

More Brain Lesions

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I

As philosophers of mind we seem to hold in common no very clear view about the relevance that work in psychology or the neurosciences may or may not have to our own favourite questions—even if we call the subject ‘philosophical psychology’. For example, in the literature we find articles on pain some of which do, some of which don’t, rely more or less heavily on, for example, the work of Melzack and Wall; the puzzle cases used so extensively in discussions of personal identity are drawn sometimes from the pleasant exercise of scientific fantasy, at times from surprising reports of scientific fact; and there are those who deny, as well as those who affirm, the importance of the discovery of rapid-eye-movement sleep to the philosophical treatment of dreaming. A general account of the relation between scientific, and philosophical, psychology is long overdue and of the first importance. Here I shall limit myself to just one area where the two seem to connect, discussing one type of neuropsychological research and its relevance to questions in the philosophy of mind and the philosophy of psychology.

The work to be discussed is the study of people and animals with lesions to the brain—lesions that may be due either to the deliberate action of the surgeon or the experimental psychologist, or to the blind malice of bullets, accidents, disease, carbon monoxide poisoning, or (most commonly) strokes. I shall *not* examine the most famous kind of brain lesion, the sectioning of the corpus callosum in order to control severe and recurrent epileptic fits, in any detail. I avoid this not merely because it has been discussed already in the philosophical literature,¹ but primarily because the impact of this enormous lesion (several million nerve fibres are cut) is so drastic that it tends to oversimplify the issues with which I am mainly concerned. That remark needs explanation. The explanation is this: as is well known, the effect of commissurotomy surgery is to detach from each other the cerebral cortexes of left and right hemispheres; occasionally the hippocampal commissures are cut as well, so that the limbic system as well as the cortex is bisected; the two hemi-

1. See T. Nagel, ‘Brain Bisection and the Unity of Consciousness’, *Synthèse* **XXII** (1978), 396–413; R. Puccetti, ‘Brain Bisection and Personal Identity’, *British Journal for the Philosophy of Science* **XXIV** (1973), 339–355; and my ‘Consciousness and Commissurotomy’, *Philosophy* **53** (1978), 185–199.

spheres are then joined only at, and by, the brainstem. The result is then (earlier cortical insults permitting)² an individual with two intact and independently functioning half-brains. Under experimental conditions one can bring it about that the patient sees, hears, smells (not tastes),³ and experiences tactual sensations with only one hemisphere; and each hemisphere can, independently of the other, be induced to make inferences, judgments, choices, and even to experience emotional reactions, of which the other hemisphere is unaware. Hence, so long as each half-brain is undamaged, one can unproblematically ascribe the *work* of perceiving, hearing, smelling, thinking, choosing, etc., to either; for even though the left hemisphere is better than the right for some functions, and vice versa, both are capable of underpinning, independently of the other, many if not most of the sensory and cognitive processes. So the philosophically interesting question here seems to be rather what to ascribe *to* than what *to* ascribe: who should be the subject of a psychological ascription when the activity of a single hemisphere underpins the psychological phenomenon in question? It is notoriously difficult to say that the patient knows that he has a screw in his left hand when he claims that it is a matchbox; it is equally implausible to deny it, when his left hand will unerringly point to a picture of a screw when he is asked to pick out with that hand a picture-card of the object he has just held. Put crudely, we have 'knowledge' and we have 'ignorance', and we want to pin them on to something; were we to allow ourselves to ascribe psychological terms to half-brains,⁴ then one half would get the knowledge and the other half the ignorance, leaving us still uncertain about how to describe the *individual*. From there it is but a short step to wondering about the concept of personal identity. But the interest of lesions more circumscribed than the massive lesion of commissurotomy is slightly different. It is not that these different lesions provide us with labels that fail to fit neatly on to any of the parcels, as the commissurotomy lesion does; rather, the labels themselves tend to disintegrate. And since the 'labels' in this analogy are the trusted and important ascriptions of psychological terms, this is a major but slightly different problem from that posed by the radical split of commissurotomy.

I shall begin by describing some of the experimental findings, with at this point the minimum of comment; in the rest of the paper I consider some of the consequences for philosophy.

² They do not always permit. Commissurotomy patients, with a history of severe epileptic fits, frequently have some brain damage.

³ All tastes are experienced by both hemispheres together; these cannot be lateralized.

⁴ I shall argue later that psychologists can and should allow themselves to do this. *Prima facie*, however, it is at least mildly odd to talk of half-brains thinking, guessing, believing and so forth.

