors. The saying, "There are none so deaf as those who will not hear" embodies a valuable truth. We can control the organs of vision with comparative ease. Thus by turning away the head or shutting the eyes we can exclude an unwanted visual datum. In the case of hearing

we cannot so simply shut out unpleasant sensory data. Nevertheless there appears to be a more subtle manner in which we exclude auditory percepts from our awareness, by excluding them from having a meaningfulness in the higher mental sphere. Ability to organise successively presented material appears to be one of the prerequisites of mental life. Thus to give a spatial analysis of perceptual experience severs it from that form of experience with which it is very closely associated, namely intellectual apprehension. The later discussion of auditory perception should clarify what is meant by this rather sketchy statement.

The discussion of the immediate content of experience, i.e. the percipient event, in spatial terms is not confined to Whitehead's early works. The whole of his discussion of perception in his Barbour-Page lectures[1] delivered in 1927, is based upon the same fundamentally spatial analysis and mainly refers to visual experience. The difficulty of interpreting Whitehead's view on symbolism seems to arise from this source.[2]

So far we have stressed the essential relatedness of past, present and future and drawn attention to the fact that

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[1] "Symbolism, Its Meaning and Effect" (Cambridge University Press, 1928).

[2] Cf. "Process and Reality", Chap.VIII, p.236 ff.

the future is necessarily implicated in the present as that period of time necessary for the completion of what is taking place contemporaneously with the perceiving subject. We must now inquire how the past is related to the present. In studying the relation of the past to the present it is usual to concentrate attention upon the structure of the past. As has been pointed out it is customary for theorists to analyse all experience in terms of past experience. Thus they use concepts only suitable for the description of fully actualised material in describing the content of present awareness. Instead of analysing present awareness as a passage towards the realisation of unitary events, the structure of which is potentially inherent in present experience as a form of anticipation, they analyse present awareness as a succession of discrete events. It is not surprising that theorists find difficulty in discriminating between the past and the present, since they analyse present experiences as if they were past, then focus attention on past experiences when they wish to compare the two.

It is usual to discuss the relation between past and present experiences by referring to memory. This often develops into a discussion of how we can distinguish an image, which relates to something now present in the environment,

from an image in the present analagous to an image seen in the past. We shall defer further discussion of memory until we have gained some clearer idea of what is implied in the distinction between past and present.

The 'dimension' of 'temporal depth' is that aspect of temporal experience which gives to the present the sense of actuality which is lacking in an awareness of past and future times. Our specious present is determined both by the rhythmic continuity of our subjective experience, - in which physical, emotional, and mental components interact to form a dominant pattern to which we tend to try to assimilate all in-coming experiences, - and by the form of durational integration manifested by the prehended entities. These developing organisms will normally form a contrast in which some new rhythmic element will be added to each. This will affect the dominant rhythm hitherto displayed by them. But in the present experience this dominant rhythm is not the only datum of which we are aware. The experience is a compound of many different components which are all in some degree contributing to its character. Many of these subsidiary forms, such as the functioning of the bodily organs, are such a permanent factor in experience that we fail to recognise their distinctive forms. We only notice them if they are impaired and cease to function normally. Nevertheless they are always present, and they form the back-ground

against which more complex and variable factors are projected. They are the constant, established, cyclical factors which give us the basis of an awareness of time as something which has form. Thus the recurrence of the same pattern is not merely a re-enaction. It also has a cumulative effect in which recognition is a factor. Exactly the same experience is never twice manifested. The same dominant pattern may occur, but the subsidiary rhythms of which we are aware will not all be integrated with it in the same manner as previously, and many of them will be different in form. Thus the content of the duration as a whole will not be identical.

In our awareness of past events only the dominant pattern is retained. Moreover some symbol is often substituted for the durational content of the experience. Thus when we recall a series of events which stretched over a lengthy interval of time, we reproduce only the salient features of the whole. We do not trouble about the exact durational content, or about the feeling for temporal depth which gave to the experience, as actually manifested, a peculiarly intimate and unique character. Thus, in the past, successivity is the dominant 'dimension'. When we reflect upon the contents of the experience we organise them as determined and finished wholes, for which potentiality has no longer any relevance. What is important for us in past experience is a given successiveness

which results from relations determined by the durational content of the material as it was actually experienced.

There is no definite boundary between past and present and future. It would seem rather that in temporal experience a factor in some ways analagous to visual perspective is at work organising the data. If you walk over five miles of open undulating country then stop on a hill to look back across the road you have traversed you do not see each incline and every contour as you beheld them in your journeying. Similarly if you recall what is essentially a temporal experience, such as the performance or apprehension of a piece of music, you do not hear each note and phrase as you were perceptually aware of them during the physical performance. The same is true of our recollection of any experienced events. We recall the outstanding features, and the order of their appearance, but not their total content or impression. Both duration and temporal depth tend to become fused with the total image, as events recede into the past. All that we are left with is a symbol of their material content, and the memory of the order of their successive presentation.

It is said that Mozart could 'hear' a whole symphony instantaneously. This is usually interpreted by assuming that his specious present was so extensive that he could apprehend the whole succession of sounds and their relations

as if they were immediately present, just as we can apprehend the first six bars of the National Anthem as a unity. In terms of the view given above, however, another explanation is possible. It may be that his memory of the past, or at least of the musical past, was such that he could comprehend its content as sheer successivity with no interference of durational factors, just as the normal person can read a sentence without being aware of the successive letters in each word. In other spheres such a feat is not so unusual as it might seem. The fact that few of us can think of sounds without recalling their durational content may be taken as yet another proof that sounds are essentially temporal in character.

Why, we may ask, should successivity become the dominant 'dimension' in past experience although it is a recessive factor in the present? Whitehead explains memory as a form of causation. Each previous occasion is gathered up into the occasions which succeed it to add some measure of determination to the potential form of the later experience. Thus given an event A it may determine some aspect of the determination of B. When B in turn affects the organisation of C it is B as it was determined in arising out of a situation in which the form A was dominant that is affecting C, thus A too

may be said to be exerting a formative power over C.[1] When we reach the present event, therefore, and reflect upon the past, the events of the past are not unrelated to our present experience. Many of the less dominant characteristics inherent in these past events may be a part of the back-ground of our present experience. Thus we recall the succession of events through which any one event is related to our present experience, but we do not recall the exact temporal durations occupied by each of these events. I do not 'see' five miles when I look at an island five miles distant from land, nor do I 'live' five years when I recall an event which happened five years previously.

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[1] Cf. the account of musical memory given by Tobias Matthay in "Musical Interpretation" (Joseph Williams Ltd., 1913), p.41 ff.

PERCEPTUAL THEORY AND TEMPORAL ANALYSIS.

Persons who wish to maintain the classical view of perception which depends upon the acceptance of a knower-known dualism, which in turn depends upon the classical view of time, will probably object that in the foregoing discussion psychological data have been introduced, causing a distorted analysis of time. The classical view of time and of perception are very closely inter-related. A knower-known dualism interpreted in relation to a subject-predicate logic, which transforms it into a subject-object dichotomy cannot be maintained unless time is treated as being a succession of non-extensive instants. The usually accepted interpretation of the knower-known dualism implies that the act of perceiving is an instantaneous awareness of unchanging static phenomena which takes place at a definite instant of time in a particular place. In terms of a polydimensional view of time there are no objects, or events, or situations which can be apprehended in an instantaneous present. The object, as we know it, is the outcome of our reflection upon the content of consciousness at the completion of some form of sensory activity. It is not an initial datum existing in

isolation from us in the physical world. An interesting analysis of the knower-known relation, tracing our present view of it back to misrepresentations of Aristotle's treatment of the subject has been given in a recent paper by A.M. Ritchie. He writes:

> "Begin with "Man sees tree". Identify agent and act and object in "seeing" or "perception", the act determining agent and object and being indistinguishable from them. Then recognise that there really must be an agent and an object, since "seeing" (or "perception") isn't really an entity that exists on its own, and extract from the "perception" an abstract agent (that whose whole nature it is to see, a sense or power) and an abstract object (that whose nature is to be seen), and we have the makings of mind on the one hand and objects as appearances on the other. The game can be played with all the senses, and with thought, capitalised or uncapitalised. The full humour, perhaps, is savoured when we recognise that what is still preserved as unchallenged from the original situation is the verb, the act, and yet that to "see appearances" (or images) demands an entirely new sense of "to see" - the whole initial situation has been explained away. The main steps are (1) the identification

in the act, and (2) the extraction of agent and object, both new and abstract."[1]

The identification in the act corresponds to the de-temporalisation of the data. When this abstraction is made a host of pseudo-problems arise. Mr. Ritchie mentions the problems of moving from the terms of the theory to human beings and to objects, and of relating the abstract entities to one another. If one begins an analysis of perception by accepting a knower-known dualism, and by detemporalising the percipient's act and the content of his perception, then the only account of time that it is acceptable is that which treats it as a one-dimensional series of non-extensive instants. The paper referred to is of particular interest because it discusses theories about the mind in terms of agent and object. This has been the basis of a great deal of perceptual theory. The agent is not identified with the writer of the theory. The theorist beholds the agent and beholds objects in an environment common to them both. He then attempts to analyse the experience of the agent knowing the object. It is not his own immediate experience of beholding the agent, but an interpretation of the factors which he either observes or can infer from similar experiences in his own past which form the

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[1] "Agent and Act in Theory of Mind". Aristotelian Society Proceedings, November 1951, p.6.

initial data of his theory. This explains why the one-dimensional view of time has appeared to be adequate for perceptual theory. It is adequate for the analysis of past happenings. But to take data which bear the stamp of past experience as the initial data of theories of actual perception is nonsense. This would appear to be the answer to Mr. Ritchie's inquiry about why so many people take "images" to be static like photographs. Past experience is static and completely actualised. Hence its content can be conceived as atomic, image entities.

A knower-known dualism is an obvious analysis from which to start an investigation of the content of perception so long as it is the perceptual process of an other person which is being used as the material for analysis. Incidentally it should be noted to what extent this type of analysis of mental and perceptual experience corresponds to, and is interpreted in terms of, the apparent structure of ordinary visual experience. When we consider knowing as the process exemplified in our own immediate experience, an analysis of it into myself as knower and that about which I am thinking as an object (or as that which is known) seems somewhat remote from the actual form of the experience. The same is true of our actual experience of perceiving. We are not aware of seeing a tree, a house, a hill, a haystack, when walking along a country road.

If later we are asked what we did see we may report upon the experience in such terms, but in the actual experiencing there is no segregation of myself as percipient from the content of my perception.

Such a segregation in theory appears to have been necessitated by the Newtonian view of the nature of spatial and temporal extension. If we accept the one-dimensional theory of time then we are discussing the structured entities which we have known in the past, in place of the vague content of present awareness, as the content of perceptual awareness. The classical view of space makes the distinctness and separation of the percipient and his individual percepts even more definite. What we refer to as objects, situations, and events are the content of our consciousness of our environment as it appears to us in the past. They cannot be accepted as real factors of the external environment or as factors involved in perceptual processes. We can think about the past. In this sense these data may be the content of thought. They are not however elements in the actual thinking process.

It has been remarked above that the Newtonian view of space is one element of importance leading to the acceptance of a knower-known dichotomy. In the present paper we shall deal with temporality principally as it affects the analysis of auditory data. We have defined temporality in terms of a

three-dimensional theory. The analysis of sound phenomena will require a four-dimensional schema, the other dimension being the high-low pitch differentiation. The exclusive use of auditory material is not intended to suggest that a three-dimensional account of time does not also apply to visual perception. A recent work dealing with the perception of the visual world is based upon the hypothesis that there is no such thing as a perception of space without the perception of a continuous background surface.[1] Moreover it is urged that the perceived entities should be analysed as the outcome of a series of successive transformations, that is, in terms of constantly changing variables, and not in terms of static objects.

> "If we cease to think about forms as a set of geometrical entities and concentrate instead on the transitions between them, as we have learned to do for colours, our thinking about the visual process may be clarified."[2]
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> "The seemingly infinite variety of visual forms is the crux of the difficulty, (of arranging visual outline forms in a systematic way such that each form would differ only gradually from all others). This manifold has usually been reduced to order only by classification, beginning with triangles, squares, circles, and the like. The

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[1] "The Perception of the Visual World" by J.J. Gibson (The Riverside Press, Cambridge, Mass., 1950).

[2] ibid., p.191.

result is a set of groups of mutually exclusive categories analagous to the classes of individual things and persons implied by Aristotelian logic. The Greeks, and especially Plato, thought of geometrical forms in this way and the tendency has persisted. Classification is not, however, the only or the best way of ordering a manifold. Serializing is more apt to bring out the fundamental relations between things. If we are ever to understand exactly what yields a perception of shape we must study the dimensions of variation of visual shapes"[1]

Thus visual theories are now being constructed which depend for their cogency upon a denial of the usually accepted static, logically uniform object-entities as the initial data of our awareness of the objective visuo-spatial world. On such a theory the structure of both visual and auditory perception depends upon a sequence of experiences and is altered with an alteration in the temporal rate of succession. There is a difference, as in auditory perception the sequence of the subjective experience is similar to the temporal sequence of the stimuli whereas in vision the events are perceived as coexisting. As a result we tend to analyse the visual perceptual process in terms of the settled atomic entities given in the fully synthesised experience without reference to the temporal

[1] Gibson, op.cit., p.193.

sequence upon which their presentation depends.

It is perhaps significant that in this book Mr. Gibson discusses the origin of the three spatial dimensions of length, height, and breadth, which are abstract concepts, in psychological terms. He suggests that the fact that man is a terrestrial animal whose actions presuppose the ground, upright posture, and forward locomotion, is the basis for his awareness of the three dimensions of space. Such a notion shows a marked change in outlook from that adopted by the older theorists. They treat the spatial dimensions as 'a priori' concepts. Hence they transform our physical environment into a rigid space in which absolute motion and absolute location may be discerned. If the new analysis is tenable then those persons who object that the analysis of time given in the earlier sections of this paper is distorted by the use of psychological data will require to re-examine the ultimate basis for their acceptance of three spatial dimensions. Perceptual theories which include temporality as a central concept must take account of heterogeneous psychological factors. Thus they are more concrete and depend to a great extent upon empirical data than the older theories.

PART III.

THE STRUCTURE OF AUDITORY EXPERIENCE.

ARE AUDITORY DATA SPATIALLY ORGANISED?

It is impossible to study any form of perception without attending to the nature of the material apprehended by that type of awareness. If our notions concerning the structure of the data apprehended are erroneous, then it is likely that our explanation of that specific type of perception will also be distorted. One cannot divorce a study of the act of perceiving from a study of the structure of the material perceived. In an earlier part of this paper it is stated that sounds are not spatially organised. We shall now show that this erroneous analysis of the content of auditory experience is the basis of most previous theories of hearing, and shall give reasons for rejecting it. The main argument might be stated thus. Sounds are essentially temporally organised; visuo-spatial concepts have been substituted for temporal concepts in the analysis of sounds; visuo-spatial concepts are not suitable for the elucidation of temporally organised data.

Theoretically the reason for the substitution of visuo-spatial entities for temporal material is that visuo-spatial entities more nearly approximate to the condition of logically discrete entities such as are found in classical metaphysical

speculation than do temporal phenomena. They form, as it were, a half-way house between the dynamic and the static components in experience. Concretely they can be associated with material which is temporally organised. Abstractly they can be regarded as identical with the non-temporal contents of a logical classificatory scheme.

The view that sounds have inherent spatial characteristics appears to be based upon a failure to distinguish between relata of one sensory modality and inter-sensory relata.[1] On p. 174 ff. Whitehead's discussion of the relationship between the discernible and the discerned is quoted with reference to our spatial awareness of place. A prima facie argument for the non-spatiality of sounds is the fact that this argument can be restated in terms of pitch and harmonic extension without reference to spatial concepts. It would then read:

> "An entity merely known as harmonically related to some heard entity is what we mean by the bare idea of 'tonality'. The concept of tonality marks the disclosure in sense-awareness of entities in nature known merely by their harminic relations to discerned entities.... In the above example the thing heard was significant in that it disclosed its harminic relations to other entities not

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[1] The distinction between sounds which we hear which we make ourselves, and sounds which we merely hear, is not dependent solely on inter-sensory relata; cf.p.335 ff.infra.

necessarily entering into consciousness.... What we discern is the specific character of a pitch through a period of time."

