

BURT ON BRAIN AND CONSCIOUSNESS

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A substantial part of Sir Cyril Burt's reply (Burt, 1969) to Powell's (1969) criticism of his paper (Burt, 1968) on the problem of the relationship between brain and consciousness is devoted to a criticism of the thesis that consciousness is a process of the brain which I suggested some years ago could be regarded as a reasonable empirical scientific hypothesis (Place, 1956). I would like to take this opportunity of answering some of Burt's criticisms and of correcting some of the logical and factual mistakes which his paper contains. At the same time, in order to rebut his contention that the so-called mind-body identity theory does not and was not intended to have any experimental or empirical implications, I shall attempt to define more precisely than I have done hitherto, what sort of a brain process I take consciousness to be, and to indicate whereabouts in the brain such a process is likely to be found.

Burt maintains quite correctly that in order to show that consciousness is a brain process we need to know what criteria we ordinarily employ in deciding that two apparently different things are really one and the same thing, and then find out whether these criteria are, or could conceivably be, satisfied in the case of consciousness and a particular brain process. He claims, however, that the advocates of the mind-body identity thesis have omitted 'to enlighten us as to what criteria, if any, we are to apply in order to demonstrate a suspected identity'. This statement is false. I discussed this matter specifically in my 1956 paper in connection with the case where we say that lightning is the same thing as an electric discharge through the atmosphere and came to the conclusion 'that we treat two sets of observations as observations of the same event in those cases where the technical scientific observations set in the context of the appropriate body of scientific theory provide an immediate explanation of the observations made by the man in the street'. I discussed the matter further in a subsequent paper (Place, 1960) in which I added 'the rather obvious additional criterion that the two sets of observations must refer to the same point in space and time, allowing for such things as the time taken by the transmission of light and sound, distortions in the transmitting media, the personal equation of the observer, and differences in the precision with which

location is specified in the two sets of observations'.

From his criticism of my use of the lightning-electric discharge analogy, it is clear that Burt has read the relevant section of my 1956 paper and it is difficult to believe that he did not realize that in that section I was attempting to specify what he calls a criterion of identity. Be that as it may, he clearly rejects the criterion I have suggested and attempts to replace it by two of his own. His criteria of identity are (1) that the two things in question must be so alike as to be indistinguishable and (2) that they must be located at the same point in space. He then tries to show that neither of these criteria apply in the case of consciousness and a brain process.

As against this I shall argue (1) that indistinguishability is not a criterion of the identity of two things in the sense in which I or any other advocate of the mind-body identity theory has used the term, (2) that even if we accept his indistinguishability criterion, Burt has not shown, as he thinks he has, that consciousness and a brain process are obviously different in appearance, (3) that his reasons for thinking that conscious experience is located at some other point in space than in their owner's head are unsound, (4) that his reasons for rejecting my 'explanation of observations' criterion are fallacious and (5) that if we accept this criterion and apply it to the case of consciousness and brain processes, a good case can be made out for the view that a brain process satisfying this criterion occurs in the sensory areas of the cerebral cortex and only in this part of the central nervous system.

Indistinguishability as a criterion of identity

Although the view which I put forward in my 1956 paper is commonly referred to by philosophers as the theory of mind-body identity, I did not in fact use the term 'identity' in my paper. I avoided using the word, because I wished to avoid certain ambiguities which arise when it is used in this connection. One of these ambiguities is well illustrated in Burt's paper. To say that the relationship between brain processes and consciousness is one of identity, may suggest, as it does to Burt, that what we are saying is that consciousness is identical with a brain process in the sense that two pins from the same packet can be said to be identical. It is in this sense that

'two things may be regarded as identical if they are so much alike as to be indistinguishable'. But this is not the sense of 'identical' that I or any other proponent of the identity theory would apply to the case of consciousness and brain process. Identical in this sense implies that there are two separate things that are so alike that it is impossible to distinguish one from the other except by the fact that they occupy two distinct and separate positions in space. What we are saying is that consciousness and a particular brain process are one and the same thing, occupying the same position in space and time. Two 'things' that are really one and the same thing are seldom in fact so alike as to be indistinguishable from one another. A house viewed from the back or the inside will look quite different from the way it looks from the front, yet this does not in any way prevent it from being the same house. Were it not for this difference in appearance when viewed from different points the possibility that there might be more than one thing here would not arise.