II

A good place to begin—because the results are so striking and illustrative—is with the rare but well-documented lesion that produces pure alexia. The lesion is one that destroys critical parts of the left visual cortex, thus rendering the patient blind to the right half of his visual field; in addition it cuts off the visual data from the right hemisphere's visual cortex from the language centres in the left.⁵ 'Pure' alexia is an inability to read that is not accompanied by agraphia, the inability to write; the patient can write either spontaneously or to dictation with little noticeable difficulty. He is able, too, to copy the words he cannot read; he does this less well, because he tends to treat the letters as shapes ('Z', for example, he might liken to a snake) rather than as letters.⁶ Unless there is further brain damage, he will be able to converse and understand spoken language well; he can 'read' words that are spelled-out by tracing them on his palm, or words constructed from blocks that he can feel with his fingers. If someone recites to him a string of letters that make up a word, he will be able to identify the word. What is even more disconcerting is that his reading disability may be confined to some but not all types of material. Hinshelwood had a patient who could not identify any *letters* on a chart—no matter what size print they were—but could read every *word* he was given, including long ones like 'stethoscope', 'telescope', 'infirmary', and 'electricity'. (This same patient could not write individual letters to command, either—but wrote home frequently to his mother)⁷. Slightly more common is the obverse of this—those who have no trouble reading letters, but who can recognize no words except the very common short ones, like 'and', 'of', or 'to'. Another patient of Hinshelwood's (reported by Gardner) was alexic for English, his native language, but who could read some French, more Latin, and Greek; thus 'grand' would be read as the French for 'large', and 'post' would get interpreted as the Latin for 'after'.⁸ It is well established that many pure alexics have no trouble with the reading of numbers, even if the numbers are written in Roman numerals; for example, 'DIX' would be interpreted as '509' but not as the syllable 'diks'.⁹ It is a

⁵ The cutting-off might be due to damage to the splenium (the lower end of the corpus callosum, across which visual data are transmitted), or it might be due to a lesion deep in the white matter of the left parieto-occipital junction. See N. Geschwind, 'The Alexias', in N. Geschwind, *Boston Studies in the Philosophy of Science*, XVI (Dordrecht: D. Reidel, 1974), 382–430.

⁶ *Ibid.*, 395–396

⁷ J. Hinshelwood, *Letter-, Word-, and Mind-Blindness* (London: H. K. Lewis, 1900), 69–71.

⁸ H. Gardner, *The Shattered Mind* (London: Routledge and Kegan Paul, 1977), 121.

⁹ *Ibid.*, 16.

disputed point whether or not pure alexics can ever read music.¹⁰ Since musical alexia is so widespread, and since pure alexia is a rare condition, the reports are inconclusive.

Not only do some forms of reading ability survive alexia; there is quite standardly an apparently distinct ability that nearly always falls with it. This is the ability to identify colours on sight. Nothing seems to be wrong with the patient's visual acuity, for he can match and sort colours; he has not simply forgotten their names, for he can describe and name the colours of bananas, the sky, blood, healthy grass, and traffic lights. It is just an inability to identify colours on sight, a disability that extends to his being unable to assent to the correct name when it is offered him. Other sorts of visual objects, such as pens, pelicans, or people, may be identified easily and accurately, even if they are obscure or poorly lit.

This brief sketch of pure alexia illustrates two complementary points. First, *prima facie* unitary capacities, such as 'can read', seem to disintegrate into a constellation of capacities of which some but not all may be preserved in brain-injured patients. Second, apparently distinct abilities appear to hang together in a manner that could not have been readily predicted, so that the capacity to name colours on sight seems to have more in common, neuropsychologically speaking, with the capacity to read words than does the skill of reading numbers, of 'reading' words by touch, or of writing. These two points are centrally important; to establish that they are not peculiar to reading alone, but instead impinge upon all the basic capacities of human beings and the higher animals, I shall list without much detail a selection of the effects that other sorts of brain lesions may have.

To illustrate the first point—that mental processes can disintegrate into a set of contributory functions which brain damage can impair selectively—we might look at vision, hearing, memory, and action.

(a) *Vision*. Patients with damage to the secondary visual cortex often prove unable to perceive complex wholes. They see and identify the individual constituents of a complex object, but find great difficulty in saying what it is, in visualizing it, or in drawing it from memory (they can copy a drawing of the item in question, but remain unable to say what it is that they have copied). A patient of Luria's declared that a picture of a pair of spectacles was a bicycle—a conjecture based on the circles, the cross-bar, and the projecting flanges;¹¹ a crab might be seen as a spider (because of the number of legs), and a telephone as a clock (because of the 'dial'). Drawings tend to turn into 'visual lists' of the constituent parts of the object depicted, in no sensible relation to one another. A different lesion, to the parieto-occipital or occipital zone of the right hemisphere, might selectively disrupt the ability to recognize faces—nothing else, just faces.

¹⁰ See Geschwind, *op. cit.*, note 5, 396–397.

¹¹ A. R. Luria, *The Working Brain* (Harmondsworth: Penguin, 1973), 10.

The patient will know that a face *is* a face, but whose it is, even if it is as familiar to him as his own, he is unable to say.¹² The visual processes provide a rich source of examples such as these.

