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Physiological Psychology and the Mind-Body Problem 1

The Mind-Brain Identity Theory

The Mind-Body Problem

The problem of the relationship between the soul or mind on the one hand and the body in general and the brain in particular has been a major preoccupation of European philosophy since the time of Plato. Moreover although it is an issue which, because of its philosophical complexity, empirical psychologists have usually tried to avoid, it is an issue which has had an important influence on the development of psychological theory; if only to the extent of inhibiting psychologists from entertaining hypotheses which might be supposed to prejudge an issue on which philosophers have been deeply divided, as indeed they still are.

The purpose of what has become known as the mind-brain identity theory in the form in which I argued for it in my paper 'Is consciousness a brain process?' published in 1956 (26b) and I suspect, of the original statement of the theory by Boring in his book The Physical Dimensions of Consciousness, published in 1933 (5) was to cut a path through this tangle of philosophical issues concerning the relation of mind and body so as to allow the psychologist to entertain the one hypothesis towards which almost all the empirical evidence was and still is pointing, but which the psychologists and neurophysiologists had not dared to adopt for fear of arousing howls of protest from the philosophers, namely the hypothesis that the private experiences whose occurrence within him is observed, reported and described by the individual concerned are nothing more or less than processes occurring in his brain.

However before presenting the arguments in favour of this view something needs to be said about the history of the problem as it has developed from the work of the Greek philosophers down to the present day.

Plato

The belief in a soul which enters the body at conception or birth, leaves it at death and may either, according to the particular form of religious belief, continue to exist as a disembodied ghost in a special world reserved for the souls of dead or return to life as the animating principle of some other body, is a belief whose origins are lost in the mists of antiquity. According to the speculations of the 19th century British Anthropologist, Sir Edward Tylor (33) the belief in a soul which separates from the body at death is a primitive scientific hypothesis whose purpose is to explain the otherwise inexplicable and awesome phenomenon of death whereby a living, breathing, thinking, talking and feeling human person becomes an inert lump of matter, a corpse. This conception of the soul as that which gives life to an otherwise inanimate body appears in Plato's Phaedo (27) where Socrates deduces the immortality of the soul from two premises (1) that death is the opposite of life and (2) that the soul is that which "causes the body in which it is to be alive". The same idea appears in Aristotle's concept of the vegetative soul which is the kind of soul which every living thing possesses, plants as well as animals and men.

Aristotle

However whereas Plato maintained that the soul is a substance in the sense of something which is capable of independent existence, as indeed it must be if it is to survive the death of the body, Aristotle (1) denied that the soul is a substance and gave an account of it in terms of his distinction which we discussed in Lecture 4 between the Form and the Matter of a substance. For Aristotle the substance is the living organism or person; its matter is the material body and its form is its soul. In speaking of the soul as the form of the body Aristotle is not referring to the shape of the body or to the arrangement of its constituent anatomical parts, but to its functions what it does and what it is capable of doing - its dispositional properties, in other words. This is shown very clearly in Aristotle's threefold classification of the soul into

the vegetative soul which refers to the functions of metabolism and growth which are common to all living things, the sensitive soul which refers to the capacity to respond by movement to sensory stimulation which is the distinctive mark of the animal and finally the intellectus agens or mind which comprises those intellectual capacities peculiar to mankind.

Since the soul for Aristotle is not an independently existing thing or substance, the notion of the soul's surviving the death of the body is not strictly speaking compatible with his view, despite the attempts of the Mediaeval Schoolmen to construe certain rather Platonic remarks of Aristotle's about the intellectus agens in such a way as to allow for the independent existence hence, survival of at least this variety of soul.

Mediaeval Christianity

Although the early Christians construed the survival of the person after death in terms of bodily resurrection, the idea of a soul which survives the death and disintegration of the body and thus bridges the temporal gap between death and the bodily resurrection on the Day of Judgement, was soon incorporated into Christian thought and teaching through the influence of Platonism on the Early Fathers and St. Augustine (2) in particular whose influence gave a strong Platonic flavour to Christian theology until the revival of Aristotelian ideas in the 13th century. Indeed the whole institutional fabric of Mediaeval Christianity was built around ritual activities designed to secure the welfare of the soul after death.