Burt, of course, recognizes that the analogies I have in mind are more like the case of the same house viewed from different points than the case of the two identical articles from the assembly line, but this, he contends, makes my view a double aspect theory like that of Fechner rather than a true identity theory. Personally I have no objection to calling my view a double aspect theory provided it is recognized that there are some respects in which the analogy of the same house seen from the inside and the outside is misleading when applied to the brain process/consciousness case. It is misleading in so far as it suggests that *we observe* our experiences in the same way that we can observe the pen on the EEG writing out the change of electrical potential on the scalp. He may also be misled by this analogy into supposing that the brain process and the experience are to be thought of as two separate parts of some other thing in the way that the front elevation and the interior of the living room are two separate parts of the same thing, the house.

But even if we were to concede that two things have to be indistinguishable in appearance to be one and the same thing, I cannot see that Burt has made out a case far saying that consciousness and brain activity are quite obviously different in their physical appearance. He seems to think that we can look at brain processes and conscious experiences and see that they are different in a simple sense-perceptual sense. This must surely be wrong for the reason that neither brain activity nor conscious experience are things we can look at and see in the literal sense-perceptual sense. We cannot look at brain activity because it is an electrochemical process which cannot be made visible even under the most powerful microscope. We can look at brains, we can

look at theoretical models of brain activity expressed in either algebraic or geometrical terms and we can look at the marks on paper made by a pen that is moved by the amplified electrical potentials generated by brain activity. But we can never look at the brain activity itself.

Nor for a different reason can we look at a conscious experience in the literal sense-perceptual sense. When we look at something in the literal sense, light emitted, transmitted or reflected from some object in the physical environment impinges on the retina and produces a characteristic visual experience. On the basis of that visual experience we are able to describe the object from which the light is being emitted, transmitted or reflected. We can also say something, though not usually very much, about the visual experience that is produced when we look at something. But we do not need to and, indeed, we cannot look at the experience in order to describe it, since our ability to describe the experience does not depend, as does our ability to describe the object in our environment, on light impinging on the retina.

Spatial location as a criterion of identity

Whereas indistinguishability is not in my view a relevant criterion in deciding the empirical identity of two separately conceptualized 'things', I do accept identity of location in both space and time as a criterion of this kind of identity (Place, 1960). Hitherto, however, I have not thought it necessary to defend the view, which I took to be obvious, that conscious experiences, in so far as they can be said to have a spatial location, occupy some not very precisely determined position beneath the skin of their owner and that there is nothing in our description of them that is inconsistent with, and a considerable amount of empirical evidence to support the hypothesis that they are actually located inside the skull.

Burt, however, seems to think that it is equally obvious that they are not so located. In support of this contention he gives three examples of alleged experiences of which, he says, that 'no one. . . unless he had some preconceived theory to maintain, would think of assigning to them the locus and status of processes within my head': his three examples are (1) the pain he (Burt) feels in his toe, (2) the blueness he sees in the sky, (3) the pulsating bulge he takes to be the soldier's brain. The argument here, I take it, is (1) that the pain cannot be in his head because it is in his toe, (2) that the blueness cannot be in his head because it is in the sky, (3) that the soldier's brain cannot be in his (Burt's) head because it is in the soldier's head. Taking these examples in the reverse order, I would certainly agree that in the case where Burt is looking at the exposed brain of the soldier, the soldier's brain is in the soldier's head and not in Burt's head. What is in Burt's head, in my view, is the visual experience which Burt has when he looks at the soldier's brain. But the visual

experience that Burt has when he looks at something, is not the same thing as the thing he is looking at and no one but a phenomenalist would think that it was. If Burt or anyone else is not convinced by Dr Johnson's well-known refutation of phenomenism, I would refer him to the posthumous publication of Austin's *Sense and Sensibilia* lectures (Austin, 1962), or to my own discussion of the so-called 'phenomenological fallacy' (Place, 1956; 1959).