(b) *Hearing*. Just as one can be alexic for words but can recognize all other sorts of things easily, so a lesion to the left temporo-parietal region can make a patient deaf to the sounds of speech. He may be acute of hearing in all other respects; indeed, a famous composer who after a stroke could no longer make out the sounds of speech clearly, continued to compose prize-winning works and assessed the compositions of his pupils.¹³ On the other hand a lesion to the *right* side can destroy musical hearing—the music becomes an undifferentiated vague noise—while leaving the patient normal for all other sensory input.¹⁴

(c) *Memory*. In the left temporal lobe we find a lesion that can prevent a patient from being able to retain in his memory a list of words if they are spoken to him (although his verbal hearing is normal enough), but does not debar him from remembering within standard limits of accuracy if he is permitted to look at a list of those same words.¹⁵ Lesions in the parieto-occipital area of the left hemisphere can cause the patient to forget the names of the objects, but not those of actions and properties.¹⁶

(d) *Action*. Damage to the left parietal area can inhibit not complex action, but only simple actions; a patient so injured may be quite capable of obeying a command such as ‘Stand up, turn around twice, and sit down’, but be lost if asked to clench his fist.¹⁷ A slightly different lesion in the same area may prevent the patient from being able to *mime* the use of a hammer, a comb, or a toothbrush, even though when given the implements he can use them appropriately; he could, for example, blow out a match but could not pretend to blow out a dead match.¹⁸

That will suffice for the time being as evidence that many human capacities tend to break down into constituent functions, which brain damage can selectively destroy. To illustrate the second point, that apparently distinct abilities tend to hang together in a way difficult to guess at *a priori*, we might look at lesions to the angular gyrus area. Despite a great deal of dispute in the literature, it now seems probable that there

¹² Gardner, *op. cit.*, note 8, 153–156; and B. Bornstein, ‘Prosopagnosia’, *Problems in Dynamic Neurology*, L. Halpern (ed.) (Jerusalem: Hebrew University Press, 1963), 132–164.

¹³ A. R. Luria, L. S. Tsvetkova, and J. C. Futer, ‘Aphasia in a Composer’, *Journal of Neurological Sciences* 2 (1965), 288–292.

¹⁴ *Op. cit.*, note 11, 142.

¹⁵ *Ibid.*, 297–302.

¹⁶ *Op. cit.*, note 8, 75–83.

¹⁷ *Op. cit.*, note 5, 207 and 319.

¹⁸ *Ibid.*, 319–320; and A. R. Luria, *Restoration of Function After Brain Injury* (New York: Macmillan, 1963), 92–93.

is such a phenomenon as 'Gerstmann's syndrome',¹⁹ caused by damage to the left parieto-occipital area. Victims of this syndrome have five distinct disabilities: they cannot identify their fingers (i.e. they cannot point to or waggle the index finger on command, or say which finger on one hand corresponds to one that has been touched on the other); calculating is done laboriously and badly: so is writing; 'right' and 'left' are easily confused, though 'up' and 'down', 'in front' and 'behind', are understood; and they are very poor at constructional tasks.²⁰ Other functions are unhindered. Another example: destruction of a part of the parieto-temporal zone may produce a disability that cuts across audition, vision, and cognition; for it appears to destroy or impair the capacity to grasp relations, whether these be visual (above–below), auditory (whether one noise is louder than another), grammatical (the difference between 'brother's father' and 'father's brother'), conceptual (the relation between 'horse' and 'animal'), temporal (before–after), or mathematical (the patient cannot do additions and subtractions).²¹ A final example: damage to the amygdala in monkeys very frequently produces a combination of hypersexuality, reduced aggressiveness, and an inability to recognize familiar objects.²² Many more examples could be given; but the point has been made clearly enough. We can now turn from narrative to assessment.

III

The philosopher's interest in these matters is about equally divided between his philosophy of mind and his philosophy of psychology. Both are profoundly affected. The findings from lesion studies seem above all to call into question the adequacy of our structure of mental concepts—the everyday terms and the tacit inferences and presuppositions that we make when describing the experience and behaviour of ourselves and others. Our common or garden descriptions, predictions, and explanations of human behaviour, couched in our vernacular mental terms, are adequate most of the time to account for the doings of most people, and can be ascribed in a fairly unproblematic way: he sees the ship, she recognizes the third person from the left in the photograph, he can read, she knows

¹⁹ J. Gerstmann describes 'his' syndrome in 'Zur Symptomatologie der Hirnläsionem im Übergangsgebiet der unteren Parietal und mittleren Occipital wendung', *Nervenarzt* III (1930), 691–695.

²⁰ See N. Geschwind, 'Developmental Gerstmann Syndrome', in *op. cit.*, note 5, 370–381.