Descartes

Consequently despite Aristotle's rejection of the notion of soul as a substance and the ingenious attempts of the Schoolmen to reconcile this view with what had by now become orthodox Christian doctrine, the new mechanical physiology of the 17th century, epitomised by Harvey's (16) treatise on the circulation of the blood, was seen by Descartes as undermining the traditional intellectual basis for the belief in a soul that survives the death of the body, by providing an explanation of the phenomenon of death in terms of the break down of a purely mechanical physiological system. Indeed it is arguable not only that it was his interest in and espousal of the new mechanical physiology which precipitated the intellectual crisis which Descartes describes in his Discours de la Méthode (9a) but also that the whole of Descartes' philosophical programme can be construed as an attempt to provide a new intellectual basis for the belief in the soul as an independent substance from the mechanical body, which does not depend in any way on the conception of the soul as the vital principle whose departure makes the difference between the living organism and the corpse.

We have already examined and discussed Descartes' argument for the view that the soul is an independently existing substance distinct from the body in Lecture 16. What remains to be said is firstly that Descartes' restatement of the mind-body problem has dominated philosophical thinking on this matter down to the present century and that the prejudice amongst philosophers in favour of some kind of mind-body dualism which was almost universal until the philosophical revolution precipitated by Wittgenstein's Philosophical Investigations (35) and Ryle's The Concept of Mind (28) in the 1940's and early 1950's was due almost entirely to the uncritical adoption of Descartes' ego-centric epistemological standpoint. The second point that needs to be made is that the effect of Descartes' restatement of the problem was not only to eliminate the concept of the soul as an explanatory principle in biology, physiology and animal behaviour, in other words in those areas reserved to Aristotle's vegetative and sensitive souls, it also shifted the emphasis in discussions of the mind away from the intellectual capacities of Aristotle's intellectus agens towards the conception of the mind or res cogitans as the individual's current private experience or consciousness as he is subjectively aware of it. Moreover by restricting the operation of the independent mental substance in this way he handed over all other aspects of mental life, including the storage of the memories of past events which are not currently in consciousness to the brain (9b).

This restriction of the independent mental substance to the individual's current private experience has two very important consequences for the subsequent history of the mind-body problem. In the first place it has allowed the neuro-physiologists to pursue their studies of the function of the brain in its control, not only of behaviour but also of many aspects of intellectual functioning without being accused of

encroaching on the sacred territory reserved for the spiritual substance, the private experience of the individual. This has led to the remarkable phenomenon whereby the most vociferous defenders of Cartesian mind-body dualism in recent years have been distinguished neuro-physiologists and neurologists like Sir Charles Sherrington (29), Lord Brain (6) and Sir John Eccles (10). Secondly, despite the fact that Descartes himself maintained an interactionist view of the mind-brain relationship whereby the mind qua conscious experience is both affected by events in the sense organs and the brain and in its turn brings about changes in the brain and hence in muscles and other effector organs, the primarily contemplative character of conscious experience as construed by Descartes and his philosophical successors helped to give rise to the various alternatives to Descartes' view in which the radical distinction between mind and body is preserved at the expense of denying any kind of genuine causal interaction between two such disparate things.

Dual Aspect theory, Psychophysical Parallelism and Epiphenomenalism

The three alternatives to Interactionism within the general framework of Cartesian Dualism are the Dual Aspect Theory, Psychophysical parallelism and Epiphenomenalism. The Dual Aspect theory originated with Spinoza (31) in the 17th century and was defended by Fechner (12) in the 19th century. According to this view mind and body are two aspects of a single substance or process. The dualism of mind and body, though not a duality of two distinct substances, is nevertheless preserved by the alleged existence of two separate networks of causal relationships peculiar to each aspect, the events in the physical aspect being linked together by mechanical motion and physico-chemical production while the events in mental aspect are linked together by connections of a rational and logical kind. Psychophysical parallelism or Occasionalism, as it used to be called, holds that there are entirely distinct and separate series of events whereby an event in the mental series results in subsequent events in the mental series and an event in the brain series results in subsequent events in the physical series, and the two series of events run parallel to one another through time without any kind of interaction between the two series. This view was held by Malebranche (22) and Leibniz (20) towards the end of the 17th and the beginning of the 18th century, by Hartley (15) later in the 18th century and by Wundt in the 19th century (35). Epiphenomenalism which was invented in the 19th century by Darwin's ally and protagonist the biologist T.H. Huxley (18) holds that conscious experience is a by-product of brain activity, but has no role or function in the control of behaviour which is mediated wholly by the brain which operates, as is implied by the other two theories, as a closed causal system. To these should perhaps be added the doctrine known as Idealism both in its Berkeleyan (4) and in its Kantian (19) form. For although Idealism rejects the dualism of mind and body, in so far as it makes the body and the physical world to which the body belongs into a construction of the mind, it takes as its starting the same standpoint of ego-centric epistemological scepticism from which Cartesian Dualism proceeds.