The same principle applies to the slightly more complicated case of the blueness of the sky. I certainly have no temptation to say that the blueness is in Burt's head. If the sky is blue, it is blue, whether or not Burt or anyone else is looking at it. The only difficulty is that there is something rather odd about saying that the blueness is in the sky. For one thing the sky is a very indeterminate physical location. Anything that is more than a few feet above the surface of the earth can be in the sky, even if it is several million light years away. Furthermore, we cannot say that the blueness, or the greyness, or the pinkness or the blackness of the sky is located at any particular point in this vast expanse. Strictly speaking the colour of the sky has no physical location because there is no such thing as the real or apparent colour of the sky in the way that there is a real or actual colour of such things as a policeman's uniform, a sapphire or the flame of a bunsen burner. We cannot say that the sky is really blue, but sometimes appears black, pink, grey or yellow. There is no distinction in the case of the sky between its apparent colour and its real colour. One might say that the colour of the sky is always apparent and never real. But this should not be taken to imply that the colour of the sky exists only in the observer's experience. The apparent colour of the sky is determined by purely physical and optical factors which determine the wave length of the light projected on to the retina of any actual or potential observer who is, or might be, looking upwards from any point on or above the earth's surface.

The case of the pain in Burt's toe is quite different. Here I clearly do want to say that the pain is an experience of Burt's which is physically located in his head. But to say that the pain is physically located in Burt's head is not to deny that there is a perfectly good sense in which the pain is located in his toe. The argument that something cannot be in two places at once is deflected in this case by pointing out the word 'in' in the sentence 'Burt feels a pain in his toe' functions in a different way from the way it functions in the sentence 'Burt has a stone in his shoe'. If Burt's pain were in his toe in the sense that the stone is in his shoe, it would be possible to remove the pain from Burt, though not perhaps from his toe, by the simple expedient of amputating his toe. In fact 'a pain in the toe' is a

portmanteau phrase that we use to describe an unpleasant experience that results typically from intense stimulation of the nerve endings in the toe, but which may equally well be produced by the stimulation of the relevant afferent pathway at any point between the extremities and the sensory cortex or by the stimulation of the relevant part of the cortex itself. This shows that the experience we call 'a pain in the toe' is not in the toe in the sense of being physically located in that part of the body. If it can be said to be physically located anywhere, the evidence suggests that it is in the sensory cortex.

The explanation of common observations as a criterion of identity

Although Burt has not given any convincing reasons for thinking that conscious experiences are not located in the subject's head, this only shows that their physical location, in so far as it is at all determinate, is consistent with the hypothesis that they are processes in the brain. We certainly cannot claim that the positive evidence as to their precise physical location is such as to preclude any other possibility. Hence in order to show that consciousness is a process in the brain we need a further criterion of identity to which we can appeal in providing evidence for this claim. Reasons for thinking that Burt's indistinguishability criterion is not acceptable as a criterion of identity in this connection have already been given. We have now to consider the reasons that Burt gives for rejecting the explanation of common observation criterion of identity which I proposed in my paper. His argument here is that in the lightning-electric discharge example, which I used in deriving this criterion, the electric discharge causes the visual sensation experienced by the observer and that therefore these two events, the electric discharge and the visual sensation are two separate causally related events and not one and the same event. From this he concludes that the lightning-electric discharge case is not an example of two apparently separate things being found to be one and the same thing, and that, consequently, no relevant conclusions can be drawn from this example.