²¹ See A. R. Luria, *Human Brain and Psychological Processes* (New York: Harper and Row, 1966), 91–92; and his *op. cit.*, note 18.

²² E. S. Valenstein, *Brain Control* (New York: John Wiley & Sons, 1973), 131–143.

what is in her hand. Although we may often lack evidence for the truth of these psychological ascriptions—we may not know whether he has yet seen the ship or not, or whether she does indeed recognize the third person from the left—we share, in general, the conviction that there is some fact of the matter: either an ascription of a given psychological term is true, or it is not. In fact, it is just those cases where the laws of excluded middle or non-contradiction seem to fail us that have hitherto presented us with substantial problems—examples would be self-deception and akrasia. In short, we treat our attributions of psychological terms as either-or, yes-no matters, and if and when they prove not to be, we discover a new philosophical problem.

If this is correct, then brain lesions provide considerable problems; our otherwise trustworthy concepts (the vernacular mental terms) prove wholly inadequate to describe patients or animals with brain lesions. For instance, it is not simply *unknown* whether Luria's patient, who looked at the picture of the spectacles and pronounced it to be a picture of a bicycle, 'saw' the spectacles or not; it is, further, that the question itself seems to lack sense or profit. There is no 'fact of the matter'—at least, no interesting, non-arbitrarily imposed, 'fact'; all that we have is the simple narrative of his reactions to the picture. Did the patient cited by Gardner read the symbol 'DIX', or not? In a sense he did, and in a sense he didn't; what is interesting is what he could and could not do—the general question, 'Can he read?' is neither interesting nor useful, inasmuch as we can defend either answer by stipulation, but neither by appeal to the ordinary application of the term 'read'. A slightly different problem: does the pure alexic who cannot say what colour the colour-chip before his eyes is painted fail to *see*, fail to *name*, or fail to *recognize*? Here too a distinction and a description that works well enough in ordinary circumstances ('I know him perfectly well, but can't for the moment remember his name') seems more or less irrelevant, and our conviction that his failure must be a failure of one or another capacity is fuelled only by our rooted belief that either he can recognize or he can't, either he knows the name, or he doesn't. Somewhat as a bar of chocolate divided and wrapped as eight segments is hard to divide equally among an odd number of recipients, and is hard to divide precisely because we have to overrule and ignore the division imposed by Cadbury, so the everyday psychological vocabulary fails to divide among patients with many of these brain lesions. For when we come across one of these brain-injured patients, the facts of their behaviour clash with our intuitions of what is right and proper—our intuitions, for example, that a man who can see and can write, can read; that an educated man who can read a foreign language can read his own; that a sighted man who can recognize objects by touch will be able to recognize them by sight; that anyone who can obey the order 'assume the stance of a boxer' can obey the order 'clench your fist'; that if there is no motor paralysis anyone who can identify his toes should be able to do the

same with his fingers. Intuitions such as these support our ordinary ascriptions of 'can read', 'knows the name of', 'recognizes', 'understands', and the like, and hence, when these intuitions clash with the facts of a patient's experience and behaviour, the ascriptions they justify are thrown into doubt. So, when confined within the limits of the everyday mental vocabulary and reasoning from the supporting background of our folk psychology, we find that these patients present an intractable problem: one cannot understand how they can behave as they do, and there seems no unproblematic or unparadoxical way of describing what it is that they *do* do.

To loosen these constraints—to step out of the conventions of ordinary language usage and to suspend our intuitions and presuppositions about just what sets of abilities do or don't go together, is simply to *abandon* the problems mentioned above. For as soon as neuropsychological fact and theory come into play, the behaviour of these patients is no longer odd; the anomalies are explained. If, for example, the theory holds that numbers are mastered along with, and by means of, strong somaesthetic reinforcement (counting on one's fingers), then it is much less peculiar that finger agnosia is regularly accompanied by acalculia; if a lesion disrupts the secondary visual cortex, and the theory entails that this area is largely responsible for synthesizing discrete visual cues into a complex Gestalt, then it is quite predictable that a patient will be able to recognize a pair of spectacles by touch but not by sight. Once one observes that colours are by their very nature named and learned only by sight, and have no associations of any great power with the other sensory modalities, then it is perfectly intelligible that the lesion responsible for pure alexia can also cause colour-naming difficulty; for both printed words and colours have to be identified exclusively by sight, but the lesion has destroyed the channel between the functioning visual cortex and the language centres. Other sorts of visual object, such as a hammer, an animal, or printed numbers *can* still be visually recognized, however, since (the theory tells us) the visual data from such things will arouse tactual or auditory associations in other parts of the right hemisphere, from whence the message can travel by intact channels to the language centres in the left angular gyrus.²³ Given neuropsychological theory, the behaviour of brain-damaged patients becomes predictable and intelligible.