Although as we have seen, the Dual Aspect theory and Psychophysical parallelism originated in the 17th century and Idealism of both types in the 18th century, it was not until the 19th century that the issue between these different conceptions of the mind-body relationship was joined in earnest. It is only in the 19th century that we get the conception (a) of the physical universe as a closed mechanical system obeying the law of the Conservation of Energy, which admits of no causal interaction with a separate mental world lying outside it and (b) of the brain as a closed causal system consisting of neural events which not only duplicate all the introspectively observed mental events, but also provide at least in principle, a complete causal explanation of the human being's response to receptor stimulation. The origin of the Dual Aspect theory and Psychophysical Parallelism in the 17th century was bound up with a misunderstanding of Aristotle's doctrine substance which was taken to imply the total independence of one substance from any kind of causal interaction between it and any other substance.

Psychophysical Materialism

Materialism, considered as a view of the mind-body relationship is the view which holds that mental events constitute an integral part of the spatially extended physical world, that they interact on all fours with other

physically specifiable events and constitute some, as yet not fully specified, part of the physiological activity of the brain. Psychophysical materialism in this sense is a view which was held in ancient times by the Epicureans as illustrated by the writings of the Roman poet Lucretius (21). A similar conclusion was reached in the 17th century by Hobbes (17) for whom this was the logical response to the speculations and discoveries of the new mechanical physiology, which provoked Descartes' restatement of the problem. But once Descartes' egocentric formulation of the epistemological problem had become accepted as the natural starting point of philosophical discussion, materialism virtually ceased to be a viable philosophical position. There were, it is true some isolated materialists in the 18th century like La Mettrie who developed Descartes' theory of reflex action and applied it to human behaviour in his l'Homme Machine (23) and the French physician Cabanis who held that "the brain digests impressions and secretes thoughts" (7). In the 19th century the German school of Neurophysiology led by Johannes Müller (25) adopted a fairly thoroughgoing materialist position; but failed to gain much acceptance for this view amongst the philosophers and psychologists. Marx (24) and Engels (11) argued for a somewhat emasculated form of psycho-physical materialism, but this likewise failed to impress the philosophical establishment as a viable solution to the mind-body problem.

The Mind-Brain Identity Theory

The Mind-Brain Identity Theory is the name usually, if somewhat misleadingly given to that form of Psychophysical Materialism which holds, not that mind qua substance is the same independently existing substance as that anatomically distinguishable part of the human body known as the brain, but that mental events and mental processes are the very same events and processes as those patterns of brain activity with which they are known or strongly suspected to be correlated. It was only when it was stated in this form that psycho-physical materialism first became accepted as a defensible philosophical position. Nevertheless a quarter of a century was to elapse between the original statement of the mind-brain identity theory in the 1930's and its acceptance as a defensible philosophical position in the late 1950's.

As I have already mentioned, the earliest statement of the identity theory under that title was in Boring's book The Physical Dimensions of Consciousness published in 1933 (5). In that book Boring states his view as follows: "To the author a perfect correlation is identity. Two events that always occur together at the same time in the same place, without any temporal or spatial differentiation at all, are not two events but the same event. The mind-body correlations as formulated at present, do not admit of consideration as spatial correlation, so they reduce to matters of simple correlation in time. The need for identification is no less urgent in this case". (5, p. 16). Boring's view did not command the serious attention either of philosophers or psychologists at the time for a number of reasons. As far as the psychologists were concerned behaviourism as a solution to and as a way out of methodological and philosophical problems within psychology had not been fully exploited and its limits and limitations discovered. As far as the philosophers were concerned, apart from the fact that Boring was writing as a psychologist for psychologists, the time was not yet ripe for the incorporation of such a revolutionary doctrine. The problem of identity and of referential identification had not yet moved into the forefront of discussion among the logicians. Frege's work on these topics was virtually unknown outside the confines of the Vienna Circle; and the Vienna Circle itself was busy a-whoring after the false Gods of atomic proposition and the verification principle. Phenomenalism in the form of the so-called sense datum theory was riding high and logical behaviourism had hardly been conceived, let alone explored as an alternative solution to the mind-body problem. Boring moreover, was himself apparently committed to combining the identity theory with a phenomenalist account of sensory qualities which on Leibniz's (20b) principle of the Identity of Indiscernibles would commit him to the view that certain brain events are literally green, high pitched, warm, sour or putrid, which for a philosopher would constitute an immediate knock-down reductio ad absurdum of his position.