If visual data are used as the perceptual paradigm, then the 'discernible' factor is 'place' which stands in some definite relation to the seen (discerned) object within the more general scheme of relationships which we term 'spatial extension'. If the perceptual paradigm is auditory data, then the 'discernible' factor is 'tonality' which stands in some definite relation to the heard (discerned) pitch, within the more general scheme of relationship which we may term 'harmonic extension'.

In the analysis of auditory data we tend to identify the total sound percept with its pitch characteristic. But we cannot analyse the significance of sounds by reference only to pitch differences. Since sound phenomena are closely related to visual, tactual, and kinaesthetic experience, we attempt to explain their significance in terms of spatial concepts. This procedure has the advantage that it makes the study of auditory perception parallel to the study of visual perception, since both are couched in spatial geometrical concepts.

If we consider auditory perception by itself, its content

gives us no awareness of external, physical phenomena. If there were a being who had only an auditory perceptual awareness he could not be aware of the spatial properties of the environment. Sounds resemble atmospheric pressures in this respect. We are immersed in them. They are not externally related to us and have no spatial position distinct from us. When psychologists speak of the extensity of sounds they are talking in metaphorical terms. It is useful to speak in terms of visual metaphor when we wish to stress the fact that the perceptual material is not purely a mental, subjective phenomenon. But this convention is to be deplored when, as so often happens, the persons using it forget that they are talking metaphorically, and attribute spatial relations to the initial data. Sounds have neither shape nor place. They are neither here nor there, but merely hereabouts. They do have a directional significance for us, but this is dependent upon inter-sensory relata and should not be used as an argument in favour of the view that sounds have intrinsic spatial properties.

When we hear sounds they are the content of our 'observational present'. They are, however, apprehended in a duration of time within which they are the main focus of our attention. Those who accept the classical view of space and time are forced to treat each act of perceiving as an instantaneous

apprehension by a subject of a particular object. Thus they lose sight of the durational nature of the apprehended data and analyse it in discrete logical terms. Each act of awareness can then be only externally related to any other.

When we pay attention to the durational content of perception we realise that in being conscious of some perceptual datum as the focus of our attention we are also aware of other bodily, perceptual, and mental functionings. Although these are not the dominant content of our consciousness, they are important as being a part of the settled background from which we, as developing individuals, originate. Thus when we hear sounds we are usually aware to some degree of the fact that as embodied selves we are situated in some specific place in which visual, tactual, and kinaesthetic sensations, as well as auditory data, manifest themselves. Thus in our auditory 'observational présent' there are many cogredient durations some of which are directly related to spatial concepts. Thus we can interpret the sound sensa, which we experience simultaneously with these other forms of sensory awareness, in terms of the spatial relations which these other sensory experiences manifest. Someone lacking binaural hearing and also the means of synthesising movements of his head with his visuo-tactual awareness of the environment, could not gain any notion of spatiality, or any directional sense through auditory awareness.[1]

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[1] Cf. p.253 f.infra.

The alleged spatial character of sounds cannot be established by reference to the variation in intensity of auditory data. We have no means of distinguishing by purely auditory clues between low intensity due to the spatial distance of a sound from us, and the low intensity inherent in a quiet sound.[1] Distance, however, is a property intrinsic to the content of visual experience. We can always discriminate between a small object near at hand, and a similarly proportioned large object at a distance. If we consider temporal 'distance' the opposite is the case. Whatever is a visual datum for me is perceived as existing now. Thus I may 'see' a star that ceased to exist many years ago at a great distance from the earth. Visually we have no way of judging the temporal connection between the origin of what we now see and our seeing of it. In hearing, on the other hand, we do have some idea of the temporal distance of what we now hear from its source of origin. Thus the first six upper harmonics and the beating caused by different tones may be discriminated when a quiet sounds is produced. These characteristics become less clearly discriminable as a sound loses intensity, and may fade out altogether while the note itself is still clearly perceptible. Thus the origin of a sound which exhibits these characteristics must be almost instantaneous with our hearing of it. This may serve as a clue for judging the distance

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[1] Shaxby and Gage, "The Localisation of Sounds in the Median Plane" (Medical Research Council, Special Report, Series No.166), p.8 and p.30.

from us of the source of a sound, since distant sounds are not immediately perceptible, the time-lag varying with the distance to be covered.

It is a fact that our normal reaction to sound stimuli is a turning of the head towards the direction from which the sound reaches us. Hearing is normally followed almost instantaneously by looking. The extent to which these two activities are correlated has been commented upon by persons investigating the interrelations between motor reaction and thought processes.[1] In his book "Progressive Relaxation" E. Jacobsen writes:

> "Auditory imagery also is attended by a sense of tenseness, perhaps felt in the auditory apparatus, but characteristically in the ocular muscles. The individual tends to look towards the imaged source of sound. With the relaxation of such looking or other tension, the auditory image is absent".[2]

This illustrates the closeness with which the two activities of hearing and looking are associated. It is natural therefore that factors characteristic of the one sense may be thought to inhere in the other. Our visual reaction

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[1] Cf. Shaxby and Gage, op.cit., p.6 f.

[2] P. 188. Quoted from "Thinking" by G. Humphreys, p.190.

to factors which are first made apparent through auditory clues is so nearly simultaneous that the durations of the visual and auditory experiences appear to be identical. Thus there is no noticeable inconsistency in attributing to the auditory field relata belonging to the visual experience. The fact that we never perceive sounds without the co-presence of other forms of perceptual awareness has led to the acceptance of spatial concepts in auditory theory. In this connection a close study of the auditory perceptions of congenitally blind subjects, whose spatial concepts are predominantly tactuo-muscular, might give interesting results.

There are two possible explanations of the fact that sounds gave a directional significance to which we respond by looking towards the source of sound. Neither depends solely, or principally, upon auditory clues. The directional significance of sounds can be explained by reference to binaural hearing. The sound stimulus reaches the one ear before the other. Hence our awareness of direction may be associated with our orientation to the temporal successivity of the received data. This does not form a part of our conscious reaction to auditory stimuli. It is dependent upon neurological rather than upon perceptual factors. The directional significance of sounds may also be explained without reference to binaural hearing in terms of movement. By moving the head

we can locate, with a fair degree of accuracy, the exact direction from which a sound originates, even if we attend only to the auditory stimulus of one ear. In this case the power to localise the direction depends upon our powers of orientating ourselves as moving subjects in a relatively stable environment. Thus it may be said that we do not really hear, but rather that we feel, the directional significance of sound stimuli. The fact that our visual reaction to sounds is so rapid lends probability to this theory.

It has been objected above that in classical theories of perception we can only study one type of perceptual data in isolation from the rest. But we appear to be advocating the study of auditory perception in complete separation from those other factors in experience which are normally found to accompany it. There is however a radical difference between the two methods. In terms of the classical theory of perception we study each act of perceptual awareness separately, but we analyse every form of perception in terms of 'a priori' concepts relating to the nature of space and time. This makes the study of each form of perception analagous to the study of visual perception, as the form of analysis used is visuo-spatial in character. What is here being advocated is a return to a truly empirical method whereby we start from a consideration of hearing as it is found under normal conditions,

then we proceed to analyse out those characteristics which are inherent in the organisation of the auditory data from those dependent upon the inter-sensory relata.

A distinction must be drawn between the conditions underlying experience and the presence or absence of similar factors as essential attributes of any specific sensory experience. For example, if you are hearing a violin sonata and I am half a mile away, then the fact that we are in different spatial positions results in your hearing violin music which, - modern broadcasting excepted, - I do not hear. Likewise you can see the player and his instrument and I cannot. Thus it might appear that spatial factors enter into additory perception in the same manner as they do in visual perception. This confusion arises because we tend to associate our bodily position with the functioning of every form of perceptual receptor. Consider the case in which we both hear and see the violinist. The fact that I am on the left side of the room and that you are on the right makes no significant difference to our hearing of the sonata. It does, however, affect our seeing of the performers and their instruments. Spatial factors, in this instance, appear to be directly related only to the visual and not to the auditory sensory content.

Whitehead defines the 'percipient event' in relation to the concept of place as the 'locus standi' for mind in nature.

We do not normally think of seeing without reference to an embodied subject who occupies a definite spatial position. To define the 'percipient event' in terms of spatial extension relates it directly to visual experience. Such spatial concepts however are inter-sensory relata with reference to auditory perception. We must therefore inquire how the notion of the 'percipient event' should be defined when it refers to hearing.

The discernible factor in auditory data is tonality which stands in some definite relation to the discerned factor, pitch. All sounds have some definite pitch characteristics. Pitch is a complex factor in noise. Our auditory acuity rarely is sufficient to enable us to analyse the pitch components of noises by means of the data perceived by the unaided ear, but it is still true to say that every noise has pitch components. Noise may be taken as the limiting case for pitch discrimination, in which we can say that we hear this pitch now. Not isolated sounds but the pitch differences between sounds is the important factor in hearing and is that which carries the meaningfulness of sound stimuli. When we have an awareness of a definite pitch relation, it affects the manner in which we analyse subsequent sounds and their meaningfulness for us. Thus the awareness of pitch relations may be regarded as the 'point of view' with reference to which we

receive and analyse auditory data. Thus the 'percipient event' must be defined in relation to pitch, which is not a spatial concept, when we consider it as it refers to auditory experience. This is possible because, as we shall demonstrate, pitch differences present a scheme of extensive relations, which we shall refer to as 'harmonic extension', adequate for the analysis of the static extensive structure of sound sensa.

Pitch differences can most easily be apphehended in temporal succession. This illustrates the close connection between extension and temporality in the auditory field. It is only by training that we can analyse out the simple components of sounds presented simultaneously. The harmony thus formed is a new entity, not merely the summation of its component sounds. The definition given above of the 'percipient event' in relation to auditory phenomena is abstract and incomplete. The 'percipient' must be defined not merely in relation to pitch, but in relation to the auditory units formed of concrete sound-patterns which have both pitch and rhythmic factors inherent in them. To confine our definition of it to the analysis of the pitch of a single sound is to apply an inadequate visuo-spatial form of analysis. This is the type of analysis which sense-data theorists recommend. It should be noted that it is almost impossible to demonstrate

the connection between extension and temporality if visuo-spatial material is used. This is partly the result of the disconnection between the percipient and his percepts, i.e. the subject-object dichotomy, introduced by spatial concepts. A fuller account of the content of the 'percipient event' in auditory experience and its importance for other factors in experience will be given when we construct a positive theory of hearing.[1] The 'percipient event' in auditory theory must refer to the dynamic feeling tone or emotion which is co-gredient with the heard duration. It is a unique datum within a particular process, whereas in a visuo-spatial theory it is an abstract point within a geometrical system of spatial relations.

Reasons have been given for maintaining the view that auditory data are not inherently spatial. The use of inter-sensory relata leads theorists to hold this erroneous belief. Why should such a belief be accepted as a basic presupposition in the analysis of sounds? Although the use of spatial concepts for a scientifically precise analysis of sounds is universally accepted, no person has inquired how these scientifically precise concepts can be applied to the vague data presented in our auditory sensa-awareness. The discussion of this topic is parallel to the discussion of the relation

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[1] See p. 332 f. infra.

between our experience of temporal duration and a scientific analysis of time. In "The Concept of Nature", Whitehead applies his method of extensive abstraction to time, and then to spatial concepts. Scientific acoustic terms such as pure tones, etc., are related to sound data in a manner similar to the relationship between geometrical concepts and visual phenomena. This is yet another proof of the independence of auditory data from spatial organisation.

HOW AUDITORY SENSATION CAN BE ANALYSED IN TERMS OF PURE TONES.

This discussion demonstrates that the relation between sound data as we experience them and the content and structure of acoustic theory can be explained in terms of the Method of Extensive Abstraction. Thus it appears that theoretically it is only when we mistake an identity of structure for an identity of content that auditory experience appears to exhibit spatial characteristics. The use of spatial concepts in the scientific analysis of auditory data is associated with the analysis of time as a one-dimensional series. It should not be inferred from the fact that we are here dealing only with the content of auditory perception that the experience of the subjective percipient is irrelevant for the adequate analysis of auditory awareness. The objective content is not more important than the structure of our subjective awareness. The two terms objective and subjective are correlative. As they are used in this discussion they do not imply an absolute dichotomy between the mental and the material elements of experience. No account can be given of perception as a process or activity until some adequate notion of the structure of the perceived material has been obtained. But this is rather the result of our manner of analysing material

linguistically than of any inherent characteristics of the material under examination. The experience of the subjective percipient will be considered after we have gained some adequate notion of the structure of the data of auditory perception.

Whitehead opens his discussion of how the Method of Extensive Abstraction is used in analysing space by defining what he means by an 'event'. He compares his durational analysis with the classical analysis which presupposes that time, space, and material are each found in experience in concrete independence. Whitehead states that we 'perceive one unit factor in nature; and that factor is that something is going on then - there.' Whitehead continues:

> "We are so trained both by language and by formal teaching and by the resulting convenience, to express our thought in terms of this materialistic analysis that intellectually we tend to ignore the true unity of the factor really exhibited in sense-awareness. It is this unit factor, retaining in itself the passage of nature which is the primary concrete element discriminated in nature. These primary factors are what I mean by events.
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> "Events are the field of a two-termed relation, namely the relation of extension which was considered in the last lecture. Events are the things related by the relation of

extension. If an event A extends over and event B, then B is 'part of' A, and A is a 'whole of which B is a part'. Whole and part are invariably used in these lectures in this definite sense. It follows that in reference to this relation any two events A and B may have any one of four relations to each other, namely (i) A may extend over B, or (ii) B may extend over A, or (iii) A and B may both extend over some third event C, but neither over the other, or (iv) A and B may be entirely separate."[1]

The relation of extension as it applies to events may be illustrated by reference to musical sounds. Musical sounds are complexes composed of a prime tone and a series of harmonic tones. If one note is a harmonic of the other then (i) or (ii) will be satisfied. If the two notes have some harmonic in common, (e.g. if they are C and G then both extend over G^{i}_{i} which is the second upper partial of C and the first upper partial of G), then case (iii) is satisfied. It is not difficult to find auditory examples of the fourth class.

Whitehead defines the continuity of nature as a continuity of events.

"This continuity is merely the name for the aggregate of

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[1] "The Concept of Nature", p.75.

a variety of properties of events in connexion with the relation of extension.

"In the first place, this relation is transitive; secondly every event contains other events as parts of itself; thirdly every event is a part of other events; fourthly given any two finite events there are events each of which contains both of them as parts; and fifthly there is a special relation between events which I term 'junction'.

"Two events have junction when there is a third event of which both events are parts, and which is such that no part of it is separated from both of the two given events. Thus two events with junction make up exactly one event which is in a sense their sum."

... "The relations of whole and part and of overlapping are particular cases of the junction of events. But it is possible for events to have junction when they are separate from each other; for example, the upper and the lower part of the Great Pyramid are divided by some imaginary horizontal plane."[1]

If the tonic and submediant [redacted] of the C major scale are sounded simultaneously, then in the resulting chord, which

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[1] "The Concept of Nature", p.76.

is a separate entity, the two notes may be said to have junction. Junction is a characteristic of the tones which constitute any complex musical sound. This chord of a fourth, from one point of view, may be taken as an illustration of the junction of separate events since the sub-mediant, unlike the dominant, does not form a part of the harmonic 'spectrum' of the tonic at that pitch, i.e. at an interval of a fourth above the tonic.

Whitehead points out that the concept of an 'abstractive set' which he has previously defined in relation to durations,[1] can be extended to apply to any events, limited events as well as durations by substitution of the word 'event' for the word 'duration'. The natural harmonic series inherent in any musical sound fulfils the conditions which an abstractive set of events must satisfy. It has the properties that (i) of any two members of the set one contains the other as a part, and (ii) there is no event which is a common part of every member of the set. The use of abstractive sets for relating vague qualitative phenomena to the terms of an exact quantitative theory is described by Whitehead thus:

> "Thus so far as the abstractive sets of events are concerned an abstractive set converges to nothing. There is the set with its members growing indefinitely smaller and smaller as we proceed in thought towards the smaller end of

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[1] See p. 183 (Part II) supra.

the series; but there is no absolute minimum of any sort which is finally reached. In fact the set is just itself and indicates nothing else in the way of events, except itself. But each event has an intrinsic character in the way of being a situation of objects and - to state the matter more generally - in the way of being a field of the life of nature. This character can be defined by quantitative expressions expressing relations between various quantities intrinsic to the event or between such quantities and other quantities intrinsic to other events. In the case of events of considerable spatio-temporal extension this set of quantitative expressions is of bewildering complexity."[1]

Theoretically we can analyse musical sounds in terms of a number of different abstractive sets. These will each yield quantitative expressions of the relations holding between certain properties of the sounds which exhibit some extensive order. This for example, we may concentrate upon time relations, intensity, rhythmic factors, pitch differences, harmonic structure, tonality or larger units inherent in the form of a whole work, when we consider the analysis of musical sounds. At present we shall confine our attention to the natural harmonic series i.e. the pitch relations of the

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[1] "The Concept of Nature", p.80.

fundamental and upper partials of musical sounds.