I would of course agree completely with Burt when he says that the electric discharge and the visual sensation experienced by the observer are two separate causally related events. But I do not consider that this in any way invalidates my argument. For unlike Burt I do not want to identify lightning with the visual experience of the observer. As I understand the ordinary usage of this word, lightning is a physical event in the environment of the observer which occurs whether or not any one happens to be there to observe it. We can say that lightning causes the observer's visual experience, just as we can say that the electric discharge through the atmosphere does. It is this physical event (lightning) that

we ordinarily identify with the electric discharge not the observer's visual experience. As I understand the matter, the observer and his visual experience enter into the matter only when we come to account for the fact that these two separate descriptions are said to be descriptions of one and the same physical event. The point here is that the word 'lightning' is used in ordinary language as the name for the physical phenomenon (nature unknown or at least unspecified) seen by the observer on a stormy night; whereas the electric discharge is the name of a theoretical event whose occurrence in the atmosphere under certain meteorological conditions is established by inference from experimental studies such as those of Benjamin Franklin and his kite. Each description is thus based on or defined in terms of a particular kind of observation or set of observations. It follows from this that in order to show that the two descriptions refer to the same event, what we have to do is to explain how it comes about that we have these two separate descriptions, when in fact there is only one event being described. And, in order to do this, what we have to do is to explain in terms of one description, which is always in such cases the more complex scientific description, how it comes about that when such a physical event occurs an ordinary observer in the street who happens to be around should have the sort of visual or other experience he does have and should be tempted in consequence to describe the physical event he observes (not his visual experience) in the way he does.

Generalizing from this example of lightning and the electric discharge, I argued in the 1956 paper that what we need to do in order to discover a brain process, of which we could properly and legitimately say that it is the very same thing as the conscious experience reported by the subject, is to find a process in the brain whose general functional characteristics and particular condition at any moment in time are such as to explain (a) the fact that human beings are apparently able to give first hand descriptions of a process occurring within themselves which plays an important part in the control of their behaviour, and (b) the character of these experiences at any one time as described by the subject. In other words if it is possible to explain the phenomenon of introspection and the character of individual introspective reports in terms of the functional characteristics and temporary state of a process in the brain without having to introduce into the explanation a separate process (the experience) which is produced by the brain process and reported by the subject, we shall then be justified in saying that the brain process and the conscious experience are one and the same thing.

The empirical implications of the identity theory

I did not attempt in the 1956 paper or in the subsequent discussion in 1960 to take the matter any farther than this. Logically the next step to be taken in finding whether there is such a process in the brain is to construct a theoretical model of a brain process which would have the property of being introspectible, find out from the model what other properties such a brain process would be expected to have, and then see whether there is any evidence for the existence of such a process in the brain, and, if so, where it might be located.

I did not feel when I wrote the 1956 paper, nor do I feel now, that my competence in the field of neurophysiology and cybernetics is sufficient to allow me to do justice to this task. I must state quite categorically, however, in view of Burt's statement that I did not propose the theory in the first place for its 'explanatory value or as a guide to experimentation', that although I did not feel competent to undertake it myself, I clearly envisaged the development of a programme of theoretical and experimental research along these lines as a consequence of my paper. This is implied (a) by the explicit statement that I regarded the view that consciousness is a process of the brain as an empirical scientific hypothesis and (b) by the fact that although the arguments in the paper were of a logical and philosophical nature, the paper was published in the *British Journal of Psychology* and not in a philosophical journal, where the force of the arguments would have been better appreciated as they subsequently were when the case was presented to a philosophical audience by Professor J. J. C. Smart (1959).

A psychophysiological theory of introspection

The failure of my paper to arouse the sort of interest on the part of psychologists and neurophysiologists that it has aroused amongst philosophers, together with my own failure to pursue the matter in this direction, has meant that the empirical implications of the materialist hypothesis have remained largely unexplored. The only significant development that I know of in the direction of providing a neurophysiological explanation of introspection that has occurred in more than a decade is Putnam's (1960) description of a theoretical machine which detects and records its own states from moment to moment.