Twenty five years later the philosophical climate in the English speaking world was very different. As far as the United Kingdom and those parts of the English speaking world, such as Australia, who drew their philosophical inspiration from the United Kingdom, the crucial influence was that of the later work of

Wittgenstein as set out in his posthumous Philosophical Investigations published in 1953 (34b) but disseminated privately amongst his disciples from the late 1930's onwards in the form of the Blue and Brown books (34a). In the United States parallel developments were taking place amongst those members of the original Vienna circle like Carnap (8) and more particular Feigl (13) who had migrated over the Atlantic as a consequence of the Nazi invasion of Austria in 1936.

This development had a number of consequences which were crucial for the subsequent restatement and widespread acceptance of the Mind-Brain Identity theory among philosophers in the English speaking world in the late 1950's. In the first place it led to a revival of interest in the work of Frege (14) and in his distinction between sense and reference which we discussed in Lecture 2. This distinction is fundamental to the doctrine of contingent identity as developed by Feigl in his 1958 paper 'The "mental" and the "physical"' (13b) and by Smart in his 1959 paper 'Sensations and Brain processes' (30). Frege's work on sense and reference also underlies the interest in the problem of how we identify the referent of a descriptive expression or proper name and thus to Strawson's (32) view which we discussed in Lecture 16 which draws attention to the importance of spatio-temporal location in this respect and which, as we saw seriously undermines the traditional view of the mind as an independently existing spiritual substance.

This interest in the problem of referential identification in the context of the use of language for the purposes of inter-personal communication is also as we have seen, the basis of Wittgenstein's private language argument (34b). This argument of Wittgenstein's together with Austin's critique of the Argument from illusion in his Sense and Sensibilia Lectures (3) led to the dramatic collapse of phenomenalism and the Berkeleyan form of Idealism which is associated with it as defensible philosophical positions within the British philosophical tradition in the period immediately following the Second World War. The refutation of phenomenalism and the recognition that naive realism, the view that what we directly perceive are real spatially extended material objects in a three dimensionally extended material world, is a viable philosophical position was and essential prerequisite for the development of a philosophically defensible form of the mind-brain identity theory, since as I argued in Lecture 19, it is only when we recognise that the language we use to describe our private experiences and sensations is a metaphorical extension of a language whose basic function is to describe material objects and their properties as they exist and occur in a three dimensionally extended spatial world, that we can circumvent the objection that experiences have properties such as greenness, high pitch, warmth, sourness and putridity that no brain process could conceivably have. I have already suggested that it was this adherence to phenomenalism that led to the failure of Boring's original statement of the identity theory (5) to gain widespread acceptance. It was also I would suggest, his failure to break away effectively from his deep-rooted phenomenalist prejudices which led to Feigl's recantation of his 1958 statement of the identity theory in the introduction to the reissue of the 1958 paper (13b) as a separate volume in 1967 (13c).

Wittgenstein's private language argument was also important as a factor in the development of a philosophically viable form of psycho-physical materialism in so far as it demonstrates that any language which is capable of serving as a medium for inter-personal communication must necessarily presuppose the existence of a spatially extended material world to which its basic concepts are referentially anchored. This as we saw in Lecture 16 leads to a rejection of the egocentric epistemology of Descartes and thereby undermines the formidable Cartesian argument for an independently existing spiritual substance. It also helped philosophers to recognise for the first time in three hundred years that the primary function of the psychological concepts of ordinary language is not to enable the individual to describe his own private experiences, but to enable him to characterise the mental capacities and propensities of other people and to explain the behaviour of others in terms of these capacities and propensities.