Sounds as such do not admit of exact quantitative measurement. To measure sounds quantitatively theorists examine them in terms of their inter-sensory relata and examine visually the forms which sound waves can be made to produce by the use of certain recording apparatus. It should be noted that the differences produced in these forms are originally of a temporal nature. Their spatial form is secondary and results from the type of instrument used to make the auditory data more accessible for analysis. The same is true if sound waves are examined as a form of vibration which can be felt, or in terms of the differences in the lengths of strings or columns of air required to produce sounds of different pitch. The first clarification necessary in an empirical investigation is to separate the sound data as such from these inter-sensory relata by means of which sounds are represented scientifically.

The extent to which visual and tactual sensations and other forms of physical and physiological material have been identified with sound data may be illustrated by a quotation from "The Oxford Companion to Music". In the subsection entitled "The Nature of Sound" in the article "Acoustics" the following passage occurs:

"The popular conception of a sound as a thing is hardly correct. It is true that sound can be considered objectively but for the purposes of such an article as the present the subjective aspect is the truer. From this aspect sound is a sensation. Some object is by some agency thrown into a state of vibration; it communicates its vibrations to the surrounding air; the vibrations impinge upon the ear-drum of a human or other animal and set up a nervous disturbance there which we call 'sound'. From this point of view, then, there is 'sound' only when there is an ear; a brass band of stone-deaf players (if the imagination can fly so high), in a deaf and dumb asylum where only the patients were present, would produce no 'sound'."

Whatever sound may be it certainly is not adequately described as a nervous disturbance set up in the ear, - later in the same passage it is said to be 'created in the brain' - by air vibrations. To call such an explanation 'subjective' seems extraordinary. A physiological explanation of hearing is admirable, but not when it is substituted for a definition of the sensed content of auditory perception. What is required is some explanation of how vibrational frequency can be correlated with heard sounds to give an exact description of their pitch and intensity. Writers on acoustics glibly quote the dogma that frequency of vibration determines pitch, and

amplitude of vibration determines intensity. They do not pause to consider what kinds of data they are talking about, or how such very different phenomena as felt vibrations,-or their visual representations, - can be substituted for heard sounds. Why, we may ask, are heard sounds not substituted for vibrations? Perhaps there are cases of such substitution, though the vibrational content of the experience is of quite a different order. When we 'voice our feelings' such a substitution may be taking place. In the scientific field, however, no such reciprocal substitution is made. We must now inquire into the nature of the process by means of which we can discuss sound data in terms of vibrational frequencies. Whitehead's generalised account of the manner in which the method of extensive abstraction relates to actual sensory events gives an adequate account of this relationship. We only require to substitute auditory instead of spatial values in the interpretation of his abstract formula. Whitehead writes:

> "If e be an event, let us denote by q(e) the set of quantitative expressions defining its character including its connexions with the rest of nature. Let e_1, e_2, e_3, etc. be an abstractive set, the members being so arranged that each member such as e_n extends over all the succeeding members such as e_{n+1}, e_{n+2}, and so on. Then corresponding

to the series

$$e_1, e_2, e_3, \ldots e_n, e_{n+1}, \ldots\ldots,$$

there is a series

$$q(e_1), q(e_2), q(e_3), \ldots q(e_n), q(e_{n+1}), \ldots\ldots$$

Call the series of events s and the series of quantitative expressions q(s). The series s has no last term and no events which are contained in every member of the series. Accordingly the series of events converges to nothing. It is just itself. Also the series q(s) has no last term. But the sets of homologous quantities running through the various terms of the series do converge to definite limits. For example if Q_1 be a quantitative measurement found in $q(e_1)$, and Q_2 the homologue to Q_1 to be found in $q(e_2)$ and Q_3 the homologue to Q_1 and Q_2 to be found in $q(e_3)$, and so on, then the series

$$Q_1, Q_2, Q_3, \ldots Q_n, Q_{n+1}, \ldots\ldots,$$

though it has no last term, does in general converge to a definite limit. Accordingly there is a class of limits l(s) which is the class of limits of those members of $q(e_n)$ which have homologues throughout the series q(s) as n indefinitely increases. We can represent this statement diagramatically by using an arrow ($\rightarrow$) to mean 'converges to'. Then

$$e_1, e_2, e_3, \ldots e_n, e_{n+1}, \ldots \rightarrow \text{nothing},$$

and

$$q(e_1), q(e_2), q(e_3), \ldots q(e_n), q(e_{n+1}), \ldots \rightarrow l(s).$$

The mutual relations between the limits in the set $l(s)$, and also between these limits and the limits in other sets $l(s^i)$, $l(s^{ii})$, ... , which arise from other abstractive sets s^i, s^{ii}, etc., have a peculiar simplicity.

Thus the set s does indicate an ideal simplicity of natural relations, though this simplicity is not the character of any event in s. We can make an approximation to such a simplicity which, as estimated numerically, is as close as we like by considering an event which is far enough down the series towards the small end. It will be noted that it is the infinite series, as it stretches away in unending succession towards the small end, which is of importance. The arbitrarily large event with which the series starts has no importance at all. We can arbitrarily exclude any set of events at the big end of an abstractive set, without the loss of any important property to the set as thus modified."[1]

It may be significant that when we study the intensity, duration, timbre etc., of sensory events the sensory clarity of the data decreases only in one direction. Thus Whitehead's remarks about the unimportance of the arbitrarily large events is verified. But when we study the phenomena of pitch or colour the series is reversible. The audibility of the sound

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[1] "The Concept of Nature", p.80.

sensa decreases both for high and low sounds. The same is true of the colour spectrum in which colours become indefinite and merge both at high and low frequencies. This attribute may be the distinguishing characteristic of material which affirms the sensory modality of a perceptual experience as distinguished from its attributes. Thus extensity, intensity, rhythm, and tonal gradations are attributes of visual, auditory, and some forms of tactual perception. They all decrease in perceptual clarity only towards the small end. Some, when increased very greatly in the opposite direction produce pain in the perceptual organs. Theoretical analyses of perceptual experiences are concerned principally with the unending succession towards the small end.

The terms of Whitehead's abstract formula which explains the application of the method of extensive abstraction to sensory events can be evaluated in terms which refer directly to pitch differences between auditory data and their analyses.

If e be an auditory event,

Let the series

$$e_1, e_2, e_3, \ldots\ldots e_n, e_{n+1}, \ldots\ldots,$$

(known as the series s)

represent the harmonic series intrinsic in a given sound.

Let the series

$$q(e_1), q(e_2), q(e_3), \ldots\ldots q(e_n), q(e_{n+1}), \ldots\ldots,$$

(known as the series q(s))

represent the vibrational structure of the ~~overtones of the~~ components of the harmonic series.

Let the series

$$Q_1, Q_2, Q_3, \ldots\ldots Q_n, Q_{n+1}, \ldots\ldots,$$

represent a set of homologous quantities running through the various terms of the series q(s), which do converge to limits. These will be the set of quantitative expressions defining the frequency or vibration rate of the contents of the series q(s). The sound series does not converge to any definite limit. We experience a gradual fading away of perceptual awareness in a region which psychologists define as the discriminable threshold. This may be represented by $q(e_{n+x})$. Its quantitative measurement $Q(e_{n+x})$ will represent a limit to which the auditory series does approximately converge.

This explanation of auditory data is greatly over-simplified for the sake of clarity of expression. We can determine the pitch attributes of the harmonic series without considering any other factors, but pitch is only one among many attributes of auditory data. Another important attribute of sound is intensity. The exact specification of the limit of audibility of sounds of normal intensity varies from one percipient to another, and also for the same percipient in different circumstances. For low sounds it is usually given as being in the region of sixteen vibrations per second. High tones 'fade out'

any place in the region of from sixteen thousand to twenty thousand vibrations per second. It should be noted that since low sounds have a greater volume than high sounds it is the sounds which have the greatest number of vibrations per second which are accepted as belonging to the 'small end' of the sound spectrum. Incidentally the terms high and low are yet another example of a spatial metaphor applied to auditory data.

Whitehead's discussion of how one abstractive set may 'cover' another gives a coherent account of the relations which we discover between variations of the intensities of sounds and the audibility of sounds of different pitch. This relationship has a mathematical simplicity such that we can forecast the discriminable threshold of any sound of a definite pitch and intensity for a particular percipient. This simplicity is dependent upon the mutual relations between the different sets of limits. It could not have been discovered by the examination of a great number of instances.

Whitehead defines the connection between abstractive sets which he calls 'covering' thus:

> "An abstractive set p covers an abstractive set q when every member of p contains as its parts some members of q. It is evident that if any event e contains as a part any member of the set q, then owing to the transitive property

of extension every succeeding member of the small end of q is part of e. In such a case I will say that the abstractive set q 'inheres in' the event e. Thus when an abstractive set p covers an abstractive set q, the abstractive set q inheres in every member of p."[1]

Whitehead's account of how abstractive sets 'cover' one another is related to his theory of the extrinsic and intrinsic character of abstractive sets. The 'intrinsic character' of an abstractive set is the limiting character of the natural relations which the set indicates, e.g. for an auditory datum it is the pure tone. The extrinsic character is the property of whole and part in which members of an abstractive set stand to one another, e.g. the harmonic series inherent in a complex sound of which the fundamental may be said to represent the whole of which the upper harmonics are parts. The most important fact about the intrinsic and extrinsic character of an abstractive set is that the extrinsic character determines the exact character of the intrinsic character.

The various forms of harmonic analyses used in the analysis of musical data can be explained with reference to the manner in which one abstractive set covers another. It should be noted that different extrinsic characters may determine the same intrinsic character. Thus different abstractive

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[1] "The Concept of Nature", p.83.

sets refer to the same datum, in terms of which a definite relationship is set up between the two abstractive sets.

Consider how we determine the pitch of the fundamental of a complex musical sound. The complex sound occurs in a harmonic passage which is in a definite key. Thus we can dismiss from our investigation forms of tonality other than the direct key-relation. We then determine what note is the fundamental of the chord under discussion. It then is possible to consider this note in relation to the extrinsic characters of various abstractive sets which represent different 'pure' or constructed harmonic series of which it may represent a limit.[1] Each of these harmonic series is the equivalent of the extrinsic character of an abstractive set. The intrinsic characters which they determine will approximate to the same pitch-sound which may be represented by the statistical average of the various frequencies given by the different analyses. This may not be identical with any of the given limits but the difference, in most cases, will not be discriminable by the unaided ear.

A more simple concrete example may help to make plain the importance of the concept of abstractive sets covering one another, for the analysis of auditory data. Consider an event e which we describe as the hearing of the sound of middle c,

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[1] Cf. p.278 ff. infra.

i.e. C'(Philharmonic pitch 522 vibrations per second). G'' which is the second harmonic of C' is a part of this event e. But G'' may be considered as the fundamental which is the intrinsic character of an abstractive set i.e. we may regard G'' as the tonic of a G major chord situated over an octave higher than middle C, or as the intrinsic character i.e. the limit, of some other abstractive set referring to an other harmonic system. If we confine our attention to the first alternative, then the upper harmonics of G'' may be said to inhere in the event e, since G'' is an element in the harmonic series inherent in the sound of middle C. The harmonic structure of the fundamental C' i.e. the abstractive set of which C' is the intrinsic character, inheres in the event e and 'covers' every member of the abstractive set of which G'' is the intrinsic character, i.e. it covers the harmonic series inherent in G''. Thus the components of the abstractive sets of which C' is a member stand in some definite relation to each member of the abstractive sets of which G'' is a member. This discussion has been couched in terms of the exact scientific acoustic relata which can be substituted for the sound phenomena. Had we chosen to discuss the relations between these sounds in dynamic instead of in formal terms then we should have approximated to the theory of prehensions which Whitehead elucidates in his later metaphysical works.

An other example of one abstractive set which covers an other is that referred to previously, namely the relationship between an abstractive set which refers to the pitch of a sound and that which refers to intensity. If we take a heard sound of some definite pitch as the event e, then there is an abstractive set q the intrinsic character of which refers to the lowest intensity at which the given sound is audible. All the upper harmonics of the given sound will be audible at that intensity, but no sound lower than the given sound. The determining of the least possible intensity for an audible sound at the given pitch is itself the outcome of the use of the method of extensive abstraction.

If we symbolise the abstractive set referring to pitch relations as p, of which the given sound is the limiting event, and symbolise the abstractive set referring to intensity as q, then we can say that p and q cover each other, since every element in the abstractive set p is audible at the given intensity which is the intrinsic character of q. The intensities at which the range of sounds which form the harmonic series of the event e are just perceptible will, moreover, vary proportionately to the variation in pitch 'height'. Thus there is an abstractive set referring to the intensity of the just audible presentation of every harmonic series such that by learning the intensity of a just discriminable sound we should be able to state its pitch value.

When Whitehead introduces the notion of one abstractive set covering another he does not intend it principally as an explanation of how abstractive sets referring to different attributes of one event interact, but as a method of defining an abstractive element. If two abstractive sets cover each other they are said to be 'equal in abstractive force'. An example would be the harmonic series natural to two sounds of the same pitch. Any two abstractive sets which are equal to a third abstractive set are equal to each other. An 'abstractive element' is the whole group of abstractive sets which are equal to any one of themselves and converge to the same intrinsic character. Thus an 'abstractive element' may be defined as 'the group of routes of approximation to a definite intrinsic character of ideal simplicity to be found as a limit among natural facts'.

The sounds which we apprehend in listening to music and their internal structure should be regarded as being homologous to abstractive elements.[1] Pure tones may be regarded as being equivalent to the intrinsic character of abstractive sets, i.e. they are the limits of abstractive sets, the extrinsic characters of which are analagous to the harmonic structure natural

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[1] For a fuller discussion of the acoustic facts which underlie this statement see the discussion of Temperament in any reputable musical dictionary.

to the note which the pure tones abstractly represent. We never hear pure tones under normal circumstances. It may be seriously doubted whether we hear them even under the most carefully selected laboratory conditions. Even if we do, it is quite certain that the study of them can tell us little or nothing about normal hearing processes.

The reason for considering heard sounds as homologues of abstractive elements can be indicated by drawing attention to the following data which relate to the sound of middle C (C').

a) In just intonation C' (middle C) produces the upper harmonics

$$(C^{1})\,C''\ D'''\ E'''\ F'''\ F^{\#}'''\ G'''\ A'''$$

These upper harmonics may be regarded as an abstractive set converging to the limit of the pure tone C' (Philharmonic Pitch 522 vibrations per second).

b) In equal temperament [redacted] C' may be apprehended as the tonic of the C major diatonic scale. This scale may then be said to represent an abstractive set converging to the limit of the pure tone C'.

c) In just intonation C' may be apprehended as the tonic of a C major diatonic scale in which all the intervals are derived from the natural (pure) fifth, and the natural (pure) third. This is known as mean tone temperament. It may be based upon other intervals but these mentioned above are the most common and useful.

The differences in pitch of the notes constituting the diatonic scale in equal temperament and just intonation tuning are as follows:[1]

	C	D	E	F	G	A	B	C
Just intonation	520	585	650	693	780	867	975	1040
Equal temperament	520	584	655	694	779	874	982	1040

In equal temperament [redacted] no interval except the octave is acoustically pure. The deviation of the fifth is very slight but that of the third is quite considerable, - about one eighth of a semitone larger than the pure third.