I cannot myself accept Putnam's proposals as a satisfactory account of introspection even at the theoretical level for two reasons. Firstly because when it is interpreted in terms of the physiological hardware it implies the existence of receptor organs or specialized nerve endings whose only function is to detect the activity of other nerve cells or groups of nerve cells. I

can find no evidence of any such receptors or specialized nerve cells in the central nervous system. The second reason is that Putnam's theory provides no explanation of why only a very limited part of the total control activity of the brain can be detected in this way, or why the descriptions themselves are as meagre and puzzling in their import as they actually are. It is only fair to add that Putnam has since expounded a revised theory of introspection which is very close to the one developed below (Putnam, 1966). His original conception of introspection in terms of an internal scanning process has, however, been revived in a recent book by Armstrong (1968).

Although to my knowledge Putnam's is the only important contribution to the theory of introspection in terms of brain activity that has emerged, it would not be true to say that there have been no important developments in the neuropsychology of consciousness since 1956. One has only to think of the remarkable escalation of research into the physiology of dreaming which has resulted from the discovery by Aserinsky & Kleitman (1955) of the rapid eye movement phase of sleep and its association with dreaming. So far, however, this research has shown no sign of providing an answer to such questions as where precisely in the brain the process of dreaming occurs (as opposed to the areas from which it is controlled), and how the individual comes to have this remarkable ability to describe what is presumably some part of the complex pattern of neural activity that is observed during REM sleep.

A more important development from the standpoint of the theory of introspection is the work of Broadbent (1958) who has developed a theory of attention in terms of a filter mechanism controlling the input to a limited capacity channel. Broadbent is concerned with the problem of accounting for the selective perception and retention of two or more simultaneously presented auditory messages rather than with the problem of conscious experience and the subject's ability to describe it. It is clear, nevertheless, that the mechanism he describes is essentially the same process as the one we ordinarily refer to by such phrases as 'paying attention to something', 'concentrating on it', 'looking at it', 'listening to it', etc.

In an earlier paper (Place, 1954) criticizing Ryle's (1949) behaviourist account of 'attending' or 'heed paying', as he calls it, I gave the following account of the concept of attention as ordinarily understood.

The expression 'paying attention' refers to an internal activity of the individual presumably of a non-muscular variety whereby he exercises a measure of control over the vividness or acuteness of his consciousness of (a) the sensations to which he is susceptible at that moment, or (b) such features of the environment as are impinging

on his receptors, without necessarily adjusting his receptor organs or their position in any way. In paying attention to something the individual is regulating the vividness of his consciousness of the object or sensation in question and hence the number of its features of which he is conscious. The expression 'being conscious of something' refers to a peculiar internal state of the individual which normally accompanies any reasonably intense stimulation of his receptor organs, the particular form assumed by the individual's state of consciousness at a given moment being determined by the pattern of physical energies impinging on his receptor organs at the time.

Being conscious of something is by definition a necessary condition of the individual's being able to give a first hand report on that something either at the time or later. It is not, however, a sufficient condition of the individual's ability to make such a first hand report, since it is possible for someone to be conscious of things which he cannot put into words, without his actual capacity to verbalize being in any way disturbed. Likewise, though here the relationship is probably contingent rather than necessary, the successful performance of any skilled activity depends to a greater or lesser extent on the individual paying attention to, i.e. maintaining a vivid consciousness of, relevant features of the situation and his own activity with respect to it. (Place, 1954, p. 244)

If this is a correct account of the relationship between attention and consciousness as ordinarily understood, it is clear that while the 'non-muscular activity' of attending is equivalent to the operation of Broadbent's filter mechanism, the resulting consciousness is equivalent to the filter output, the limited capacity channel which it is the function of the filter to protect from overloading. The question that arises, therefore, is whether it is possible in terms of Broadbent's model to explain how human beings might be supposed to acquire the ability to report and describe what is going on in the limited capacity channel at any given moment and why the activity in this particular part of the system should be so describable and not other parts.