What then happens to our conflicting philosophical intuitions about the oddity of these patients when we are told how, in terms of the scientific theory, the peculiar combinations of abilities and disabilities can be explained? Evidently these intuitions will not just go away; nor, given that most people most of the time do not behave like these patients, should we try to make them go away. But these findings might modify our *attitude towards* these intuitions when we reflect upon the reasons why

²³ N. Geschwind, 'Acquired Disorders of Reading', in *op. cit.*, note 5, 14,

neuropsychologists do not have a problem (whether they realize this or not), whereas the layman does. For the first move of the psychologist—an essential move, if he is doing science at all—is to dismiss many of the intuitions, conventions, implications, and presuppositions which, by providing a rough but capacious background prescientific ‘theory’ of human behaviour, partly constitute the meaning, and always help to determine the application, of vernacular mental terms. In place of this background he must substitute the controlling surround of the explicit scientific theory to which he subscribes, a theory which is the analogue to the implicit ‘theory’ embedded in vernacular linguistic habits, but which differs from it both in systematic rigour and in scope—in scope at least partly because it must undertake the responsibility of explaining human *malfunction* as well as normal functioning. This theory will then determine what is or is not predictable or anomalous, usual or peculiar; and also will determine the meaning and the application of the terms that comprise the conceptual framework of the theory. Thus, for example, the psychologist may need to have a concept of perception that (a) includes in its range the phenomena of dreaming, visualizing, hallucinating, and illusions—ignoring the common vernacular constraints that tend to limit ‘see’ to the ‘got-it’ viewing of public objects—because his theory requires that these phenomena should be analysed together; and which (b), tolerates its own dissection into the networks of interlocked capacities that the theory postulates—ignoring the everyday assumption that seeing is a simple and unitary matter. In short, neuropsychological theory does not claim that the *everyday* notion of perception includes the phenomena of dreaming or hallucinating, nor that *it* is composed of a constellation of contributory theoretical functions which complex cerebral structures underpin; it is the psychologist’s technical concept that is shown, by lesion studies *inter alia*, to be thus intricately constructed. Analogously, it is not the everyday notion of memory that neuropsychology examines. We laymen distinguish sharply between memory and belief, a refinement that the scientist, deploying his concepts of information storage and information retrieval, seems neither to want or need; and we divide memory up in ways that he may not need to follow. For example, we find (for good and sufficient reasons) the distinctions between remembering that *p*, remembering *X*, and remembering how to ϕ , important, but the psychologist may ignore *these* categories and substitute his own—postulated theoretical functions controlling, perhaps, the short-term storage of numerical data, or the medium-term storage of visual data, and many more besides (a recent psychological treatise on human memory postulates no fewer than twenty-five types of memory storage system).²⁴ It is for just this reason, that the

²⁴ See P. J. Dunham, *Experimental Psychology: Theory and Practice* (New York: Harper and Row, 1977), 142–143.

scientist can create his conceptual apparatus (largely by adopting and then denaturalizing vernacular terms) and can allow the links, entailments, and presuppositions between these terms to be determined by the theory whose *raison d'être* is to remove unintelligible anomalies, that the only problems a psychologist has in understanding behaviour reflect *not* a genuine paradox, but a deficiency in his current theory. So of course he dodges the philosophical problems:

Science has a distinct advantage over other fields of verbal communication; whenever the going gets rough and terms seem too vague or fail to communicate adequately, it can coin new terms and avoid many purely verbal problems. This method of escape is usually chosen when the natural tendency of vernacular terms to lose precision and to become applicable to many unspecified situations proves too cumbersome.²⁵

The distinction between vernacular mental terms and scientific psychological ones—which I shall now for convenience label as ‘mental’ and ‘psychological’ respectively—has been little emphasized in the literature. Indeed, it will at times appear to be an unreal distinction; for, by and large, what the psychologist calls ‘reading’, ‘remembering’, ‘perceiving’, ‘feeling pain’ and the like will accord with lay intuitions. But even if the distinction is not always self-advertising, it is always there. We are familiar enough with the fact that terms like ‘force’, ‘mass’, and ‘energy’ do not behave in science in quite the ways that they behave in ordinary language; but they have been baked in the physicist’s theoretical kiln so thoroughly, and the theory that surrounds and locates them is so well worked-out, that we do not attempt to dispute their legitimacy. Psychological terms should be seen in the same light, never subject to criticism because they fail to accord with linguistic intuitions as to their correct use. The temptation to overlook this point is due, probably, to the fact that we have a great need to do our own quasi-psychological theorizing in order to get along with the people we meet, and so tend to muddle this everyday proto-science with experimental and systematic psychology; moreover there is no question but that psychological theory is not an integrated system that commands allegiance from all participants, but is instead at present a loosely related network of partial micro-theories, whose proponents are by no means always clear themselves about their freedom from the constraints of ordinary language. But the distinction is nevertheless real enough, as lesion studies make apparent; to deny this is, in effect, to deny the status of a science to psychology.