If we extend our scales in these tunings through a number of octaves upwards and downwards from middle C it will be found that in equal temperament [redacted] the intervals within the scale and the octave relations remain stable, and that modulation into other keys, using the same sounds, is possible without dissonance or deviation from the diatonic scale greater than those exhibited in the C major original scale. The scale based upon just intonation however tends to flatten the pitch of the tonic in successive octaves. Moreover it cannot be used to reproduce a major diatonic scale using any other note as the tonic. For example, the first three tones of the G major scale G A B would have different internal relations from those of the C major scale. The introduction of

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[1] Quoted from "The Harvard Dictionary of Music".

chromatic tones would lead to even greater confusion. Just intonation produces pure triads, but the harmony of the supertonic chord leads to a lowering of the pitch of the tonic.

The natural harmony produced by overtones, which we refer to as the 'harmonic series', the diatonic scale based upon equal temperament and that based upon mean tone temperament may all be considered as abstractive sets which equal each other in abstractive force and converge to the same internal character, i.e. have the same limit. The first two series are components in all modern music and theoretically we waver between accepting one or other as the fundamental basis of musical analysis. Theorists discuss pure tones because they are elements common to both systems. To accept pure tones as the most simple elements heard, thus making them the auditory equivalent to visual sense-data, is merely an attempt to escape from a discussion of the problems involved in analysing the content of hearing as something which belongs either to the harmonic series or to the tempered scale.

Modulations are possible to any key in scales of sounds tuned to equal temperament. Thus we use this system for the tuning of instruments and the construction of any complex musical work. If auditory perception consists in the apprehension of single sounds which are later connected by an intellectual activity to form complex wholes then we should

expect that the differences between the sounds inherent in the harmonic series and those used in equal tempered tuning would be apparent. Auditory perception, however, consists not in hearing single sounds in isolation but in the apprehension of a sequence of sounds as a unitary datum, including the relationships in which they stand one to another. Thus we tend to hear the individual sounds as approximating more closely to the 'pure' interval than the phenomenological structure of the material warrants. The successive groups of sounds which we hear 'in relation' may thus be described as the perceptual correlates of "groups of routes of approximation to a definite intrinsic character of ideal simplicity to be found as a limit amongst natural facts". This is the basis for the contention that the human ear may be compared to a very skilful practical Fourier analyser.

The sounds which are the content of normal auditory perception should, therefore, be regarded as abstractive elements and not merely as the limits of a number of abstractive sets, for

1) we do not hear pure but complex tones;

2) we hear sounds which have a specific harmonic structure in the system which we call just intonation, as belonging to the equal tempered harmonic system, and conversely

3) we hear intervals presented in the equal tempered system, e.g. the third, as if they were acoustically 'pure', or at

least we minimise the degree of error.

The pure tone, which is the element common to all the various analytic systems, is the initial datum with which acoustic theorists must deal and upon which their scientific theory is based. Unfortunately pure tones have been introduced into discussions of musical phenomena by psychologists and others with disastrous results. The relationship between pure tones and complex heard sound unities is similar to that between the limits, i.e. the intrinsic character of abstractive sets, and abstractive elements. To call the sounds heard abstractive elements is an abstraction, for in thus regarding them we are treating them in disjunction from the temporal elements which are inherent in them. To discuss the structure of a datum in isolation from its temporal content is however necessary for intellectual clarity. But there are limits to the simplicity which can be achieved without distortion of the essential features of the data. To describe a datum as being the intrinsic character of an abstractive set, when the relationships in which it stands to other relevant factors necessitates that it should be conceived as an abstractive element, leads to much ambiguity between conceptual interpretative factors and the structure of the perceptual material under discussion.[1] In visuo-spatial theory the confusion of the two leads to the

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[1] Cf. discussion of Seashore's musical psychology, infra p.306ff.

conception of the point as an actual physical entity which can be perceived, instead of as a theoretical limit to which the physical data only roughly approximate. Likewise in auditory theory it leads to the conception of the pure tone as being an actual physical element in perceptual awareness, not merely the outcome of a method of analysing data by abstracting them from the temporal duration in which they inhere, then confining attention to the smallest discriminable segment of the static extensive material which remains.

In discussion of space the geometrical point which exhibits the absolute miminum of intrinsic character is the basis of our conceptual theories. In the conceptual analysis of sounds, the pure tone plays an analagous part. The effect of spatial analysis on the theory of sound is apparent in the fact that, because the geometrical point can be conceived as existing at a moment, the same instantaneousness is attributed to pure tones despite the fact that they are analysed in terms of 'vibrations per second'. Thus there is a radical incoherence at the base of the acoustic analysis of auditory material. The practical necessity for this abstraction of temporal factors as a methodological postulate has been discussed in dealing with the relationship between the method of extensive abstraction and temporal extension.[1] It may be accepted as a

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[1] Cf. p. 181 ff (Part II), supra.

methodologically useful abstraction in the existing theories relating to auditory data. If we alter the presuppositions upon which theories of auditory perception are based, it may be possible to abolish this irrationality which leads to much confusion in discussions of the nature of sound and of hearing.

The intrinsic character of a point is that it should be without parts and without magnitude, cf. Euclid's general definition. As applied to space both terms refer to non-temporal forms of extension. It is possible to follow a point-track throughout a duration of time without interfering with the point's essential characteristics, or so the theory would have us believe. If we speak of a sound without parts and without magnitude these terms must apply to temporal forms of extension. The intrinsic character of the abstractive element which exhibits a convergence to an absolute minimum for sound may be defined as being without duration and without pitch variation, i.e. 'thickness' or to use a more expressive and non-spatial term, 'vibrato'. Such a definition represents the ideal of sound-events without extension. In fact there are no such entities as these non-extensive events. We can express this simply by saying that in the analysis of space the ideal is events without non-temporal extension, whereas in the analysis of sounds the ideal is events without temporal extension.

In discussing space Whitehead points out that the ideal limits to actual events are not points in an external timeless space, but points in an instantaneous space. The space of physical science, however, is an external timeless space. Whitehead therefore suggests that the term 'point' should denote only the theoretical minimum, i.e. events without extension situated in an external timeless space. He introduces the term 'event particle' to denote the minimum limit to actual events. This is an abstractive element i.e. a group of abstractive sets relating to one particular time system and converging to approximately the same intrinsic character.

A similar distinction between the ideal limit as theoretically conceived in acoustic theory, and the phenomenological datum which represents it as a heard datum ought to be made in auditory theory. We shall call the theoretical minimum which is equivalent to Whitehead's 'point' a 'pure tone'. The auditory datum, equivalent to an 'event particle' may be termed a 'pure sound'. Acoustic theory deals with the resolution of complex sounds into pure sounds both of which relate to equal tempered tuning, and their theoretical description in terms of pure tones which relate to just intonation. Acoustic analysis stresses the discrepancy between classical tonality, based on equal tempered tuning, and just intonation. Classical tonality cannot be understood with reference to just intonation except as a series of errors and approximations.

It should not be thought that the empirical content of a sound series which is analysable in terms of just intonation is exactly homologous to the acoustic data. Acoustics treats each sound as an individual complex entity composed of the summation of a number of pure tones produced by a specific number of vibrations per second. To identify the acoustic data with the material heard is similar to the error of confusing the geometrical triangle which the mathematician describes, with a three-sided figure drawn in pencil on paper. The acoustic description depends upon a mathematical calculation which treats the complex sound as a summation of simple tones which can be added together. But the sound data as heard interact. Thus the 'composition theory' cannot adequately describe them. This distinction has been expressed in the saying that whilst in mathematics things are what they are in aesthetics things are what they seem. Writers on acoustics and on the psychology of music seldom attempt to keep the theoretical and the empirical data distinct.

In the analysis of spatio-temporal experience there is a similar confusion between timeless space and instantaneous space. Instantaneous space is the spatial character of all nature at a moment of time. Timeless space, on the other hand, differs with each time system. The term 'timeless space' sometimes prefixed by the word 'external' or 'scientific' is

also used to denote an abstract theoretical space from which all temporal references have been abstracted. This latter abstract space tends to be confused with instantaneous space. But the content of instantaneous space is the data of concrete experience, whereas the content of timeless space, as distinct from the timeless spaces of different time systems, is abstract and theoretical.

In auditory theory just intonation is equivalent to the instantaneous space of spatio-temporal theory: mean tone tuning is equivalent to the timeless space of different time systems. Equal tempered tuning upon which key-relations and the system of classical tonality is based correspond to scientific timeless space. The differences between these specific systems is important as their confusion is the basis of much of the prevalent muddle regarding theoretical and empirical data in auditory theory.

The analysis of visuo-spatial material is made in terms of three spatial and one temporal dimension. All four dimensions are interpreted on a static, mechanistic analysis of our visual experience of the physical world. Incidentally it may be noted that theorists who accept this analysis always indulge in a naive nominalism. Since the fourth dimension, which they interpret in mechanistic and static terms is called the temporal dimension they introduce temporal and dynamic

elements into their explanations although these have no place in their formal interpretative scheme.

An unprejudiced examination of auditory data leads one to suspect that an inverse distribution of dimensions is required for an adequate analysis of any sound phenomena. This will give us three temporal dimensions and one non-temporal scalar dimension. We should expect the three temporal dimensions to correspond roughly to what has been termed rhythm, duration, and intensity. The three temporal dimensions postulated on page 224 which we called successivity, duration, and temporal depth may be regarded as more general aspects of those characteristics of time which a more specifically auditory examination reproduces as the concepts of rhythm, duration, and intensity. The content of the non-temporal dimension will relate to the position of any datum on a one-dimensional high-low pitch scale. In investigations of auditory phenomena this non-temporal dimension may be referred to as the 'scalar dimension' as it is by reference to it that the conception of a musical scale is formed.

When we attend to the structure of simgle complex sounds in isolation from one another, we define them in terms of pitch units, i.e. in terms of the vibration frequencies of pure tones. (Theoretically we define spatio-temporal entities similarly in terms of non-extensive geometrical points.)

This gives us useful information about the structure of individual sounds. But this analysis cannot be identified with the non-temporal scalar dimension in terms of which we determine the position of sounds in a scalar series. Similarly, we do not attend to extensionless instantaneously presented material when we wish to determine actual spatial relations, although we may use such entities for the intellectual analysis of spatial categories.

In the acoustic analysis of sounds and the intellectual analysis of spatio-temporal phenomena we start from the consideration of ideally limited entities and construct a theory to explain the units which we perceptually apprehend [in terms of these postulated entities]. In defining auditory or spatial data in terms of our empirical awareness, we start from vague incoherent unanalysed data. This consists of the spatial material which relates to the timeless spaces of each temporal system, and of sounds which relate to mean tone temperament. As our investigation proceeds we make our theoretical schema more coherent. We construct a Scientific Timelsss Space with reference to which we analyse spatial data, and we replace mean tone temperament by equal tempered tuning in the analysis of sound data. These analytic systems are based upon approximations to the mathematically 'pure' spatial and temporal relata in any given situation. The

important fact is that, perceptually, equal tempered tuning is found to be more acceptable than phenomena which represent the theoretically correct data. If we ask what the criterion of correctness should be, either an aesthetic judgement of perceptual fitness, or mathematical correctness of the data of our analytic schema, the answer must surely be that perceptual fitness is of greater importance than mathematical correctness.

This discussion may be illustrated by reference to the discussion of whether or not violinists and other string players should adopt just intonation. Joachim was often charged with playing out of tune in his later years. His biographer, Dr. Fuller Maitland, has defended him by stating that in fact his intonation is 'true' in the sense that it accords with just intonation whereas keyed instruments are tuned to equal temperament and thus admit 'error'. Dr Fuller Maitland states that Helmholtz asserted that Joachim always played in just intonation. Elsewhere, however, it would appear that what Helmholtz examined was Joachim's playing of the unaccompanied scale. It is not improbable that Helmholtz, holding the theories he did hold, may have inferred from an experiment on such an isolated datum to Joachim's playing as a whole. Commenting on this discussion Percy Scholes writes:

"An unaccompanied scale played under laboratory conditions has no bearing upon the performer's practice (a) when

accompanied by a tempered instrument or by the orchestra with its many tempered instruments, (b) when playing a passage full of chordal implications in (say) a string quartet (and, moreover, full of modulations, each of them implying, from a just intonation standpoint, a change of pitch of notes that remain notationally the same). etc.....

The conclusion then, is that the so-common statement that good string players use just intonation is quite incorrect. When playing unaccompanied by keyed instruments they deviate from equal temperament, but they do not drop into 'justness', except in certain appropriate passages, whilst in some other passages they (quite suitably) drop into a more pronounced 'unjustness' than any of which the modern pianoforte is mechanically capable."[1]

Dr Scholes also quotes the remark of Moritz Hauptmann, who was reputed for his acuity of aural perception, that 'the mathematically true intonation does not suffice for an animated performance'. The latter is 'just as little mathematically true as an animated time-keeping is strictly in accordance with the metronome.'

Why should there be this discrepancy between the content of a mathematically pure acoustic analysis of sounds and the

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[1] "The Oxford Companion to Music" (Eighth Edition 1950), Article on Temperament section 10, p.927.

actual perceptual phenomena? Hauptmann comes very near to giving us an explicit statement of the reason. The acoustic analysis is based upon a static mathematical schema similar to that in terms of which we analyse time as a one-dimensional successive series. When we introduce actual durational factors as real elements in the investigation 'perceptual illusion' becomes manifest. It is a tribute to the dominance of a materialistic metaphysic that the 'illusion' or 'error' is always regarded as being inherent in the perceptual data, not in the analytic terms used for its elucidation. Seashore, for example, assumes that an acoustic analysis, which can account for the structure of complex sounds in terms of the vibrational frequencies of pure tones, is The Correct Analysis of all types of auditory data. Thus he would make the non-temporal scalar dimension consist in the multiplicity of scales which just intonation introduces. Every auditory datum must then be analysed in complete isolation from every other. Temporal duration thus becomes merely a trivial and extrinsic form of organisation by which sounds happen to be presented simultaneously or in close succession. But sounds require a temporal durational span for their very existence. To treat them in isolation from temporal factors is fundamentally an illogical procedure, even when we are dealing with their pitch characteristics. It is not pitch in itself that is important to any

sound but the relationship between its pitch and that of the preceding and succeeding sounds, and these can only be compared within a temporal duration.

The conclusion to which this discussion leads is that sounds as heard should never be regarded as isolated entities, but should always be analysed as relational factors with reference to their temporal relations. We can then understand why the mathematical formulae which represent the structure of individual entities is only approximately correct when applied to the empirical content of sound perception. We can also gain some insight into the relationships which hold between the various spatial systems and the various systems of musical temperament in use in the different forms of analysis which we apply to perceptual data, according to whether or not we analyse them in complete abstraction, or only in partial abstraction from temporal factors.

It should be noticed that the same difficulty of freeing our theoretical terms from the deadening effect of static formal analysis appears at higher levels of discussion. The whole of musical terminology relating to musical form and structure is impregnated with mechanistic static assumptions which greatly lessen its usefulness. Thus Tovey writes:

"If elementary architectural concepts were definable only in mathematical terms, we might over-estimate their

> artificiality as grossly as we at present over-estimate the rigidity of the art-forms of classical music. But in reality the sense of key relationship in music is on the same level of thought as the elementary topographical sense that enables us to enjoy the symmetries of architecture..... It is thus no question here of 'immmutable laws of art'; but it is a question of permanent categories. If these categories are describable only in such untranslated technical terms as counterpoint and tonality, and if such vernacular words as harmony, rhythm, and form develop technical meanings which are at once narrow and ill-defined, who shall set limits to the possibilities of plausible nonsense in musical history and education?"[1]

The rigidity of the art forms and of the abstract schemes which we use for the discussion of both the melodic and rhythmic characteristics of music and of all types of auditory data, spring from the one source, namely the lack of adequate attention to the temporal factors in experience.

It has been established in the foregoing discussion that the method of extensive abstraction applies equally well to auditory as to spatial phenomena, and that spatial concepts are irrelevant to auditory data. If further demonstration of this fact is required one may attempt to give an auditory interpretation of the discussion of spatial position contained

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[1] "Essays and Lectures on Music" (Oxford University Press 1949), p.107.

in "The Concept of Nature" on page 90 ff. It is evident that auditory phenomena do not possess 'qualities of position' in the same sense as do visual phenomena. The serial order which pitch differences, which are the content of the non-temporal dimension in auditory analysis, exhibit may be explained in a manner analagous to that outlined in "The Concept of Nature" page 63, where Whitehead describes how time can be arranged in a one-dimensional series. The idea of position in a series is not something which is inherent in the idea of extension. In spatial investigation it is introduced by connecting the three main structural dimensions with a fourth temporal dimension. In auditory investigation it is introduced by connecting the three main structural 'dimensions', which in this case are temporal 'dimensions', with a fourth dimension which refers to the pitch characteristics of the data.

