Patricia Smith Churchland.
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Critical Notice[1]

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Professor Churchland's book is the most recent contribution to what has become an extensive philosophical literature advocating the materialist or identity view of the mind-brain relation. This philosophical literature stretches back thirty years to my own paper 'Is consciousness a brain process?' which appeared in the *British Journal of Psychology* in 1956. In view of the coincidence between the thirtieth anniversary of my paper and the publication of Professor Churchland's book, it seems not altogether inappropriate that I should devote this essay to an examination of some of the similarities and differences between the position for which Churchland was arguing in 1986 and that for which I was arguing in 1956.

To begin with the similarities, the most striking of these is the agreement between us in thinking that the issue concerning the mind-brain relation is at least in part an empirical issue to be decided in the light of, if not by, research in what are known these days as the neurosciences. Indeed, the whole of Part I of Professor Churchland's book is devoted to what to the eyes of a comparative layman in such matters appears to be a truly excellent survey of the present state of empirical research in this rapidly developing field of scientific enquiry. In this respect we are both of us very far removed from the position adopted by Donald Davidson in his well-known paper 'Mental Events' of 1963. Davidson not only bases his case for his version of materialism on a purely *a priori*

[1] This critical notice was commissioned by the editor of the *Quarterly Journal of Philosophy* in 1986 when the book first appeared; but since it was not completed until four years later in 1990, it was never submitted. It was revised in 1999 in anticipation of a meeting with Pat Churchland in Siena, Italy, in October of that year. The only substantial changes are to the second paragraph on p. 13 which has been rewritten.

argument; he uses as one of his premises (or is it a conclusion?) a proposition which holds that there are no psycho-physical bridge laws. The adoption of this principle has the effect of rendering all the empirical evidence of psycho-physical correlation which Churchland surveys in her book entirely irrelevant to the truth or falsity of the materialist view.

But while we are agreed in thinking that the empirical evidence is relevant to the issue of the mind-brain relation, this is where the similarity ends and the differences begin. The most striking of these is the very different conceptions we have of the role of the philosopher in relation to empirical scientific research. Written in the early 1950s during the heyday of ordinary language philosophy, 'Is consciousness a brain process?' was profoundly influenced by that philosophical tradition and by Ryle's *The Concept of Mind* in particular. Indeed, I presented the materialist thesis not so much as an alternative to, as closing a gap in, Ryle's behaviourist theory of mental concepts which Ryle, on his own admission, had not been able convincingly to fill.

Now one of the fundamental dogmas of ordinary language philosophy, as Churchland clearly recognises in her repudiation of it, is that a sharp distinction is drawn between empirical issues which are the concern of empirical scientists and other specialists, such as historians, who are concerned with the determination of matters of fact, and conceptual issues, conceived as issues concerning the meaning of the words and sentences of ordinary language, which are the province of the philosopher. When I wrote 'Is consciousness a brain process?' I knew perfectly well that, in terms of what was then accepted as the line of demarcation between philosophy and empirical science, in arguing that the materialist thesis is a straightforward scientific hypothesis to be decided in the light of empirical evidence, I was proposing that the mind-body problem should no longer be regarded as a purely conceptual and, hence, philosophical issue, and should be handed over to specialists in the neurosciences to be resolved by empirical research. After all problems about the creation of the Universe have ceased to be an issue in theology and philosophy and have become instead an empirical issue to be decided by astronomers, physicists and mathematicians on the basis of observation, measurement and calculation. Why should the mind-body problem be any different?

It is a curious fact that when confronted with the suggestion that the mind-body problem should be handed over for solution by the neuroscientist, philosophers have fought very much harder to retain their stake in this problem than they have done to retain their stake in deciding issues concerning the creation of the Universe. During the first decade of its existence as a recognised philosophical position on the mind-body relation, most philosophers who commented on the mind-brain identity thesis sought to refute the thesis by relying on an *a priori* argument which purported to show that the alleged identity contravenes Leibniz's Law of the Identity of Indiscernibles. But the same reluctance to accept that the mind-body problem is an empirical issue was to be found amongst those philosophers who argued in favour of the identity view. Thus in his defence and elaboration of the identity thesis in his 1959 paper 'Sensations and brain processes', J. J. C. Smart went out of his way to criticise my suggestion that the thesis should be regarded as an empirical scientific hypothesis; and, as we have already seen, Davidson's token-identity version of the thesis effectively makes all empirical evidence of psycho-physical correlation irrelevant.