All this makes for a curiously uncomfortable situation. How genuine are the philosophical puzzles and paradoxes arising from the behavioural

²⁵ G. Mandler and W. Kessen, *The Language of Psychology* (New York: John Wiley and Sons, 1959), 79.

oddities of brain-damaged people? For if what has been said holds true, it looks as though they are entirely untouched; and yet they simply do not exist as puzzles or paradoxes to the neuropsychologist with an adequate theory of brain function. Can a philosophical problem be genuinely interesting when it dissolves so readily in scientific hands? As well as the dilemma posed to philosophy by the lesions so far mentioned, one can cite two different philosophical problems that are in a similar situation.

(a) The philosopher's difficulty with commissurotomy patients is primarily a problem of describing the conflicting abilities of these people in a manner that makes their behaviour intelligible in the light of our implicit working theory about how people in general behave. If we ascribe the conflicting psychological terms to two minds, two hemispheres, or two people,²⁶ then that problem dissolves—only to engender others: the relation of the single patient to his two hemispheres, his two minds, or his twinning, and the legitimacy of ascribing mental terms to anything less than a person. Scientists do not have any of these problems (even though they may think that they do) because there is nothing that need compel or even lure them away from ascribing *psychological* terms, however complex, to structures so exceedingly sophisticated and intricate as whole half brains. They need pay no attention to the vernacular taboo against ascribing terms like 'sees', 'hears', or 'understands' to anything less than a person,²⁷ so long as such characterizations suit the theory. These ascriptions are tolerable because, since they are ascriptions of highly complicated abilities to equally complicated structures, one can rely upon the fact that they will only be needed at a very molar level in the study of the brain; as one analyses the phenomena into their constituent functions, and the half brains into their constituent structures, even the appearance of illicit mentalizing disappears. Crudely: the commissurotomy patient is 'normal' to the psychologist just so long as he behaves in ways thought thoroughly 'abnormal' by the philosopher.

(b) A second striking example of this combination of philosophical tangle with scientific straightforwardness is the mind–body problem (called by neuroscientists the 'brain–mind problem'). I have discussed this at length elsewhere,²⁸ so shall here offer only a brief summary of the salient points. Neuropsychology cannot find for itself a mind–body *problem*, for two main reasons. (1) The dichotomy between mental and physical, once translated into the dichotomy between *psychological* and

²⁶ It is Puccetti (op. cit., note 1) who goes so far as to talk in terms of two persons coexisting in a single body.

²⁷ *Mutatis mutandis*, the same freedom belongs to workers in artificial intelligence describing the powers of their machines. For further discussion, see my 'Anthropomorphism and Analogy in Psychology', *Philosophical Quarterly* **XXIV** (1974), 126–137.

²⁸ In *Physicalism* (London: Routledge and Kegan Paul, 1978).

physical, vanishes. For the step-by-step progression from the psychological (the molar level of analysis) to the neurophysiological (the micro level) requires a journey through the realm of the less molar and the less micro—the realm of neuropsychological functions and structures—which are described in *neuropsychological* terms; and neuropsychological terms are neither, or perhaps both, psychological and neurophysiological. For neuropsychology overlaps and indeed *is* psychology at its molar end, and cannot be distinguished from neurophysiology at its micro end; in the middle it may employ terms that smack of one rather than the other, but the question, ‘Is this concept psychological or not?’ is as boring as is the same question in a different guise, ‘Is neuropsychology a branch of psychology or not?’, and for the same reasons. Hence the dichotomy in terms of which the mind–body problem is posed has vanished. (2) Psychology and neurophysiology, if seen as lying at the molar and micro poles, respectively, of the science of neuropsychology, are made to meet precisely because the whole point and the whole endeavour of neuropsychology is to get them to do so. Each of the two, psychology and neurophysiology, must of course provide a theory to explain adequately and systematically the behaviour of the entities in its own domain (human beings on the one hand and neural happenings on the other); but each has too an important second constraint. For psychological theory must in addition be cast in terms of concepts which are such that the capacities they pick out tolerate dissection into constellations of contributory, theoretically postulated functions which cerebral structures might realistically be expected to perform, while, conversely, neurophysiological theory must identify and explain just those operations of the brain that fulfil the theoretically postulated psychological functions. To regard each science as bound by both these constraints (to explain in its own domain and to provide explananda or explanantia for the other) is just to leave no room for the mind–body problem; the ‘problem’ is begged in advance. Philosophy, on the other hand, has a real problem, inasmuch as it assumes at the ‘mind’ end descriptions of human experience and behaviour that are couched in, and classified by, the vernacular mental vocabulary, and which are therefore intolerant of dissection into the categories of neuropsychology; and it is evident that *this* problem is insoluble. It is insoluble for just the same reasons that make it impossible for particle physics to reduce a set of objects such as ‘alarm clocks’ to the micro-entities and processes of its domain.