Once we begin to ask what it means for him to know, believe, want or intend something instead of asking what it means for me to know, believe, want or intend something, logical behaviourism at least as an account of these mental state concepts, becomes almost irresistible. As we saw in Lecture 18, Wittgenstein himself gave a successful logical behaviourist analysis of what it means to understand something in terms of the ability to 'go on' correctly (34b, I, 143-155, pp. 56-61), as well as his less successful attempt at a logical behaviourist account of sensation (34b, I, 244, p.89) which we discussed in Lecture 19. However more

important than his own specific contributions to the logical behaviourist view, was Wittgenstein's undoubted influence inspiring Ryle's exposition of this point of view in The Concept of Mind (28).

Strictly speaking logical behaviourism, if taken to its logical conclusions, is an alternative and rival to materialism as an account of the mind-body relationship. For if and in so far as all we are doing when we use mental concepts is talking in a logically complex way about the publicly observable behaviour of human beings, it follows (a) that there is no separate class of mental states and events over and above behavioural events and behavioural dispositions and (b) that the relationship of mind to brain is simply a matter of the relatively unproblematic causal relationship between brain activity and overt behaviour. Nevertheless had it not been for the fact that we had both been strongly influenced by Ryle's logical behaviourism and had both been impressed with how close this view comes to getting rid once and for all, of the private world of mental events, neither Smart (30) nor myself (26b) would have ventured to explore the possibility that those aspects of mental life which had proved impermeable to the dispositional analysis which Ryle had used with such devastating effect elsewhere, might perhaps be rescued from the strange extra physical limbo to which Descartes had consigned them by postulating their identity with events and processes in the brain.

The Restatement of the Mind brain identity theory

The mind-brain identity theory in the form in which it became accepted as a serious philosophical thesis stems from three papers published in the late 1950's. The earliest of these was my own paper 'Is consciousness a brain process?' published in the British Journal of Psychology in 1956 (26b). This was followed in 1958 by Herbert Feigl's paper 'The "Mental" and the "Physical" which appeared in the second volume of the Minnesota Studies in the Philosophy of Science (13b) and in 1959 by J. J. C. Smart's paper 'Sensations and Brain Processes' which appeared in Philosophical Review (30). Although there are certain differences of detail in the positions adopted in these three papers, the area of agreement was sufficiently great for all three of the original protagonists to be able to agree that they were all defending the same basic position. In the case of Smart and myself there was a direct personal connection in that I had developed my view on the basis of a series of discussions in which Smart had participated which took place in Smart's Department in the University of Adelaide, of which I was then a member in 1954. I had already announced my intention to defend the thesis that "the logical objections to the statement 'consciousness is a process in the brain' are no greater than the logical objections which might be raised to the statement 'lightning is a motion of electric changes'" (26a, p. 255) in my paper 'The concept of heed' which appeared in the British Journal of Psychology in the same year. But it was only after this series of discussions with Smart, C. B. Martin and D. A. T. Gasking (while on a visit to Adelaide from the University of Melbourne) that the argument of 'Is consciousness a brain process?' was finally knocked into shape. During these discussions, Smart although he became increasingly sympathetic to my point of view as time went on, had not entirely accepted the position which we later came to call 'the identity theory'. By 1957 however, he had been sufficiently convinced of its viability to make a tour of Philosophy Departments in the United States advocating my view and inviting objections to it. His 1959 paper (3) records these objections and develops his answers to them.

Feigl's version of the identity theory was developed quite independently of Smart and myself and grew out of his 1950 paper (13a) which we discussed in Lecture 14. As we saw in Lecture 14, Feigl argued in that paper "that the designata of the mentalistic language are identical with the descripta of the behaviouristic language and that both are identical with the designata of the neuro-physiological language". In his 1958 paper Feigl allowed the "descripta of the behaviouristic language" to drop into the background and attempted to specify more precisely those concepts within the mentalistic language whose designata could reasonably be supposed to be identical with certain events or processes in the brain. "The word 'mental' in present day psychology", he argued "covers ... not only the events and processes of direct experience (i.e. the raw feels) but also the unconscious events and processes, as well as the 'intentional acts' of perception, introspective awareness, expectation, thought, belief, doubt, desire, volition, resolution etc. ... since intentionality as such is to be analysed (on Feigl's view) ... in terms of pure semantics (and thus falls under the category of the logical rather than the psychological), it would be a category mistake of the most

glaring sort to attempt a neurophysiological identification of this aspect of mind.'" (13b, p.445). In the light of these considerations he concludes: "the identity thesis which I wish to clarify and to defend asserts that the states of direct experience which conscious human beings 'live through' and those which we confidently ascribe to some of the higher animals, are identical with certain (presumably configurational) aspects of the neural processes in those organisms" (13b, p. 446).