As I see it, the answer to this question is to be found in the suggestion, which I hinted at in my 1956 paper, that the ability to report and describe conscious experience is a by-product of the ability to describe what is going on in the environment. In learning to describe what is going on in the environment, we learn among other things to respond to characteristic patterns of sensory stimulation by using or becoming ready to use certain words which are said to refer to or describe the objects and phenomena in the environment from which the distinctive stimulus pattern in question emanates. In the light of the considerations presented above, however, it is apparent that the immediate stimulus that determines the descriptive responses of an individual is the neural input after it has successfully passed through the filter mechanism, in other words, the activity in the limited capacity channel.

Since the pattern of activity in the limited capacity channel under normal waking conditions is presumably controlled by the pattern receptor stimulation at that part of the sensorium from which the filter is accepting information at the time, there will normally be a consistent relationship between the occurrence of a particular pattern of activity in the limited capacity channel and the existence of a particular state of affairs in the individual's stimulus environment. When this is the case the individual will be able to learn a descriptive response to the relevant pattern of activity in the limited capacity channel which, in terms of the conventions of the language he is learning, will be an appropriate description of the current state of the stimulus environment.

In some cases, however, the pattern of neural activity in the limited capacity channel which elicits a particular description may occur under conditions where there is no corresponding state of the environment, either because the stimulus at the receptors is very similar to that normally required to produce the relevant pattern of activity in the higher centres of the central nervous system, as in the case of an illusion, or because some internal factor acting, presumably, on the filter mechanism produces a pattern of activity in the limited capacity channel that is quite unrelated to the pattern of stimulation at the receptors, as in the case of a mental image, a dream or a hallucination.

On most occasions when such a discrepancy occurs between the individual's descriptive reactions and the actual state of the environment there is a cue in some other part of the sensory input which, if it is filtered into the limited capacity channel, can act as a discriminative stimulus which the individual can use in learning to inhibit his immediate descriptive responses, as well as other impulsive reactions to the stimulus based solely on the way it looks, sounds, tastes, smells or feels.

However, once he has learned to inhibit these possible or actually inappropriate descriptive responses when attempting to give an accurate description of the state of affairs in the environment, the individual can also learn to reissue them with an appropriate qualificatory phrase 'it appears to me', 'it looks to me', 'it sounds to me', 'it feels to me like' or 'as if it were so and so' which serve to warn the audience that this is not intended as a descriptive statement about an actual state of affairs in the environment.

Such statements are introspective in the sense that they provide information, not about the environment, but about the individual's own otherwise unobservable reactions to the stimulation impinging on his receptors. They give information primarily about the speaker's immediate unconsidered descriptive temptations that he is able to suppress. But they also provide information

about the immediate source of those descriptive temptations, the individual's conscious experience, which on the present hypothesis is to be identified with neural activity in Broadbent's limited capacity channel.

In my view this explanation accounts for the majority of those introspective statements made by human subjects which can properly be said to refer to conscious experiences. The only statements referring to the individual's own conscious experience, in the strict sense (i.e. 'consciousness of' as opposed to 'consciousness that') which remain unaccounted for are those in which particular somatic sensations such as pains, tickles, itches, etc., are referred to by name. I do not propose here to enter into a discussion of the thorny problem of how we learn to give names to this small group of conscious experiences for which we do have proper names. Nor do I propose to discuss other varieties of introspective statement such as those which mention the various interpretations or constructions that an individual is or was tempted to put on an actually or symbolically presented situation, or those which describe the individual's feelings or emotional reactions to his experiences. Suffice it to say that in my opinion whenever an individual makes what is misleadingly called an introspective statement or report, he is either (1) expressing his otherwise suppressed verbal temptations or (2) expressing in words his suppressed temptations to behave in some non-verbal way, or (3) making a statement whose meaning can only be learnt and explained by reference to statements which express such temptations.