This situation—in which we have puzzles that are both philosophically insoluble and scientifically non-existent—is surely highly uncomfortable. There are various possible ways of reacting to the discomfort: one is to maintain that the scientific explanations reveal the philosophical dilemmas to be mere muddles which dissolve in their light; another is to argue that all we have here is a simple proof of the fact that scientific findings and theories have no bearing upon philosophical problems. The latter is the

cop-out answer, leaving the proponent of the view with the problem only of saying what if anything *could* constitute any kind of answer to the philosophical puzzles; the former looks implausibly quick. Presumably some compromise position is required. Any such compromise would require a full account of the relation of vernacular terms and folk psychology to scientific terms and experimental psychology; in the final section I try to provide, not this desired account, but at least some considerations that must bear upon such an account.

IV

If we look at vernacular concepts and everyday descriptions *vis-à-vis* some different sciences, there seem to be at least two relations in which ordinary usage can stand to scientific theory. One obvious one is the relation of benign coexistence that characterizes, for example, objects on the one hand and their constituent parts on the other. Whirling clouds of molecules, or at a deeper level protons, neutrons, and electrons, constitute this table, this pen, this paper; and the micro-entities don't quarrel for room with the medium-sized samples of dry goods that abound in the visible world. Only the extreme reductive metaphysician will discover deep problems stemming from the respective degrees of reality of atomic entities and tables; such metaphysical headaches aside, the relation of constituents to constituends is unproblematic enough. It is worth noting, too, that not only are there no law-governed relations or links between objects like tables and micro-particles, but neither do philosophers bother about *this* sort of anomology. There should of course prove to be laws relating micro-entities to such natural kinds as wood of various sorts, and some metals (via the intermediary stages of atoms, molecules, and so on), and tables can be made of wood or metal; but tables themselves do not comprise a natural kind in any science, and disassociate themselves from the unified scientific portrayal of the world and its contents.

The second type of relation between vernacular usage and scientific theory comes into play when everyday terms do purport to pick out natural kinds. When this is the case, science moves in to correct and refine. No organism is a dolphin unless it is a mammal; in a world including both dolphins and dolphin-like fish, zoological theory would adjudicate and rectify the layman's descriptions, declaring him to be wrong if what he calls a 'dolphin' is in fact a non-mammal. Similarly, we are wrong if we call anything that is not H₂O 'water' (allowing a certain latitude for impurities). The scientist here has the last word; even if we cleave to our inaccuracies for various pragmatic purposes (there is an obvious sense, as

Quine points out,²⁹ in which the marsupial mouse is much more mouse-like than kangaroo-like, *whatever* the zoologist may say), they remain, strictly, inaccuracies.

These reflections advance us some distance, but not far enough. For there are problems in fitting the mental–psychological relationship on to either model of the vernacular–scientific connection. It may seem at first sight as though the constituents–constituends model fits perfectly, for neurophysiological processes may in fact ‘constitute’ hearing (mental), and if they did, would not do so in any law-governed manner (as I have argued above)—and this is indeed parallel to the way in which micro-particles irregularly constitute tables. But the trouble with this solution is that constellations of neurophysiological processes *also* ‘constitute’ hearing (psychological), and do that in a law-governed way. So we seem to end up with hearing (M) and hearing (P), competing for room *at the same level*, and each claiming adequacy for the task of describing and explaining human behaviour—they conflict in the same domains.

This tempts one in the second direction, i.e. to regard the vernacular mental as something subject to correction by the scientific psychological, rather as an everyday concept of dolphin that included dolphin-like fish would compete with, and succumb to, the rival zoological classification that decreed dolphins to be a subclass of mammals. But again matters are not that simple. There is no sufficiently clear notion of a natural kind in psychology—at least not as yet—to be useful; and, in any case, the cost of bringing our vernacular mental concepts into line with the psychological ones is considerably too great to pay. The fact is that we need them as they are; for even if they are less than ideal for the purpose of describing and explaining in a *systematic* way the capacities and incapacities of people in general, they are irremediably essential for the regular and recurrent necessity of describing, predicting, and explaining the unique actions and reactions of specific people in particular circumstances, something that scientific psychology does not purport or want to do. Moreover, unlike psychological terms, our mental concepts are required for countless purposes other than the restricted scientific concern with description and explanation: we need them to warn, urge, condemn, praise, entreat, threaten, condole—and the list could run on indefinitely.