Similarities and Differences between the positions of Place, Smart and Feigl

Although Feigl, Smart and myself all agreed that we were defending the same position for which we all sooner or later came to describe as the mind-brain identity theory, there are inevitably certain detailed differences between our different presentations of what is basically the same thesis. But before discussing these differences it will be helpful to set out the points on which from the outset, there was agreement between us. We all agreed on the following four points:

1. The private experiences or sensations of the individual are reducible without remainder (are nothing but) certain as yet unspecified events or processes in the brain (the identity thesis).
2. The identity thesis is a contingent proposition i.e. it is not a logically necessary truth. Descriptions of an individual's private experience do not have the same sense or meaning as the physiologist's description of the hypothetical brain processes in which the private experiences themselves in fact consist.
3. The truth of the identity thesis is at least partly a matter of empirical determination.
4. The identity thesis applies only to certain aspects of mental life - consciousness (Place), the raw feels of experience (Feigl), sensations (Smart). The cognitive and volitional (intentional) aspects of mental life are not reducible to brain states or processes; but are (conceptually) reducible to some kind of semantic, logical or verbal competence or propensity.

Identity versus composition

The differences between our three formulations of the same basic thesis can all be related to these four points of agreement. In relation to the statement of the identity thesis itself (Point 1) there is a difference between my version of the thesis which was stated in terms of what I referred to as "the 'is' of composition" (26b) and the version of Feigl (13b) and Smart (30) who followed Boring (5) in speaking of the identity of private experiences or sensations, on the one hand with brain processes or brain events on the other. My contention was not that consciousness is identical with or the very same thing as the brain processes with which it is correlated, but that consciousness consists entirely in or is entirely composed of brain processes. In other words I construed the relationship of experiences to brain processes in terms of the substantial micro-reduction of a substance into its constituent parts at a lower or more microscopic level of analysis such as we discussed in Lecture 4, whereas Feigl and Smart discussed the relationship in terms of Frege's (14) notion of the identity of the referent of two descriptions with different senses which we discussed in Lecture 2.

I must admit that for a long time I was in a state of some confusion as to whether or not this difference was merely a matter of two different ways of saying the same thing or whether there was not perhaps, as I once argued (26c) a reason for preferring my formulation in terms of composition to the more generally accepted formulation in terms of identity. In favour of the view that two formulations are two ways of saying the same thing is (1) the fact that both are equally effective in eliminating mental events and mental processes as a separate class of events and processes with no extension or location in ordinary three dimensional space and (2) the fact that both formulations imply that the relationship is a contingent one. As we saw in Lecture 4 substantial, material or micro-analysis and reduction is a matter of breaking down the entity itself into its constituent parts in contrast to conceptual analysis and reduction which is a matter of breaking down the concept under which an entity falls into its component conceptual elements, as we described it in our discussion of definitions-in-use in Lecture 6-1. Such a micro-reductive analysis presupposes a closer more rigorous, more detailed and more scientific investigation of the entity or stuff which is being analysed, than is required in order to identify it as an entity or stuff of a certain kind at the

macro-scopic level. Empirical observation is likewise required in order to demonstrate that two logically independent descriptions, as in Frege's (14) example of 'the Morning Star' and 'the Evening Star', have a common referent (the planet Venus) which is employed both by Feigl (13b) and by Smart (30) in their expositions of this view.

The principal argument against treating the two formulations as equivalent is the argument that the relation of identity is symmetrical in that if A is the same thing as B, it follows necessarily that B is the same thing as A. The composition relation, on the other hand, is asymmetrical in that if A is entirely composed of B's, we cannot say that B's are entirely composed of A. What we have to say is that B's entirely comprise or make up A. Furthermore in the case of what I called in Lecture 4 'material analysis and reduction', while it is true that an entity can be said to be entirely made up of the parts of which it is composed, a mere collection of all the parts of a thing does not comprise the thing of which they once formed part, unless they are arranged in the particular way in which they were originally arranged. A list of parts, however complete, is only a description of the same thing as is described by a description of the whole of which they form part in so far as their form and arrangement is also specified. Where both form and matter are specified in the description of the analysis, there is no doubt a sense in which the two descriptions refer to one and the same thing; but the relationship is still in an important sense, asymmetrical in that the description of the analysis of thing into its constituent parts tells us a great deal about it which the macroscopic description does not mention and, as I pointed out in Lecture 6-1, the micro-reductive description explains the characteristics of the macroscopic entity in a way that the macroscopic description cannot be said to explain the micro-description.