One thing both the philosophical critics and the philosophical advocates of the identity thesis were agreed upon was that the issue of the mind-brain relation is a purely conceptual and philosophical issue and not an empirical one. In this respect, Churchland's position is very different both from that of her philosophical predecessors and from my own position. She wants to maintain that the mind-brain relation is an issue to be decided in the light of empirical evidence; but this, she maintains, does not in any way threaten the philosopher's claim to be the final arbiter in such matters.

She is not, of course, suggesting that the philosopher should herself engage in experimental or clinical research. The philosopher, as she conceives the matter, is an expert in the kind of "top-down" theorising which is needed to integrate the vast quantities of confusing detail in which the empirical evidence in this area largely consists. The philosopher's role is to grasp the shape of the wood where the working scientist sees only the trees. Nonetheless, the data which the philosopher has to interpret, on this view, is empirical data and the enterprise to which she contributes is the enterprise of empirical neuroscience. This view of the role of the philosopher in relation to the mind-body problem is in evident conflict with the view of the ordinary language philosopher for

whom, as Churchland points out, the role of the philosopher is strictly confined to issues of a conceptual and linguistic nature. It follows that, in order to defend her view of the philosopher's role and "neurophilosophy" as a legitimate philosophical enterprise, ordinary language philosophy and all its works has to be repudiated. Besides denying the philosopher the right to meddle in empirical matters, ordinary language philosophy is also accused of committing another heinous crime, that of conceptual conservatism. As Churchland sees it, ordinary language philosophy is committed to rejecting the kind of conceptual innovation which is essential to the progress of science on the grounds that it offends against the canons of polite usage governing the kind of conversation to be heard at the High Table or in the Senior Common Room of an Oxford college.

In considering these criticisms of conceptual analysis and the philosophy of ordinary language, it must be conceded that, as a matter of historical fact, the philosophers in this tradition such as Wittgenstein in his later years, Ryle, and Austin thought of philosophy as an activity with a greater affinity to literary and humane studies than to empirical science and that they regarded the attempt by psychologists to construct a natural and empirical science of the mind with profound suspicion and contempt. It must also be conceded that the techniques of "conceptual analysis" which they deployed were better adapted to throwing light on existing ordinary usage than to assisting the scientist in the process of conceptual innovation. It was also part of their view that failing to respect the canons of ordinary usage, when words and expressions are taken outside their normal context of use, is a potent source of conceptual confusion.

Nevertheless, to claim, as Professor Churchland does,

(a) that conceptual analysis has no application to empirical scientific enquiry and

(b) that ordinary language philosophy is opposed in principle to any kind of conceptual innovation,

is surely wide of the mark.

While it may be true that the techniques of conceptual analysis have never in fact been applied to the elucidation of any concepts other than those embedded in ordinary language, there is no reason in principle why the same techniques should not be applied to the elucidation of the

concepts embedded in the technical language of the empirical sciences. The reason why this has not in general been done is simply that one of the essential features of conceptual analysis is the use that is made by the conceptual analyst of his or her own linguistic intuitions as a fluent speaker of the language in which the relevant concepts occur in deciding what it is or is not natural or correct to say in this or that hypothetical context; and it so happens that those who have practised conceptual analysis in the past have not in general been fluent speakers of the technical languages of empirical science. The notable exception here is Wittgenstein himself who began his academic career with a degree in Engineering. But apart from his lifelong interest in the philosophy of mathematics, one looks in vain in his later writing for any trace of the facility which he must have possessed to speak the language of applied science. In general, those philosophers in the analytic tradition who have had a thorough training in the natural sciences have followed Frege, Russell, and Quine in seeing the role of the philosopher in relation to those sciences, not in terms of the conceptual analysis of existing scientific concepts, but in terms of the replacement of those residual features of scientific language which have their roots in ordinary discourse by a purely formal logical calculus.