To use spatial categories in the description of sounds is to speak metaphorically. There is a close connection between hearing and looking, but the phenomenological content of the two types of awareness remains distinct. A structural similarity exists between them in that both can be analysed in terms of a four-dimensional schema but the content of these is not the same. When we use static intellectual terms we tend to associate them with visuo-spatial terms on account of the prevalence of such terms on our language. To try to analyse

sounds in terms of three non-temporal and one temporal dimension leads only to confusion, and to the misrepresentation of the auditory material. There is a parallelism between the problems of visuo-spatial theory and those of auditory theory. It is not an exact parallel but a similarity of basic structure. This has apparently misled many theorists who assume that the same phenomenological values must be given to the abstract schema in both cases. Such presuppositions underlie the acoustic theory of Helmholtz. In the following section a brief outline of Helmholtz analysis of sounds as given in his important work on acoustics, "On the Sensations of Tone", will be given as proof that theorists really do use the types of analysis which we have discussed in this section. Reference will also be made to the use which Seashore makes of this material in his attempt to found a psychology of music upon it. The fact that Seashore fails to achieve any marked success in his attempt to clarify musical problems should encourage theorists to discover some alternative schema which does not imply that sounds are analysable in terms of the analytic system used in defining spatio-temporal material as it is visually apprehended.

THE ACOUSTIC AND PSYCHOLOGICAL ANALYSIS OF SOUND DATA.

The extent to which the science of acoustics depends upon inter-sensory relata is apparent if one studies its historical development. Helmholtz summarises the earlier development of acoustic theory thus:

"Long before anything was known of vibrational numbers, or the means of counting them, Pythagoras had discovered that if a string be divided into two parts by a bridge, in such a way as to give two consonant musical tones when struck, the lengths of these parts must be in the ratio of these whole numbers. If the bridge is so placed that 2/3 of the string lie to the right and 1/3 on the left, so that the two lengths are in the ratio of 2:1, they produce the interval of an Octave, the greater length giving the deeper tone. Placing the bridge so that 3/5 of the string lie on the right and 2/5 on the left, the ratio of the two lengths is then 3:2, and the interval is a Fifth.

These measurements had been executed with great precision by the Greek musicians, and had given rise to a system of tones contrived with considerable art. For these measurements they used a peculiar instrument, the monochord, consisting of a sounding board and box on which a single string

was stretched with a scale below, so as to set the bridge correctly.

It was not till much later that, through the investigations of Galileo (1638), Newton, Euler (1729), and Daniel Bernouilli (1771), the law governing the motions of strings became known, and it was thus found that the simple ratios of the lengths of the strings existed also for the vibrational numbers of the tones they produced, and that they consequently belonged to the musical intervals of the tones of all instruments, and were not confined to the strings through which the law had been first discovered."[1]

The discovery that the ratios between the vibration numbers of the physical series of definite pitch-sounds are identical with the ratios of the lengths of strings producing sounds of the same pitch was very important for the development of acoustic theory. Theorists could then speak of sounds as being produced by a certain number of vibrations per second, and of tonal intervals as exhibiting certain mathematical symmetries. Such a procedure greatly simplifies the task of analysing simple sounds and musical intervals in terms of their pitch characteristics. But theorists fail to take account of the differences between sound phenomena and their physical correlates. To

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[1] "On the Sensations of Tone", translated by A.J.Ellis (Longmans Green and Co., Third Edition 1875), p.23.

substitute one set of physical data which are easily measured, for an intractable set, is a common method in modern science. It is based upon the use of inter-sensory material and the method of extensive abstraction. Its danger lies in the ease with which the two sets of data may become identified, and characteristics inherent in the data used in a physical analysis are then erroneously associated with the sensory phenomena.

G.S. Ohm was the first to point out that the sounds correlative to pendular vibrations do not exhibit any harmonic components. Further he demonstrates that all periodic vibrations can be analysed physically as a series of pendular vibrations which correspond to the upper harmonics of a complex sound. This is a special instance of Fourier's discovery that any periodic motion is analysable as the sum of a finite number of pendular vibrations. Acoustic theorists sometimes call the ear a practical Fourier analyser because the ear can detect upper harmonics the pitch of which is equal to the pure tones correlative to the pendular vibrations into which the vibrating body's periodic vibrational motion can be analysed. Thus there is a similarity in structure between the analysis of a complex sound in terms of its pure harmonics and the analysis of the complex wave motion of a vibrating physical body. Theorists therefore ignore the fact that such

an analysis depends upon inter-sensory relata, and that the pitch characteristic of sounds only partially describes the sounds as such. Theorists identify a physical vibrational analysis with a direct analysis of sound phenomena in auditory terms. Thus an opportunity arises for endless nonsense to be talked about the structure of sounds, in terms of this partial and inadequate view of the nature of auditory data.

Helmholtz writes:

> "The ear when its attention has been properly directed to the effect of the vibrations which strike it, does not hear merely that one musical tone whose pitch is determined by the period of the vibrations in the manner already explained, but in addition to this it becomes aware of a whole series of higher musical tones, which we will call the harmonic upper partial tones, and sometimes simply upper partials of that musical tone, in contradistinction to that first tone, the fundamental or prime partial tone or simply the prime, which is the lowest and generally the loudest of all, and by whose pitch we judge of the pitch of the whole compound musical tone, or simply the compound. The series of these upper partial tones is precisely the same for all compound musical tones which correspond to a uniformly periodical motion of the air."[1]

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[1] Helmholtz, op.cit., p.33.

The underlying assumption of acoustic science is that the structure of a sound is identical to the structure of its physical cause. In other words pitch is assumed to be the only structurally important characteristic of sounds and it is thought to be totally analysable as a vibrational frequency.[1] In the above quotation Helmholtz is stating that the effect of the vibrations which strike the ear is a complex musical tone, and that its component parts, i.e. its harmonics, are the effect of the component vibrational frequencies. He is careful to speak of the effect of the vibrations, thus escaping the charge of identifying two quite different sets of data. The importance of an abstract serial analysis of time which gives us a means of measuring temporality with precision is illustrated by the following quotations from the first chapters of Helmholtz work. He distinguishes between noise and musical sounds thus:

> "By a periodic motion we mean one which constantly returns to the same condition after exactly equal intervals of time. The length of the equal intervals of time between one state of the motion and its next exact repetition, we call the length of the oscillation vibration or swing, or the period of the motion. The kind of motion of the moving body during one period, is perfectly indifferent."[2]

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[1] Tovey speaks of Helmholtz's discovery of the nature of timbre; cf. quotation p.312 infra. Some clarification might be gained if acoustics were recognised to be the 'science of timbre' and not defined as concerned with 'the properties, production, and transmission of sounds'; cf. The Oxford Companion to Music, article of 'Acoustics'.

[2] Helmholtz, op.cit., p.13.

Thus in the science of acoustics we abstract from temporal duration as we actually experience it, and concentrate upon the measurement of exactly equal intervals of time. This is a useful scientific postulate regarding temporal passage, but it cannot be taken as explanatory of the temporal content of musical experience or even of sound data of a less highly integrated type. It is a purely intellectual analytic schema for measuring data exactly by applying a set of quantitative expressions to qualitatively discriminated sensory material. Using this as a basis of interpretation, acoustic theorists describe pitch in terms of a definite number of vibrations produced in a specific time-span. Helmholtz writes:

> "Pitch depends solely on the length of time in which a single vibration is executed, or, which comes to the same thing, on the vibrational number of the tone. We are accustomed to take a second of time as the unit, and consequently mean by vibrational number the number of vibrations which the particles of a sounding body perform in one second of time. It is self-evident that we find the periodic time or vibrational period, that is the length of time which is occupied in performing a single vibration backward and forward, by dividing one second of time by the vibrational number."[1]

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[1] Helmholtz, op.cit., p.17.

Helmholtz mentions three distinguishing features of musical sounds, namely (1) their force or loudness, (2) their pitch which he describes alternatively as 'relative height', and (3) their quality. Their loudness is correlated with the amplitude of the vibrations. Quality depends upon the form of the vibrations. This determines the occurrence of upper harmonics. Helmholtz usually distinguishes between auditory, phenomenological, material and the physical data which may be correlated with it. The two, simple, non-analysable elements which are the physical and sensory elements in acoustic theory are the simple pendular vibrations, and the pure tone. Later acoustic theorists treat them merely as different aspects of one identical datum. Thus they speak, for example, of the harmonic constituents of a wave form and of sound-waves.

Helmholtz stresses the fact that he is confining his investigation to natural philosophy. He tries to avoid mixing up aesthetic problems with physical problems. It should be noted that Helmholtz warned musical theorists against hastily applying his scientific results to the art of music, but he warned them in vain. An example of the type of musical theorising to which Helmholtz' theory gives rise may be seen in William Pole's "The Philosophy of Music" which embodies the substance of a course of lectures delivered at the Royal Institution of Great Britain in 1877.[1] Dr Pole examines melody

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[1] The English and Foreign Philosophical Library, Vol.XI. Published by Trübner and Co., Ludgate Hill, 1879.

harmony and counterpoint, and, for the sake of completeness also includes some remarks on 'an element founded on the duration of the various sounds, introducing what are called time, measure, and rhythm'; and on 'another feature of interest, affecting the general design of any piece as a whole, called form."[1] He distinguishes between the physical and the aesthetic principles of musical structure, and states that 'the philosophical inquiry simply resolves itself into the question - How much is due to the one influence and how much to the other?' Dr Pole continues:

> "The inquiry, though apparently strictly theoretical, is not without a practical bearing, as it directly influences the weight and authority of the rules and forms. So far as these can be distinctly traced to physical principles, they take a more fixed and authoritative character; but so far as they are the result of aesthetical principles, being to a certain extent empirical and conventional, they are of less stability."[2]

This attitude, which places undue weight upon the authority of scientific method, is harmful in musical investigation. Its rational outcome is the psychological theory of Seashore. Music, he thinks, may be reduced to a set of scientific

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1 "The Philosophy of Music", p.11 f.
2 ibid., p.15.

hypotheses based upon the examination of the structure of its physical correlates. He does not term these vibrational frequencies but sound-waves. This gives the impression that the vibrations are auditory data, not merely hypothetical entities useful in scientific explanation. Thus the unwary tend to think that auditory data as heard exhibit wave forms, but there is no empirical justification for this.

The first paragraph of Chapter Two of Seashore's "Psychology of Music" states that the medium with which the musician works is the sound wave. But musicians would surely say that it is sounds, not physical waves, in which they are interested. Seashore himself seems to doubt the tenability of his opening remark for the paragraph ends "The musician has but one medium, the physical sound." This statement is ambiguous. The term 'physical' is difficult to define exactly in this context. Moreover, the writer ought to tell us what he means by the term 'medium'. Seashore writes:

> "Psychology proceeds systematically by analysing situations and reducing them progressively to their simplest terms. The first great step in approaching the psychology of music is to recognise that everything the singer or player conveys to the listener is conveyed through sound waves or in terms of these. This conception simplifies our approach immensely in that it frees us from confusion with unnecessary accessories,

furnishes us with a basis for classification and terminology, and paves a way for preservation of findings, measurements, and scientific explanation."[1]

Thus Seashore is prepared to accept acoustic analysis as a total analysis of musical data. Everything is to be reduced to its simplest terms then measured and compared. Seashore accepts the abstract scientific data as the measure of the actuality of auditory experience. Thus he substitutes abstract detemporalised elementary data for the 'real' material under investigation. Seashore states that sound waves have four characteristics, frequency, amplitude, duration, and form.

"Before proceeding to describe the sounds which we hear in terms of these four characteristics, it should be made clear that in reality the hearing of tones is rarely an exact copy of these physical characteristics of the sound, because hearing is seldom complete and many principles of distortion operate. We are subject to a great variety of faults and errors in hearing. These are due primarily to five sources: the physical limit of the sense organ, the physiological limitations, inaccurate or inadequate perception principles of economy in hearing, and principles of artistic hearing. These deviations from direct correspondence to the actual physical sound we call "normal illusions". It is

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[1] "The Psychology of Music" (McGraw-Hill Book Company, 1938), p.13.

significant that they are not mere errors but may serve in the interests of economy, efficiency, and the feeling of beauty in mental life. And it is particularly significant for us at this stage that all these illusions may themselves be measured in terms of these same four sttributes of the sound wave."[1]

The inference which Seashore makes is that if hearing were 'complete' its content would be identical to that of acoustic theory. Because there are known laws of illusion relating to our perception of colour and visual forms Seashore concludes:

"So, in musical hearing, we are fully justified in speaking in quantitative terms of the physical sound wave as the true description of the physical tone. But a large and very interesting part of the psychology of musical hearing consists of principles of deviation from the actual physical tone."[2]

This amounts to arguing that because an inadequate theory is accepted in the visual field, we should accept an even more inadequate analysis of auditory perception. At these very points where both theories are in conflict with the structure of the initial data we must not question the adequacy of the theoretical schema, but should construct a theory of illusion

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[1] op.cit. p.17; cf. also p.29.

to account for the discrepancies. Fully to criticise Seashore's views would necessitate a restatement in more concrete terms of the material included in our discussion of the Method of Extensive Abstraction. Seashore's theory is based on a type of representationalism. He believes in the absolute validity of scientific explanations stated in mathematical terms. This abstract material is taken as the standard by comparison with which all phenomena are to be judged. Thus Seashore discusses 'Normal Illusions of Pitch' and 'Normal Illusions of Time'.

> "An illusion is said to be normal when all persons under similar circumstances tend to get the same result. It is called illusion because the perception does not correspond to the physical object to which it refers. The illusory perception is always positive; that is, it represents a genuine perception and may be just as strong and clear as the perception in which no illusions are involved."[1]

Thus the illusion is generated by interpreting the heard data in terms of their physical correlates. Seashore assumes that the auditory data have deviated from the norm when they do not fit the scientific schema, instead of realising that the mathematical, scientific data are only approximate

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[1] op.cit., p.63. (Underlining not in text).

quantitative measurements of one particular aspect of the sound data. The exact measurement is limited because it refers only to an abstraction. The deviation between the sensory correlate of this precise scientific concept and the initial sound data should not be called an illusion. Such a description arises from a failure to appreciate the true nature of the relationship between precise quantitative measurement and our sensory awareness of auditory material. Tovey, in discussing the kindred topic of just intonation, remarks that this subject is fatally fascinating to people whose mathematical insight has not attained to the notion of approximation. He writes:

> "In art, as in mathematics, accuracy lies in estimating the relevant degree of approximation rather than in unrolling interminable decimals. Music is no more to be heard through Helmholtz resonators than pictures are to be enjoyed through microscopes. The true musical ear will recognise the real meaning of harmonies though the practical intonation confounds them with hononyms."[1]

Such approximation, or recognition, is no more illusion than the fact that the same object may be seen as round and as elliptical when viewed from different angles. If one accepts a temporal account of auditory experience, then one may call the

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[1] "Musical Articles from Encyclopaedia Britannica", p.64.

sound-datum analagous to any pure tone sounded in isolation, illusory. Under normal conditions we never hear the scientifically accurate tone correlative to the vibration frequencies present. This is due to the influence of sounds the durations of which are partly simultaneous though not coextensive with the given sound. Seashore's theory is a kind of naive representationalism based on the assumption that since all music may be said to be conveyed to the listener by the medium of sound waves, therefore a scientific analysis of sound waves will furnish a complete account of the structure of auditory experience. It is surprising that views which imply the acceptance of philosophical principles which have long been discarded in other fields are defended and made the basis of theories of auditory perception. Helmholtz's theories suffer from an extreme form of nineteenth century elementarism. Seashore accepts this, then tries to analyse auditory experience in terms of a representative view of perception. Seashore is not alone in holding such views about music and hearing, but he is probably the best known of modern theorists. Similar statements could be found in almost any treatise on acoustics, or musical aesthetics.

MUSIC AS THE CONTENT OF HEARING.