Nevertheless, although there is still an element of asymmetry between the macroscopic and the microscopic description whereby the microscopic explains the macroscopic and not vice versa, this is not the sort of asymmetry which is incompatible with asserting the symmetrical relationship of identity as far as the common referent of the two descriptions is concerned. Provided we specify their form and arrangement we can equally well say that the parts of a thing so arranged are the same thing as the thing itself and that the thing itself is the same thing as the collection of its parts is arranged in that particular way.

But although this argument shows that there is no logical incompatibility between these two formulations of the relationship, it is clear that the two formulations are different and complementary to one another. The formulation in terms of composition has the advantage of drawing our attention to examples such as the cloud's consisting of water droplets, the lightning's consisting of an electric discharge through the atmosphere or water's consisting of H_2O, where we identify an entity, a process or a stuff with its scientific micro-description which provide a much closer parallel to the experience-brain process case than does the standard example of the contingent identity of the referent of two logically independent descriptions - the Morning Star/Evening Star case. On the other hand the fact that a collection of the parts of which a thing is composed is not by itself the same thing as the original entity, process or stuff might be thought to allow too much latitude for the supernatural mind-stuff to creep back in through the back door under the banner of the emergent whole being greater than the mere sum of its parts. This back door the identity formulation keeps firmly closed.

It is worth pointing out in this connection that the reason why the standard example of two logically independent descriptions having a common referent are not closely comparable to the experience/brain process case is that they all involve different descriptions which are true of and can be used as a means of identifying a single particular individual. This is true both of Leibniz's (20c) case where the same individual is identified either by the proper name 'G. Julius Caesar' or by such descriptions as 'the man who crossed the Rubicon' or 'the man who was murdered by Brutus and his associates', of Frege's (14) case where, the same individual heavenly body is identified either by the proper name 'Venus' or alternatively by the descriptions 'the Morning Star' and 'the Evening Star' and of my own case (26b) of an entity which is describable both as a table and as an old packing case. In the experience/brain process case, by contrast what is asserted is the identity not of one particular common referent of two or more descriptions but of the referents of two whole classes of descriptions, descriptions of private experiences in general on the one

hand and the neurophysiological descriptions of all the corresponding brain processes on the other.

Now, as I pointed out in my paper (26b), "if we lived in a world in which all tables without exception were packing cases, the concepts of 'table' and 'packing case' in our language would not have their present logically independent status. In such a world a table would be a species of packing case in much the same way that red is a species of colour. It seems to be a rule of language that whenever a given variety of object or state of affairs has two characteristics or set of characteristics, one of which is unique to the variety of object or state of affairs in question, the expression used to refer to the characteristic or set of characteristics which defines the variety of object or state of affairs in question will always entail the expression used to refer to the other characteristic or set of characteristics." (26b, p. 46).

In other words in a universe where it is both true and obviously true that (x) ($\Phi x.\Psi x$)[1], (x) ($\Phi x.\Psi x$) will become true by definition such that anything that does not have the characteristic Φ will not be accepted as a case of a Ψ. One consequence of this principle is that we can only expect to encounter cases where a class of things has two properties whose descriptions are logically independent of one another when the fact that both descriptions apply to the same class of things is not apparent at the level of common sense knowledge and observation. It would seem moreover, that the only cases where this happens are ones where previously unknown properties of familiar things are revealed by scientific micro-analysis. Another consequence of this principle to which I also drew attention in Lecture 4 is that when, as in cases like water and H_2O, the substantial analysis of a class of entities or stuffs becomes a matter of common knowledge the statement that water is a compound of two atoms of hydrogen to one of oxygen ceases to be a contingent proposition and becomes true by definition, so that anything that does not have this chemical composition is no longer accepted as a genuine case of water. As I have argued elsewhere (26c, footnote pp. 66-7) we may expect a similar conceptual development to take place in the case of the mind-brain relationship once the identity of experience and brain processes becomes a matter of known and accepted scientific fact.

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[1] [Editor] I suppose that '$\Phi x.\Psi x$' must be read as a material equivalence and not as a conjunction.

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