So it appears as if the coexistence of the two is a brute necessity; and their peaceful coexistence is evidently a desideratum. The price of peace is, I think, to concede to science superiority in the systematic descriptive and explanatory tasks, while maintaining for the vernacular the pre-eminence in the task of accounting for the particular behaviour of a specific individual on a given occasion; and, inasmuch as our judgments of reality must

²⁹ W. V. O. Quine, ‘Natural Kinds’, in his *Ontological Relativity and Other Essays* (New York: Columbia University Press, 1969), 128.

prefer entities that can be fitted in to a unified picture of the world to entities competing over roughly the same range that do not, to retreat from any strong realism about the mental. We have done this before, of course, in particular cases; compelled both by philosophical arguments and by scientific considerations we have, generally speaking, stopped regarding 'the will' as a mental faculty, or 'willing' as a mental event; and most contemporary philosophers are reluctant to assert that there exist such items as sense-data. (It is worth noting that Aristotle used no concepts that translate even roughly as 'will', 'willing', or 'sense-datum'.³⁰ Whatever one's views about Aristotle's philosophical psychology, this shows at least that some of our intuitions about mental reality come in to, and go out of, fashion.) Such a retreat from realism would not in fact be a substantial or a significant retreat (it is not like giving up a belief in the reality of chairs, chewing gum or chess boards). Ordinary language does not supply or suggest any consistent picture of the ontological status of mental phenomena—it reifies mental images, for example, but also talks of the activity of visualizing, it refers indifferently both to thoughts and to thinking—and the philosophical analysis of mental concepts has not, by and large, smoothed out the inconsistencies into a coherent account of the categories and the status of mental entities of various sorts. Indeed, philosophical analysis has instead tended to emphasize just how misleading the grammar of the mental can be if we *are* bewitched by the ontological hints of common locutions—if, for instance, we model the expression 'there's a pain in my foot' upon such a locution as 'there's a beetle in my box'. To allow psychology to discover and determine the ontology of the mind is to give up very little indeed, and helps to clear the ground for an examination of the mental that is less hampered by the trammels of existential questions.

The other concession to scientific psychology—that it is superior in the *systematic* descriptive and explanatory tasks—is also no concession to regret. Folk psychology does not purport to explain fundamental and pervasive human capacities that are common to all men (how many generalizations about human behaviour has lay wisdom provided that are not proverbial or trivial?). It does however undertake, as no science could, the description and explanation of the behaviour of specific individuals (of people with unique characteristics, backgrounds, and beliefs) in highly specific circumstances (which can be indescribably complex and well-nigh unrepeatable),

³⁰ When Aristotle says (in the *Nicomachean Ethics* III, 1) that the voluntary agent is one who has the *archē* in himself, to act or refrain from acting, this '*archē*' is not the will. It picks out what we need to cite to explain the action—i.e. the agent himself, with his plans and beliefs, rather than a blow or a gust of wind. As for 'sense-datum', the rare form '*aisthemata*' (the nearest Aristotle ever gets to 'sense-datum') never means a private or inner object of sight in the discussion of perception.

and is superbly equipped for this task—a task that is essential if we are to cope with the complex social situations that confront us. But a vital heuristic for this endeavour is the ruling assumption that people do, *ceteris paribus*, behave in the way that a normal person, normally rational, would behave. In short, our folk psychology relies upon what Dennett has called the ‘Intentional stance’;³¹ we treat people as Intentional systems and ascribe to them unreflectingly the necessary equipment that Intentional systems must possess in order to act intelligibly. If this is so, then the anomalies caused by various brain lesions are *of course* not explicable from the viewpoint of folk psychology; to comprehend these failures of normal functioning we have to drop the Intentional stance in favour of the ‘design stance’—whereby we examine the functional organization of the system, so as to discover where the abnormality arises—or even to the ‘physical stance’—whereby we examine the structural realization of the design. Once we drop the Intentional stance in favour of either the design or the physical stance, we have turned to a systematic scientific analysis of the system. To complain that the behaviour of brain-damaged patients is paradoxical from the viewpoint of ordinary language is strictly parallel to the complaint of a chess player that the moves of his damaged computer opponent cannot be understood in the way that chess moves are standardly understood; only the programmer or the technician will be able to grasp why the computer is behaving so oddly.

In sum: our mental concepts in general apply to, and have to be understood in terms of, normal and paradigm cases. They let us down when we are puzzled by the abnormal; but this failure is, I have argued, inevitable. However, the abnormal—whether found in the actual cases of brain-damaged patients, or constructed from the imaginations of philosophers—is of the first importance in enabling us to plot the scope and range of the vernacular. To reflect upon the reasons why pure alexia (for example) is paradoxical helps us to see how our mental concepts *usually* hang together; to reflect upon the reasons why scientists find nothing peculiar about the phenomenon helps us to discover in greater depth the intricacy of the connection between scientific and philosophical psychology.³²

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³¹ D. C. Dennett, ‘Intentional Systems’, *Journal of Philosophy* **LXVIII** (1971), 87–106.

³² Earlier versions of this paper were read at the universities of Ottawa and Western Ontario, and I am most grateful for the comments and criticisms in the ensuing discussions. I am also indebted to Tom Nagel for his helpful remarks.