It may be inferred from the foregoing discussion that it is useless to examine auditory perception with reference to any single sound sensum or a single series of successive sounds. Just as an examination of two-dimensional figures drawn on paper is not adequate for a study of visual perception, so an examination of single sounds and their structure cannot provide a basis for an adequate theory of auditory perception. Thus we must dismiss acoustic theory from our minds when we discuss auditory perception. As Tovey writes:

> "Helmholtz's discovery of the nature of timbre proves that certain aspects of harmony are latent in nature. Conversely, the art of harmony constantly produces effects of timbre apart from those of the particular instruments in use. But musical elements interact in ways that quickly carry musical aesthetics into regions far removed from any simple relation between harmony and timbre. What acoustics can tell us of concord and discord is not only inadequate for our musical experience, but contrary to it.....
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> The art of music had not attained to the scimplest scheme for dealing with discords before it traversed the acoustic

criterion in every direction. It became a language in which sense dictated what should be accepted in sound."[1]

What is meant by 'sense' in this context? Fundamentally it is the relationship, which is essentially a temporal relationship, between sounds. Any two or more sounds may be heard simultaneously. In every musical setting their 'sense' depends upon the relationships in which they stand to the sounds which have preceded them and will follow them. Harmony is inseparably linked to melodic and rhythmic factors.

"What is always important is the peculiar life breathed into harmony by contrapuntal organisation. Both historically and aesthetically 'counterpoint' and 'harmony' are inextricably blended; for nearly every harmonic fact is in its origin a phenomenon of counterpoint. Instrumental music develops harmony in unanalysed lumps, as painting obliterates draughtsmanship in masses of colour; but the underlying concepts of counterpoint and draughtsmanship remain."[2]

The initial data for a study of hearing must be postulated as the whole verbal or musical sentence. Even these highly organised, complex data should be considered only as minimum

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[1] "Musical Articles from the Encyclopaedia Britannica" (Oxford University Press 1944. Taken from the Fourteenth Edition 1929 of Enc. Brit.), p.45 f.

[2] ibid., p.30.

sensa. There is an important difference between our visual awareness of colour, and auditory awareness of harmonised sounds. If we put one colour on top of another then we have a new colour which is different from its two components. When we hear a musical chord the simultaneously presented sounds give us a new third sensum which is not identical to the sum of its parts. Nevertheless the parts are discriminable within the complex datum. When we consider visuo-spatial experiences we attend, therefore, to separate portions of space which we discriminate one from another by attending to their coloured surfaces. When we consider auditory experiences we should attend to what is being presented throughout a duration of time, but we should not analyse this in a spatialistic manner making of each section a discrete sensum and analysing its components.[1] We must analyse it with reference to the onward flow of its rhythmic components, treating the harmonies thus formed not as independent entities, but as passing phases in a perceptual whole. Classical counterpoint

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[1] Cf. Tovey, "Essays in Musical Analysis" (Oxford University Press 1939), Vol.VI, p.156. "In mature Wagnerian opera every theme and every figure naturally becomes a dramatic symbol of the situation and words with which it was first associated; and the fascinating and easy analysis of the resultant Leitmotiv has greatly promoted the doctrine, against which my essays constantly protest, that good music is built up from small figures, instead of consisting of larger things from which small figures can be broken off." The same is true of the analysis of auditory experience. Also his "Beethoven", p.84: "We must simply face the fact that our musical terminology is misleading and that if we begin by taking themes for ideas, we shall end by missing all musical ideas whatever" etc..

has been described as 'the conveying of a mass of harmony by means of a combination of melodies'.[1] It is to the rhythmic and melodic content of auditory data that we must attend if we would gain a true understanding of its significance as the content of human perception. As Tovey remarks. "Any musical terminology must be wrong if it assumes a map-like or space-like view of music instead of a time-like view."[2]

This statement conflicts with a recent discussion on significance in music. In Chapter Eight of "Philosophy in a New Key" Mrs Langer stresses the fact that music is an unconsummated symbol, a significant form without conventional significance. She interprets a paragraph from Wagner as stating that 'music is not self-expression, but formulation and representation of emotions, moods, mental tensions and resolutions - a "logical picture" of sentient responsive life, a source of insight, not a plea for sympathy.'[3] The structural similarity of music and subjective experience is noted, but 'what music can actually reflect is only the morphology of feeling.'[4] Such statements are useful as they clear away much pious nonsense talked by earlier writers on musical aesthetics. But Mrs Langer deals with music as if its forms are analagous to static visual patterns. She speaks

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1 "Musical Articles from the Encyclopaedia Britannica", p.30.
2 "Essays in Musical Analysis" (Oxford University Press 1935) Vol.I, p.11.
3 Oxford University Press, 1951 Edition, p.220.
4 ibid., p.238.

only of the tonal components of music and treats them as if they are the whole content of musically significant material. To concentrate upon its tonal content makes music seem exactly parallel to forms of visual symbolism. Thus it does not conflict with Mrs Langer's idea of form as something expressible in classical logical terms. Her views on musical material as a significant form of symbolism are based upon Dr Kurt Huber's investigations of the psychological effects of simple tonal patterns. Mrs Langer writes:

> "In a remarkably able and careful work, Dr Kurt Huber has traced the successive emergence of expressive factors in the apprehension of the simplest possible tonal patterns - bare pitch-patterns of two or three tones, stripped of all contextual elements of timbre, rhythm, volume, etc., by their uniform production on an electrical instrument, in timed succession and equal strength."[1]

The results of this experiment are summarised under ten headings.

1) The lowest stage of apprehension yields only tone-colour.

2) Meanings conveyed by tonal brightness always involve change i.e. imagination of an event does not occur without an impression of tonal movement.

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[1] op.cit., p.229.

3) The most primitive factor in the perception of tonal movement is a sense of its direction.

4) The apprehension of a width of tonal intervals is independent of this sense of direction; and "all spatial symbolism in the interpretation of motives has its roots in this impression of inter-tonal distance."

5) The idea of a musical step requires a joint perception of tonal distance and direction. "We are not saying too much if we make all the higher psychical interpretation directly dependent on the grasping of interval-forms, or at least view them as mediately related to these."

6) Impressions of consonance, dissonance and relatedness require the notion of musical step, or progression (simultaneous tones were not given; the inquiry rested upon melodic elements).

7) Tones taken as related may be referred to a tonic, either chosen or 'understood'.

8) Reference to a tonic determines the feeling of modality.

9) A subject accent may fall upon the tone which is harmonically more important as the hearer has organised the interval.

10) Subjective rhythmatization, when it occurs, is built upon mental accentuation.

Mrs Langer notes that Huber distinguishes between purely temporal measure, and 'musical rhythm', which latter results

from the internal tonal organisation of the motif. He ought, therefore, to be aware of the danger of generalising from his subjects' reactions to 'bare pitch patterns' to the effect of tonal components in musical experiences. In a footnote Mrs Langer calls attention to the fact that Schenker describes rhythm as a function of tonal motion, not of time division, and that such motion depends as much on melodic and harmonic tension and direction as on tempo.[1]

All these writers evidently regard the tonal content of sounds as of prime significance. They make rhythmic organisation a kind of epiphenomenon which is of secondary importance. What is outstanding about the results listed above is their visualistic bias, and the fact that, despite this, each characteristic depends upon temporal organisation. Huber states that tonal brightness is not significant unless we apprehend some tonal movement. This gives us an idea of direction, but we also have an apprehension of a width of tonal intervals. We may note his use of inter-sensory relata. The implicit assumption is that since we can describe the data in spatialistic terms, therefore its temporal components are inessential.

Every factor mentioned, except our apprehension of tone-colour, involves temporal organisation. It is only because

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[1] op.cit., note p.231.

the material of the investigation is presented in the form of discrete individual sensa, that tone colour is associated with single tones. In normal conditions it results from the merging of various sounds, and is related to key rather than to individual sounds. Tovey thinks that the tone-colours associated with individual keys are merely subjective phenomena. He writes:

> "Notions about the characters of keys in themselves are entirely subjective, and no agreement about them is to be expected, though doubtless their psychological statistics might be as interesting as those of 'number-forms'. But I doubt this: there happens to be another basis for these ideas of key-colour, which rather knocks the bottom out of their psychological interest.
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> What is not subjective at all is the effect of one key as approached from another. etc.."[1]

Tovey goes on to discuss the <u>functions</u> of key-relations. He states that the dominant as the penultimate chord in every full close is the centre of activity and forward movement in tonality. The most natural way to establish a new key is to get on to its dominant and stay there long enough to rouse the expectation of a close into the new tonic. Tovey regards the

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[1] "Essays and Lectures on Music" (Oxford University Press 1949), p.136.

distinction between ON the dominant and IN the dominant as being one of the most important distinctions in all music. "But the all-pervading, constant element in musical design is time."[1]

The tonal contents of music are in themselves merely its raw material. No significance attaches to them in themselves. Their significance arises from the manner in which they are related, and that depends essentially upon the temporal organisation of the whole. Thus Mrs Langer is right in stressing the structural similarity between music and sibjective experience. She errs in thinking that the significant elements in musical structure are its tonal, as opposed to its rhythmic contents. There is a fundamental metaphysical reason for her neglect of the temporal factor. Although her theory of symbolism is in many ways independent of the classical views about perception and knowing, she still retains a subject-object dualism and is therefore obliged to analyse the contents of experience on a static visuo-spatial model.

What, the reader may wonder, has the discussion of musical form and content to do with the structure of hearing? Music appeals directly only to one sensory faculty, namely hearing. It therefore seems reasonable to suppose that the manner in which musical forms have developed will be correlated with the manner in which the human percipient finds it most natural to

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[1] "Essays in Musical Analysis" Vol.II,p.4 (Oxford University Press).

synthesise sound data. Early artists did not realise that we do not see everything on one plane. As man's powers of reflection and self-criticism increased, he gradually evolved a means of representing three-dimensional space upon a two-dimensional surface by attending to the 'laws of perspective'. These correctly describe the ways in which shapes, sizes, and relationships of lines must appear on a plane projection. They are based originally upon generalisations from the visual experience which we have of environmental objects and flat surfaces. If our eyes were structured differently, then we should not behold the world as we do. Classical perspective is based upon Euclidean geometry which refers only to two-dimensional visuo-spatial awareness. Geometers over-intellectualise the abstract data which they study in much the same way as musical theorists over-stress the systematic relationships which they discover in abstract pitch phenomena. In both visual and auditory sensory experience the structure exhibited is not so precise as the intellectual analysis of the sensory content would have us suppose. Thus artists interpreting three-dimensional experiences on a two-dimensional canvas are guided partly by the 'laws of perspective' and partly by the phenomenal appearance of the objective data which they are representing.[1] Modern representational art often exhibits a

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[1] Cf. Thouless, "Phenomenal Regression of the Real Object", Section VIII. British Journal of Psychology Vol.XXII Part I, July 1931, p.27 ff.

more or less complete independence of the Euclidean notions of perspective and refers only to the phenomenal object. Thus representational art appears to exhibit a development which has been guided principally by what is normal for visual perception.

There are grounds for believing that similarly the development of musical form is dictated by what is normal in auditory perceptual experience. As Tovey reminds us:

> "Art-forms themselves do not exist in the abstract, however habitual they may have become to those who use them. They are the forms which normally arise from the artist's proper use of his materials."[1]

In an article on harmony the same writer declares:

> "The great classical tradition cares little for the study of chords as things in themselves; and the art of harmony perishes under a discipline that separates its details from counterpoint and its larger issues from form."[2]

This would suggest that the time-scale of auditory data is their most important attribute. To think of sounds as 'blocks' is quite a modern notion. Primitive music depends wholly upon melodic and rhythmic factors for its effect. Greek music has no harmonic content. Sounds appear only in succession and

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[1] "Essays and Lectures on Music", p.193.
[2] "Musical Articles from the Encyclopaedia Britannica", p.61.

not in combination. It seems probable that the rhythms of Greek music are closely allied to speech rhythms, unlike our modern idea of rhythm which is essentially based upon body rhythms. Genuine folk-song often exhibits the same independence of harmonic and exact metrical organisation. The substitution of instruments for voices in producing music may have had some effect on the change in the rhythmic structure of musical material.

Medieval musicians advance from doubling parts in fourths and fifths to a system of polyphony that demands complete independence in its melodic parts. Polyphony is based upon notions of scale and key which far surpass the data afforded by acoustics theory. The early forms of musical writings are all of a contrapuntal nature. They appear to arise out of the elementary fact that in listening to music we grasp as an auditory unity a whole 'melody-gestalt' which can be recognised in very various circumstances. Consider, for example, the rondel and canon. The first consists of a combination of short melodies in several voices, each melody being sung by each voice in turn. If auditory perception consists in an instantaneous awareness of what is being presented now, and not of an awareness of a pattern which extends over a temporal span, how can we explain the interest and charm of the rondel? One would have to study a written score to find out its formal

structure. Possibly in successive hearings memory of the various parts might be built up, but this does not explain our immediate recognition of and delight in canonic forms. Mere repetition cannot produce a form of apprehension which is not inherently present from the first, although the listener's attention may be consciously directed to other aspects of the experience. The fact that rounds and canons are the primitive forms of musical construction and not late developments is surely significant for the auditory theorist.

In a canon in the unison one voice begins alone. When it begins a second melody, a second voice enters with the first, and so on. Such a procedure gives a curious feeling of stability to the design of the work as a whole, even when the harmonies produced by the coming together of the various voices are very 'rough'. This stability arises from the fact that the rate of successivity of the auditory units does not vary. Also the duration of each melody as it appears in various voices does not alter. Hence the temporal 'depth' of the experience remains stable. This gives the feeling of a completely balanced and regular whole. When in a fugue, melodies change their position in relation to the different voices, (multiple counterpoint), the ear has little difficulty in recognising them although they may be transposed into a new key. Moréover a melody may be completely inverted in the

imitating part. Every interval of the leader is then reversed, the second part ascending where the leader descends and vice versa. In many melodies the inversion is as natural as the original form, and does not strikingly alter the character of the melody as a whole, e.g. the theme of Bach's "Art of Fugue". This device produces harmonic variety and a sense of melodic identity in difference.

If it were the interval structure of the pitch content of musical works which carries the essential meaning-content, as many theorists suggest, such a device as inversion could not be self-explanatory to the ear. The change in the acoustic material used for the presentation of a melody is trivial in comparison with the fact that the melody is recognisable as an auditory unit which has been presented in other circumstances in which it was expressive of a different mood or effect. Tovey writes:

> "The resources of canon, when emancipated from the principles of the round, are considerable when the canonic form is strictly maintained, and are inexhaustible when it is treated freely. A canon need not be in unison; and when it is in some other interval the imitating voice alters the expression of the melody by transferring it to another part of the scale. Again, the imitating voice may follow the leader at any distance of time; and thus we have obviously

a definite means of expression in the difference of closeness with which various canonic parts may enter; as, for instance, in the stretto of a fugue. Again, if the answering part enters on an unaccented beat where the leader began on the accent (per arsin et thesin), there will be artistic value in the resulting differences of rhythmic expression. All these devices ought to be quite definite in their effect upon the ear, and their expressive power is undoubtedly due to their special canonic nature."[1]

This illustrates that the earliest developments of harmonic music arise from the combination of independent melodic 'lines' simultaneously presented. Harmonic texture is the result of a development in the complexity of melodic and rhythmic elements. This development depends upon the fact that we can hear more than one melody forming their individual patterns at a time, i.e. it depends upon our awareness of 'temporal depth'. At first not more than two independent melodies are presented, but the fact that two moving parts can be heard as distinct should warn us against a too facile acceptance of the idea that the interval relation between notes, and the tonal-colour of the resultant sound when two notes are presented simultaneously, is the main element in auditory organisation. As Tovey remarks:

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[1] "Musical Articles from the Encyclopaedia Britannica", p.22.

"The abstraction of harmony from counterpoint cuts music adrift from its foundation and leads to no better results than the abstraction of sound from sense."[1]

Eighteenth century musicians evince a distaste for pure polyphony together with an impulse towards the expression of dramatic effect in musical sound patterns. This leads to an increase in the durational significance of the harmonic changes in music, and of the time-scale within which musical developments take place. Temporal organisation becomes more, not less important, as musical forms develop. The richer harmonic content grows out of a widening of the time-scope of musical thought, not from its diminution.