If I am right in thinking that this theory can be developed so as to account, not only for all the information that human beings can provide about events and processes inside themselves that control their behaviour, but also for the fact that no other kinds of information about the process controlling behaviour are forthcoming from this source, and can do so without postulating an entity, the individual's conscious experience, which is something over and above Broadbent's limited capacity channel, we have, I suggest, on the analogy of the case of lightning and the electric discharge, all the evidence we need to satisfy us that consciousness and Broadbent's limited capacity channel, are one and the same thing.

Broadbent's limited capacity channel, however, is nothing more than a unit in a particular cybernetic model of how the brain must be supposed to function in order to account for certain features of human performance. It is not as it stands the name of any anatomically specifiable brain process. Nevertheless the fact that Broadbent found it necessary to introduce into a theoretical model of brain function designed to account for certain facts of human performance, an element

which has or can readily be supposed to have all the properties commonly attributed to human consciousness, makes it at least highly probable that there actually exists a part of the brain which is specialized to perform this particular function.

The physical location of consciousness

In fact, it is not very difficult, even for someone with as limited knowledge of such matters as myself, to indicate the general area in which a process answering to this description is likely to be found. The first point to be made in translating Broadbent's model in terms of the physiological and anatomical hardware is that the limited capacity channel, and hence, on the present argument, consciousness, is going to consist, not as Burt seems to think, in some special kind of electrochemical process at the molecular, atomic or sub-atomic level of analysis, but in a complex pattern of activity involving the excitation and inhibition of a very large number of individual neurones. This pattern of activity is going to be distinguished not so much by any special peculiarity of the way the neurones in question interact, but by the function it performs in the process whereby information is transmitted from input to output. Since, as we have seen, the limited capacity channel appears in the flow diagram with its input end at the output end of the filter mechanism and since one of its important functions is to select appropriate verbal behaviour on the output side, we would expect to find these relationships reflected in the anatomical lay-out of the brain.

Now there is considerable body of evidence that has accumulated in recent years which suggests that the functions attributed by Broadbent to his hypothetical filter mechanism are in fact performed in the brain by the reticular formation. We also know that the reticular formation plays an important part in the control of the general level of consciousness particularly the process whereby the individual is aroused from sleep. The evidence relating to the functions of the reticular formation has been reviewed by French (1960) and Lindsley (1960). It seems unlikely, however, that consciousness will turn out to be a process in the reticular formation itself. Consciousness, we have suggested, is the output from the filter mechanism, not the mechanism itself. It is something that is regulated by the reticular formation rather than something that takes place in that part of the brain. The reticular formation as a whole appears to perform a regulative function with respect to many parts of the nervous system, but in its capacity as a filter mechanism it is the control it exercises over the activity of the sensory areas of the cortex that is of most obvious importance.

Furthermore, if we consider the output side of the flow diagram our attention is again drawn to the sensory

projection areas of the cortex by the fact that the part of the brain most commonly implicated in speech and language disorders resulting from brain injury is part of the dominant hemisphere of the cerebral cortex which lies roughly midway between three important sensory projection areas, the visual area in the occipital lobe, the auditory area in the temporal lobe, and that for somatic sensitivity in the parietal lobe. One is tempted, no doubt naively, to think of consciousness as a wave of neuronal excitation converging on this critical area for the interpretation and production of speech from the sensory projection areas.

It may well be that future research will show that both the theory of introspection I have outlined and the tentative identification of consciousness with neural activity in the sensory areas of the cerebral cortex are wrong. It may be that evidence contradicting either or both theories already exists. This by itself would not prove that the mind-body identity thesis is false. For it would not preclude the possibility that some other physiological theory of introspection is true, or that consciousness is a process in some other part of the brain. Nor would it defeat my primary objective in developing these theories, which is to show that the so called mind-body identity hypothesis is something more than an elegant piece of logical sophistry attractive only to philosophers, that it is capable of generating empirically testable hypotheses, and can be tied into the relevant anatomical, physiological, psychological and logical facts more closely than any dualistic theory, such as the one advocated by Burt, could ever hope to be.

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