Tovey describes the change from pure polyphonic writing to that which aims at dramatic effect as being equivalent to Kant's 'Copernican revolution'. The importance of time and the lengthening of the temporal dimension of musical units may be illustrated by quoting from his writings:

"Music, which in Palestrina's age was 'a linked sweetness long drawn out', with the links extending only from one accent to the next, had by the beginning of the eighteenth century trained the mind to measure harmonic relations over melodic periods of eight or more bars; and the mighty polyphony of Bach and Handel broke down the melodic regularity,

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[1] "Musical Articles from the Encyclopaedia Britannica", p.44.

but did not greatly enlarge the range over which the listener must depend on his memory."[1]

"Musical history may be traced in terms of the time-limit over which the listener's memory is brought into play. In the sixteenth century that limit is from accent to accent; by the end of the seventeenth century it ran from phrase to phrase. The great architectural forms of Bach could stretch it easily to six minutes, and in extreme cases to ten. The rise of the dramatic sonata style did not greatly enlarge the time-scale; for there are few well-constructed sonata movements that exceed a quarter of an hour, though on no smaller scale could Beethoven have prepared the famous harmonic collision that gave such offence in the first movement of the 'Eroica' Symphony. Now this ten-minute time-scale obviously compelled musicians to handle the action of an opera by means of convention. It is less obvious that it also produced a similarly conventional artifice in the relation of sonata forms to their emotional content. A design may complete itself in ten minutes while raising enotional issues that cannot be dealt with in less than forty. And so the sonata forms are grouped in from two to four (rarely more) movements as artificially as the musical sections of classical operas.

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[1] "Musical Articles from the Encyclopaedia Britannica", p.59.

> Wagner's enormous achievement in music-drama consisted essentially in giving music the same time-scale as that of the drama. As with all first solutions of an art-problem he achieved an extreme case, for his drama became cosmically slow."[1]

What can we imply concerning the phenomenology of hearing from this discussion of musical form? Firstly, we may infer that the fundamental mode of organisation of auditory data is temporal. We could not train our musical memory to extend to periods of a quarter of an hour or longer in the absence of some inherent urge towards a temporal synthesis in our initial apprehension of the material. If sounds were presented to us as discrete unitary entities which we perceive successively, we could not retain the impression of long sequences of them. To assert that this is possible on account of our ability to memorise is like asserting that a blind man can construct a visual image of the outline-form of an object which he apprehends tactually. Memory will not suffice to explain how we both synthesise, and retain a vivid apprehension of a succession of sounds if these are presented as discrete instantaneous percepts. Compare, for example, our difficulty in remembering the shapes, colours, and order of presentation, of a number of

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[1] "Musical Articles from the Encyclopaedia Britannica", p.129 f.

successively presented individual objects, or of remembering nonsense syllables or numbers unless we can organise them rhythmically.[1]

Secondly, it is plain that a one-dimensional analysis of time is quite inadequate for the discussion and analysis of the temporal factors in auditory experience.

Thirdly, it may be noted that the discussion of musical forms in terms of their temporal dimensions inevitably includes some reference to the emotional significance of the work. This is in accordance with the common-sense view that hearing is more closely connected with subjective and emotional factors than the other forms of sensory awareness. It is only in terms of a temporal analysis that the relationship between hearing, sound, and emotional experience can be explained.

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[1] Cf. McGeoch, J.A. "Psychology of Human Learning" (Longmans Green, 1942), p.163 ff.

THE RHYTHMICAL CONTENT OF AUDITORY DATA.

Pitch factors, as such, and their organisation are the material from which the significant patterns of meaningful auditory symbols are fashioned. At present, however, we shall confine our inquiry to the study of rhythm in abstraction from its sound content, since rhythm is an essential formative element in significant sound structures. This is true of our production and reception of verbal language as well as of music.

Two different kinds of rhythm can be distinguished. These are found to be incompatible in many forms of experience, but are held in equipoise in some forms of music. They are called body-rhythm and speech-rhythm respectively, and have in the past been defined as the rhythmic correlates of the mind-body dichotomy, body-rhythms being associated with physical movement and the functioning of the bodily organs, while speech-rhythms are associated with the expression of thought by linguistic or other means. In the present context the term body-rhythm will refer to any rhythm which is the outcome of a cumulative process. Its components may be physical, emotional, or psychical. Speech-rhythms are directly controlled by a single

conscious process and aim at a clarification or transference of meaning. They can only be apprehended and measured in contrast to the pervasive rhythm of the person who produces them or the person who hears them. The significance of speech rhythms arises principally from the tension which they evoke between the dominant pattern of their background and their own temporal organisation.

The distinction between body-rhythms and speech-rhythms makes possible a fuller explanation of the content of the 'percipient event' as it applies to auditory experiences. Whitehead defines the 'observational present' as a duration defined with reference to our immediate awareness of a datum or event presented to us as an individualised entity. He then defines 'percipient event' as the 'locus standi' of mind in nature.[1] This relates directly only to visual experience. The auditory 'percipient event' must be defined in relation to pitch, i.e. with reference to 'harmonic extension',[2] but we cannot discriminate harmonic relations without also being aware of the rhythmic organisation of the auditory data. Thus in a full description of the 'percipient event' as it applies to hearing, pitch is the sensory content and body rhythm defines a definite state of the percipient which affects the manner in which he apprehends the sensory data. For example, two percipients

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1 Cf. p.225 f.supra.
2 P. 257 supra.

hearing the same musical phrases may apprehend the tempo as fairly fast and as leisurely, in contrast to their dominant body rhythms. Thus we might say that, with reference to auditory experience, the 'observational present' defines the temporal location, and the 'percipient event' defines the tempo and pitch characteristics of the data. These can only be separated by an act of abstraction. The temporal attributes are just as important as the pitch content in any auditory material which is significant.

The difference between Whitehead's two perceptual modes, presentational immediacy and causal efficacy, which he states with reference to visual experience,[1] appear to be very similar to the difference between speech rhythm and body rhythm. Speech rhythm depends principally upon pitch-structure and the 'dimension' of successivity. It illustrates a cross-section of the immediate experience of the speaker. It arises, like the mode of presentational immediacy, in the later originative, integrative phases of experience which depend upon cognitive awareness. Whitehead states that we are subject to our percepta in the mode of causal efficacy, but we adjust our percepta in the mode of presentational immediacy. He adds:

"But, in fact, our process of self-construction for the achievement of unified experience produces a new product,

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1 "Process and Reality" pp.236-259, and chapter VIII, and "Symbolism" passim.

in which percepta in one mode, and percepta in the other mode, are synthesised into one subjective feeling."[1]

This synthesis cannot be adequately described in spatial geometrical terms, for it is really a temporal phenomenon. We can adjust speech rhythms and synthesise them with body rhythms because the pitch factors out of which they are constructed are independent relata which are purely sensory. They do not directly affect our organic synthesis of environmental factors, but have a definite structural unity of their own.

Speech rhythms are more superficial than body rhythms but for the exact transference of meaning they are very important both for speaker and hearer. They are really an abstract form of rhythmic organisation, broken off from the cumulative rhythm natural to the subject by a process of holding as inoperative those parts of the total temporal organisation which do not directly strengthen the subject's positive reaction to that which he wishes to convey. This explains why a speaker who is emotionally disturbed makes less impression on his audience than a speaker whose feelings are under control. Wordsworth's definition of poetry as 'emotion recollected in tranquility' conveys the same idea. Speech rhythms must be organised in accordance with the structure of the pitch material

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1 "Process and Reality", p.252.

used to convey meaning, and the exact intention, or 'subjective aim' of the speaker. Speech rhythms may be exactly reproduced in music. Tovey writing of Palestrina states:

> "His rhythms differed from speech rhythms hardly more than the rhythms of quantitative verse. The rhythms of later music correspond to those of vigorous bodily exercises, and conversation is not more difficult to reconcile with the control of the paces of a horse. Dance rhythms and speech rhythms are at opposite poles of the musical sphere."[1]

How are we to account for these two types of rhythm? If we analyse auditory data in terms of three temporal and one scalar pitch 'dimention' we may indicate the difference by stating that the characteristic patterns of speech rhythm relate to successivity and pitch, whereas body rhythms are dominated by the durational content of experience and its temporal depth.

The differences between these two kinds of rhythmic experiences are best discussed in relation to the problem of the distinction between sounds which we make ourselves and sounds which we merely hear. This distinction is sometimes referred to in terms of subjective and objective sounds but this terminology is misleading in relation to auditory data,

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[1] "Essays and Lectures on Music", p.190.

because of its spatial associations. We tend to think of subjective experiences as being confined to happenings taking place within a spatial location defined by the percipient's body, although no person is aware of a sharp demarcation between himself and his environment. Such a distinction is the result of defining perception in visuo-spatial terms. Auditory data are often produced from musical instruments which are spatially discrete environmental objects. Such sounds cannot be classed as either subjective or objective in relation to the performer. The distinction between sounds which we both make and hear, and sounds which we merely hear, should be stated in terms of the presence or absence of physical effort. There may be a phenomenological difference between them owing to the presence of bone conduction as well as air conduction in the sounds which we ourselves produce, but the difference is principally one of rhythmic organisation. It therefore raises problems concerning the relationship in which auditory phenomena stand to other aspects of our total experience, and the possibility of isolating auditory material as a perceptual paradigm without distorting it. This brings us back to our original topic of body and speech rhythms.

In all sentient life a constant rhythmic balance is maintained by means of which various forms of experience are internally organised and are integrated one with another. We do

not experience a uniform succession of physical, emotional, and mental events. We experience a constantly changing intensity of feelings. These manifest considerable variation in their tensions and releases. Thus it is not so much the particular quality of an experience, as the manner in which it is related to our experience as a whole, which is of importance.

The strength of a body-rhythm arises from the fact that it is the result of an integration of the great variety of rhythms which are co-present in any portion of our sentient experience. If one takes a heterogeneous assortment of short, sharply defined rhythmic phrases and produces them repetitively throughout a duration of time, a listener will apprehend a dominant rhythmic pattern. This dominant pattern is composed of a complex mass of rhythmic elements, but it is felt to exhibit a certain easily recognisable pattern and a definite pace.[1] The momentum of such a rhythmic whole is so strong that any new rhythmic patterns either disintegrate or accommodate their pace to it. The pervasiveness of a strong body-rhythm when it has become established may be illustrated on a lesser scale with reference to tempo in music. Tovey writes:

"The sense of tempo is a larger aspect of the body-rhythm, and in classical music it is very steady. A fundamental law

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[1] Recent research suggests that such an organisation is the origin of the complex rhythms of African drum music.

of all musical rhythm is that a hurrying or slackening of tempo has no power to alter the rhythmic organisation. If your phrase is too short a ritardando will not make it aesthetically any longer; nor will an accelerando get rid of a redundant bar."[1]

The fundamental rhythmic pattern of a complex body rhythm cannot be suddenly changed. The rhythmic continuity of the whole allows a gradual variation of pace, but not of the essential internal structure,[2] for body rhythm is probably the most comprehensive example of 'temporal depth' known to us. Similarly the structure of durational spans is important in temporal organisation. Such durational spans do not necessarily occupy an identical span of mechanically measured time.

On page 220 the significance of an experience was said to be positively correlated to the extent of the temporal depth which it exhibits. Significance is here being used with reference to what is essential in experience. There is another meaning of significance which refers to the use of symbols. A factor is said to be significant if it is a good symbol, i.e. lends itself to manipulation by means of which slight differences of meaning may be expressed. Such a 'significant' factor is usually quite trivial apart from its context. 'Temporal depth'

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1 "Musical Articles from the Encyclopaedia Britannica", p.179.

2 cf. op.cit., p.175.

is significant in the former sense, for it is an integrative element in all experience. Auditory percepts, for example, are always apprehended against a back-ground of body rhythms for which temporal depth is a 'sine qua non'. Pitch is significant in the second sense.

The internal organisation of speech rhythms depends upon pitch which is an inessential factor in our bodily orientation to the environment. Thus speech rhythms may be counted from accent to accent and may be contrasted to the dominant body rhythm of the speaker, and also of the hearer. To use verbal language expressively, however, phrasing and pitch-pattern, i.e. the cadences of speech, must be controlled. These factors are regulated by some form of mechanical control which must be integrated with the dominant body rhythm of the speaker. Thus when we hear sounds which we have made, we have some fore-knowledge of their structure. Speaking is a rhythmic action, and as such becomes fused with other forms of bodily activity and their dominant rhythmic organisation. Sounds which reach a percipient from an external source have a certain novelty not present in sounds which he himself produces. They have to be synthesised with his dominant body rhythm and may set up a certain degree of tension between the fundamental durational 'flow' of his experience and their own sharply accented rhythmic content.

This account of the manner in which we differentiate between sounds which we make ourselves and sounds which we only hear serves as a basis for explaining why we do not attend to all the sounds in our environment. Single isolated sounds do not attract our attention because they lack complex rhythmic organisation and do not set up a contrast with other durational factors in experience. Loud sounds attract our attention but tend to be instantly forgotten.

It is usual to associate hearing with subjective feelings and emotional reactions. It is because of the importance of rhythmic factors for all sentient experience that sounds have a direct emotional effect. P.E. Vernon writes:

> "The indefinite listener (either the baby who is responding to speech, or the musically untrained adult) does not first perceive sounds as something objective in the external world, and then proceed to translate them into organic senations, emotions, or visual images. His field of consciousness is mainly absorbed with entirely irrelevant thoughts, or with those physiological and subjective processes which are excited in him immediately and involuntarily."[1]

It is strange that this writer overlooks the importance of the rhythmic organisation of auditory data and analyses it

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[1] "Auditory Perception.I. The Gestalt Approach", Pritish Journal of Psychology, Vol.XV, Part 2, October 1934.

in terms of its melodic and harmonic structure. He treats music as analagous to a two-dimensional visual percept. This approach is inevitably unsatisfactory, and he would now appear to have abandoned it.

The variation in the proportion of phrases and the complex patterns which result from the simultaneous presentation of two or more rhythms embodies the basic pattern of musical structure[1]. When it is associated with pitch differences this dynamic rhythmic structure does not produce a mere body-rhythm but becomes a symbolic form suitable for the expression of feeling. Thus many of Bach's contrapuntal works set up a very strong body-rhythm while at the same time they express with the utmost subtlety changes in the dynamic organisation of mood and feeling. If we abstract any single melody it may exhibit in isolation a typical speech rhythm, because in speech rhythms duration and temporal depth are recessive factors. In the case of body rhythms these two temporal 'dimensions' predominate and the static scalar dimension may merge with the emotional tone of the experience as a whole. This emotional content may be affected by the pitch characteristics of environmental sounds, but it is more immediately dominated by temporal factors. P.E. Vernon writes:

"It is hardly rash to suppose that much of the appeal of modern dance music consists in the euphonic effects of its

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[1] Cf. Tovey "Essays on Musical Analysis" Vol.II, p.4 ff. & p.137.

rhythm and tone-colour, since it is seldom attended to per se. Except among those who, disapproving of it, inhibit it, it seems to stimulate all the muscles of the body, to produce emphatically that well-known 'itching of the feet' and so genially to exercise the whole organism without the violent and overt movements which were characteristic of the older types of dance. The present popularity of Bach may well be due to the same process."[1]

Our reaction to rhythm is quite spontaneous. Often it is largely unconscious and may be purely organic. Modern jazz music has been aptly described as "that which goes in at the ears and passes to the feet, without going through the brain". The rhythm of jazz music is a recrudescence of the repetitive beats which invariably become dominant in a body rhythm. Such a definite repetitive rhythm is the necessary foundation for syncopation which depends for its effectiveness upon opposition and contrast. Jazz rhythms by-pass the brain because they lack variation and meaningful structural contrast. They tend to lapse into being a monotonous pulsation marking a mechanical beat. As Tovey remarks:

"Ordinary jazz music distributes its rhythmic surprises over the most imperturbable eight-bar ambling trot that ever

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1 "The Phenomena of Attention and Visualisation in the Psychology of Musical Appreciation". British Journal of Psychology, Vol.XXI, 1930, p.52.

lulled the rhythmic sense to sleep. Most drugs that begin with a stimulating effect end as narcotics."[1]

It is evident that what principally differentiates speech rhythms from body rhythms is the fact that the pitch components of sounds can express, by very subtle nuances in their organisation, extremely small difference of meaning and shades of expression, whereas body-rhythms accumulate a ponderous momentum whereby their internal rhythmic structure tends to perseverate. There has been a tendency to consider rhythm in relation only to bodily movements and to analyse music and speech in terms of timbre, pitch, and intensity, disregarding the symbolic importance of rhythmic organisation. Since the pitch characteristics of sounds appear to be more directly associated with our cognitive awareness than with purely physical or emotional reactions, it is understandable why significant sounds have come to be analysed only in terms of pitch.[2] But this is merely an example of over-intellectualisation in our theoretical approach to auditory sensory data.

In this connection it is significant that a child's acquisition of speech appears to originate in mere rhythmic babbling. This is followed by a discrimination of "tune".

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1 "Musical Articles from the Encyclopaedia Britannica", p.141.

2 Cf. p.316.

At first the "tune" as well as the loudness and shrillness of the voice tend to be exaggerated. Only vowel sounds are used in conjunction with "tune" to express meaning. Acoustic discrimination, which depends upon a precise apprehension of small variations in pitch patterns, makes the articulation of words possible, only after these preliminary stages have been gone through.[1] Conversely, in acquired deafness, the cadences of speech deteriorate, while its rhythmic patterns remain. This would suggest that the most primitive form of auditory perception is an awareness of temporal organisation.

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[1] See Sheridan, M.D. "The Child's Hearing for Speech" (Methuen 1948).

THE PITCH CONTENT OF AUDITORY PERCEPTION.

When we analyse visuo-spatial experience we start by considering the position of objects with reference to the three dimensions of space. We do not explicitly mention either the sensory content of the experience or its temporal organisation. This purely spatial analysis gives us an approximate description of the structure of the contents of our visual awareness. We complete the absolute theory of space by associating these three dimensions with a highly schematised account of the structure of time as we experience it, which describes time as a one-dimensional, purely successive series. Such an analysis of time was formulated not as a result of an empirical study of temporal relations, but to lend coherence to the Newtonian conception of space.

In the study of auditory perception the three temporal 'dimensions' which we have called successivity, duration, and temporal depth, are equivalent to the three spatial dimensions in the analysis of the spatio-temporal continuum. There is also a static, scalar dimension composed of the pitch-differences between sounds. A perfectly coherent, logical account can be given of the manner in which the pitch factors inherent in sounds are related. Such an analysis of pitch does not resemble the manner in which pitch-factors enter empirically into

auditory experience, any more than the scientific account of time resembles our actual experience of temporality. This logical analysis of pitch serves a useful function. It affords us a means of indicating with precision any particular component in a complex auditory experience. The one-dimensional analysis of time as pure successivity has a similar function in spatio-temporal theory.

We ignore the absolute theory of time if we wish to account for temporality as we actually experience it. Since we cannot refer to time without naming some happening in time, we take as its content some sensory material which can be regarded as a one-dimensional extensive series. In examining temporality in relation to auditory experience, pitch-differences form a suitable content for this non-temporal 'dimension'.

Time and space are not separable factors in our awareness of the spatio-temporal continuum. To treat them in isolation involves abstraction. If we take spatio-temporal experience as the field of reference for our investigation of time, then a linear measurement of space would form the content of the fourth dimension. Since we all tend, unreflectively to accept the classical Newtonian view of space, which does not admit the importance of temporal factors in the organisation of spatial data, such a procedure would raise many pseudo-problems.

Time is not a less important factor in our experience than space, as might be inferred from the fact that we normally describe the spatio-temporal continuum as being composed of three spatial and only one temporal dimension. The fact that theorists over-stress the importance of visual perception in our experience as a whole is the source of this erroneous notion. Space separates a percipient from his percepts, and divides one percept from another. Thus it is disjunctive and analytic. Temporal relations, on the other hand, are a synthetic, integrative factor in experience. Space can be more easily analysed because of this difference, but it is not therefore the more important factor.

The sounds which are the sensory content of auditory perception are necessarily related both temporally and harmonically, for rhythm and pitch-differences cannot be separated except by an act of abstraction. Silence is related to pitch, just as darkness is related to colour, as a direct contrast which is equally important to the organisation of the sensory content and to the formal relations exhibited by the perceived material. In studying auditory phenomena theorists tend, however, to regard silence as important for rhythm but as unrelated to the pitch-content of the experience. Such a view is superficial.

The rhythmic organisation of sound data is much more complex than is usually assumed. Rhythm, moreover, is a very important factor in our apprehension of significant sound sensa. Sounds could not function as a symbolic medium, and as a means of inter-personal communication, if they were presented at exactly equal intervals of time, and in no other manner. Some idea of the complexity of rhythm can be gained by analysing it in relation to the three temporal dimensions, - successivity, duration, and temporal depth. Such an analysis, however, depends upon treating rhythm in abstraction from other relevant factors in our total experience.

When we wish to analyse the temporal factors in experience it is necessary to construct a schema in which the structure of the sensory content of the experience is represented by a one-dimensional series, just as in the analysis of the visuo-spatial continuum time was represented by pure successivity. We accept the high-low pitch scale as the content of this fourth dimension in analysing auditory experience. Such an account of pitch relations does not describe our actual awareness of pitch phenomena in auditory experience. It is a schematic representation of one factor in pitch relations, just as the scientific analysis of time is a schematic representation of one factor in temporal relations.

When we accept pitch as the content of the fourth dimension in the analysis of auditory experience, we attend only to the interval relation between variations in pitch sounds. We ignore the intensity and tonal quality of the pitch sounds, and concentrate upon naming the relationships which exist between sounds of different pitch, according to the positions which they occupy in some predetermined musical scale. The names which we give to these relations are purely functional in character. Actual pitch sounds are the values which can be given to these functional terms.

This account of the structure of the pitch series serves a useful purpose in giving us a precise method for indicating any particular component within a complex auditory experience. It is a purely intellectual, logical device whereby we are enabled to name the relation in which one pitch sound stands to another. It is not a description of the structure of auditory percepts as they are empirically apprehended.[1] To attempt to describe the whole content of auditory perception by referring only to these functional terms descriptive of pitch relations,

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[1] Cf. Tovey, "Essays and Lectures on Music", p.134 f., or "Essays in Musical Analysis", Vol.I,p.4 ff. It is interesting to compare his account of the method of symbolising musical pitch relations with Whitehead's account of the principles of algebraic symbolism, in "Remarks", Philosophical Review, Vol. XLVI, no.2, p.183.

is like attempting to analyse the structure of the content of visuo-spatial experience by referring only to our one dimensional analysis of time as a pure successivity.

A more adequate analysis of the pitch content of auditory perception could be given in terms of three 'dimensions' relating to the non-rhythmic content of sounds. The content of these 'dimensions' would probably represent intensity and the two aspects of tone quality which psychologists call timbre and sonance. The fourth dimension might be represented either by the scale of pitch differences which is used in analysing the rhythmic structure of auditory experience, or by the temporal 'dimension' of pure successivity. The former is possibly the more suitable content from a practical point of view. The use of temporal material might introduce complexities similar to those introduced into temporal analysis by using some form of spatial discrimination as the content of the fourth dimension.

To analyse the pitch content of sounds is much more difficult than to analyse their rhythmic structure. This is because pitch, like colour, is peculiar to one sensory modality, whereas rhythm is manifested in a great number of different forms of experience. The task of examining the pitch content of sounds is the main problem of acoustics. This investigation has been greatly hindered by the erroneous assumption that sounds can be analysed with reference to spatial concepts.

Only after theorists have freed themselves from a naïve representationalism in the interpretation of the data of acoustic schemae will an adequate theory of the pitch structure of sounds be formulated.

There are considerable terminological difficulties which face the investigator of the pitch content of auditory experience. Thus it is impossible to attempt any such investigation in the present study of auditory perception. It is obvious that the importance of this aspect of sound sensa has been understated. There appears, however, to be an even greater need to stress the significance of temporal factors for auditory perception, since these have been completely overlooked in accounts of auditory phenomena which treat sounds as being spatially organised.

One reason why the pitch content of sounds is so difficult to analyse is that the ear discriminates very slight variations in pitch, tone quality, and intensity. As a discriminating sensory organ the ear is very much more acute than the eye. Thus we must distinguish theoretically, very minute differences in the phenomenal structure of the data. Moreover, we have no definite physiological clues to guide us as to what we should adopt as the content of our abstract schema in terms of which to describe the pitch content of sounds.

When we analyse any form of experience whatever we must

adopt some specific stand-point. Certain aspects of the data under investigation will appear more important than others as the result of the point of view which we adopt. We may concentrate upon the sensory content of an experience, or upon its formal structure, or upon its temporal organisation. These various aspects are not separable in fact. To gain clarity in exposition, however, we must confine our attention to one dominant mode of integration exhibited by the material, and view the whole experience from this selected stand-point.

It is usual to define events which are directly related to the spatio-temporal continuum in relation to a spatial perspective, because this gives us an analysis which is very convenient for many practical purposes. Nevertheless it is possible to view the same data from a temporal stand-point. The important advances in modern scientific research appear to be the result of changing from a purely spatial to a temporal analysis of physical phenomena. The seeming complexities of the theories thus produced is balanced by the depth of insight obtained.

The time dimension is of fundamental importance in analysing the content of auditory perception. Thus this study of auditory perception deals mainly with the phenomenal content of the experience from a purely temporal stand-point. A similar partial analysis of the content of sound sensa could be given in terms

of its pitch perspective. Although both these analyses give a coherent account of the structure of the data as viewed from a specific stand-point, they are abstract and incomplete. The content of auditory perception in our normal perceptual experience is very much more complex, because the pitch and temporal elements inherent in the data interact. Each modifies the manner in which the other is phenomenally apprehended. This inter-action cannot be described in terms of a four-dimensional schema. In the act of producing significant speech and musical sounds, and in our interpretation of them when other persons communicate with us, we achieve a practical knowledge of how the temporal and non-temporal aspects of sound data are inter-related to produce certain specific effects. It is doubtful, however, whether we shall ever achieve an exact decription of these complex inter-relations. Certainly so long as theorists continue to analyse sounds in terms of a visuo-spatial analysis no conception of the complexity of their inherent structure will be gained.

SUMMARY AND CONCLUSION.

We may draw certain general inferences concerning the study of perceptual experience from the foregoing discussion. Firstly, it is obvious that any theory of perception which cannot account for the structure and content of auditory perception is seriously limited in its scope. In the past it has been customary to use visual experience as a perceptual paradigm. Hence theorists have confined their investigations to a study of the manner in which the content of ordinary visual awareness is related to the spatio-temporal continuum, as we describe it in geometrical and scientific terms. Such a study completely ignores the integrative character of temporal factors in experience. It is descriptive only of a certain restricted portion of our visual awareness, namely the content of perception in the central visual field. Peripheral vision, tactual perception, and hearing cannot be analysed without reference to the temporal organisation of sensory material. Certain investigators are now questioning the adequacy of a non-temporal analysis of the content of [redacted] the central visual field. It may be inferred from this study of auditory perception that the outcome of their research will

be the rejection of the non-temporal scheme of analysis. The theory which will supersede it will be more complex in appearance but should give a much greater depth of insight into the structure of the sensory content of visual awareness and of the perceptual processes involved.

The negative result of the present investigation into auditory perception is a belief that no theory of perception which ignores the form of the temporal synthesis involved in every experience can be regarded as adequate. Almost all previous theories of perception are based on a visuo-spatial analysis of the content of experience. This is true even of the few investigations which have been made of tactual perception. Theorists thus accept the spatial continuum as the important form of extension for the analysis of all types of experience. This assumption appears to be fundamentally unsound and should be abandoned.

One cannot study perception without raising many fundamental epistemological issues. Theorists who study visual perception to the exclusion of other forms of sensory awareness tend to accept without question the classical dualistic metaphysic. They treat the relation between a percipient and his percepts as a particular form of the knower-known dichotomy, and they analyse all perceptual phenomena in subject-object, subject-predicate terms. This is possible in the case of

visual perception, because its content can be analysed in geometrical spatial terms, and spatial extension is essentially disjunctive. Moreover in studying visual perception theorists concern themselves only with the experience of an isolated percipient who sees relationships between visual objects as viewed from a particular spatial position. Such an analysis of perceptual awareness makes it a one-way process which, theoretically, becomes divorced from other factors in the percipient's experience. Thus the symbolic character of visual phenomena is destroyed, and visual images become identified with the surfaces of physical objects.

In the Preface the importance of hearing as a socialising influence in human development was stressed. Sounds are the sensory media for direct inter-personal communication. To attempt to analyse sounds in terms of a subject-object dichotomy imposes a limitation upon auditory perceptual theory which cannot be accepted. If we examine the elements involved in any concrete situation in which communication takes place we discover that a minimum of three terms is necessary.[1] There must be two persons. One produces the meaningful sound stimuli. The other actively apprehends them, synthesising these new data with his subjective experience. The third element in the situation is the physical medium, which conveys

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[1] Cf. Macmurray, John "The Analysis of Language". The Philosophical Quarterly, Vol.I, no.4, July 1951; p.322 ff.

the meaning from the originator of the sound stimuli to the hearer. It is significant that if a person cannot hear the sounds which other persons make, his own capacity for producing sounds is seriously handicapped. The converse is also true. The ability to produce certain forms of speech sounds or musical sounds greatly enhances our powers of discriminating these sounds from other environmental auditory sensa.

Rhythm is a common factor in the experience both of the originator and the recipient of the auditory stimuli, and in the sensory material. The time element is ignored in the analysis of visual perception because we identify the visual percept with a physical object instead of treating it as a symbol. If a visual percept is considered as a significant symbol the temporal relations existing between it and the percipient cannot be entirely ignored. It then becomes possible to explain how visual phenomena can serve as a means of direct communication between persons, as in gesture and sign language.

In studying any form of perception, we have to abstract certain aspects of the data from the total experience, and deal with them in isolation. This methodological procedure gives a clarity of exposition which could not otherwise be attained. The relationship of part to whole can be discussed in subject-predicate terms. Theorists are often misled by

this. They then attribute a similar structure to the contents of the perceptual experience under investigation. Thus pitch, for example, can be conceived as a part of a total auditory datum, and as such may be predicated of sound phenomena. This does not warrant the assumption that the connection between the pitch of the sounds which we hear and our hearing of them is describable as a simple two termed relationship. The same is true of the rhythmic structure of sounds. This may be studied in isolation. Rhythms are then treated as unitary data similar to visual objects. Investigators then examine the relationship between the 'initial datum' and the subject's prehension of it. Such an analysis of the rhythmic components of sounds cannot be accepted when we also take into account the pitch differences between the components of the rhythmic whole. The rhythmic pattern in isolation may be predicated of the subject's awareness. Concrete auditory material, however, which is a unity for which pitch and rhythm are both essential factors, is not describable as a simple two-termed relationship. Such an analysis presupposes the detemporalisation of the data. It thus falsifies our conception of the essential elements inherent in the perceptual experience.

No adequate account cen be given of the content of auditory perception without firstly inquiring into the structure of temporal experience. The study of time has been neglected both in metaphysical and epistemological theory. Many thinkers

assume that all intellectual experience is concerned with abstract, schematic, logical concepts to which the temporal content of experience is totally irrelevant. Thus they analyse not only all forms of sensory awareness, but also cognitive apprehension and memory as if their content were similar in structure to the content of the central visual field. It is impossible to explain the phenomenon of memory in these terms which result in the identification of the thinking process with the logical structure of the finished product of thought. Even in terms of a purely successive view of time, the two cannot be identified, as the process is prior to the structure in terms of which it is being described.

An important outcome of this study of auditory perception is that it demonstrates that the four-dimensional extensive schema can be given a value other than that which transforms it into the spatio-temporal continuum. The latter is not a universal framework to which every type of experience is necessarily directly related. It is merely a useful schema in terms of which to analyse those forms of experience in which spatial relations predominate. Other experiences, to which spatial relations are irrelevant require an alternative interpretation of the extensive schema. A study of the manner in which these alternative interpretations are related

in our total experience, may provide important data for the investigation of all forms of symbolism and in other related fields. The analysis of auditory perception, concerned as it is with the relationship between the temporal and the static components of sound sensa, is a particular instance of this general problem. Since the elements are very clearly contrasted in sound phenomena, there are grounds for believing that a more detailed analysis of auditory experience would do much to clarify what is involved in this issue.

However this may be, the study of auditory perception is an important branch of perceptual study which has been strangely neglected. If pursued, it would afford useful information about [redacted] temporal relations and provide suitable material for an adequate discussion of the manner in which mental, emotional, and perceptual factors interact in all forms of sentient experience.

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