Likewise, the contention that ordinary language philosophy is opposed in principle to the kind of conceptual innovation which is required for the development of new scientific theories and hypotheses has a substantial basis in the claim by the philosophers of ordinary language that failure to pay attention to the way the words and expressions of ordinary language are used when, to use Ryle's expression, they are "on duty", i.e. being used to describe or otherwise characterise concrete events or states of affairs, is a potent source of conceptual confusion, and that such confusion could be avoided by paying close attention to how we naturally and ordinarily talk. However, to interpret this as placing a ban on any kind of deviation from the canons of ordinary language is surely mistaken. Indeed, it is arguable that had psychologists paid much closer attention to the way we ordinarily talk about matters psychological they would not only have avoided "the barrenness and confusion" of which Wittgenstein complains in the closing paragraphs of the Investigations, their conceptual innovations might have been correspondingly more productive. By allowing the psychologist to discard those features of common sense psychology which are irrelevant from the

scientific standpoint, it might have enabled the psychologist to bring into focus those features of ordinary language which provide us with useful insights into the way in which behaviour is controlled by what Churchland calls "the mind-brain".

In Chapter 7 of her book, Professor Churchland tries to justify her repudiation of the notion that the philosopher's job is conceptual analysis by means of a somewhat tendentious reconstruction of the recent history of the philosophy of science in North America. According to this account, the view that a sharp distinction can and should be drawn between conceptual and empirical issues is a hangover from logical positivism or "logical empiricism", as it was called by Feigl, after he and Carnap had migrated to the United States. Churchland mentions two doctrines associated with logical empiricism as being important in this connection:

(1) the doctrine that logical and analytic truths, including the truths of mathematics, are tautologies which merely "express conventions of language" (p.254), and

(2) the doctrine that factual sentences are true in so far as they are reducible to an actual set of observation sentences describing the private sense data of an observer and are meaningful only in so far as they are reducible to a possible set of such sentences.

These doctrines of Logical Empiricism, she argues, are no longer tenable, an insight which she attributes to the influence of Duhem (1914) and Quine (1951/1980). With the demonstration that these two pillars of logical empiricism are no longer tenable, she concludes that the rug has been pulled

> out from under those philosophers who practised on the assumption that the solution to philosophical problems consisted in analyzing meanings (p. 271).

Even when due allowance is made for the fact that her account is restricted in its scope both to North America and to the philosophy of science rather than philosophy in general, this has to be a gross travesty of the historical relationships involved. It is, of course, perfectly true that the two doctrines she mentions were part of the logical positivist/empiricist view. but to represent the suggestion

(a) that the proper function of the philosopher is to analyze the concepts embedded in existing linguistic usage is a hangover from logical positivism/logical empiricism, and

(b) that it presupposes the two logical empiricist doctrines mentioned by Churchland,

is wide of the mark.

It is true that both logical positivism/empiricism and conceptual analysis as practised by the philosophers of ordinary language were influenced by Wittgenstein; but whereas logical positivism was influenced by the Wittgenstein of the *Tractatus*, the Wittgenstein who inspired ordinary language philosophy was the very different Wittgenstein of *The Blue and Brown Books* and the *Philosophical Investigations*. Now to suggest that anyone who had been influenced by the later Wittgenstein and by the Private Language Argument in particular could conceivably subscribe to a subjectivist epistemology, in which all the sentences of empirical science are reduced to actual or possible sentences describing the private sense data of a single observer, is patently absurd. Whatever else it may be, Wittgenstein's Private Language Argument is the ultimate demonstration of the absurdity of that view.

Moreover, none of the leading figures in Oxford Ordinary Language Philosophy could plausibly be accused of subscribing to such a view. David Armstrong, it is true, has accused Ryle of phenomenalism with respect to his theory of dispositional statements as concealed hypothetical, but he is not using phenomenalism in its traditional epistemological sense. The Ryle of *The Concept of Mind* can hardly be accused of that. Austin, moreover, devoted the *Sense and Sensibilia* lectures which he gave at Oxford in 1947-49 to the refutation of phenomenalism. Nor is there any trace of epistemological phenomenalism in Strawson's writings.

With regard to the analytic/synthetic distinction, Churchland is on stronger ground. I am certainly inclined to agree with her in seeing Quine's (1951/1980) critique of this distinction in his 'Two dogmas of empiricism' paper as one of, if not the, most potent influence in turning the tide of philosophical opinion against ordinary language philosophy. Certainly it is the case that without a clear distinction between those propositions that are true solely by virtue of linguistic convention and those which are true by virtue of the way things actually are in the world, the distinction between conceptual and empirical issues becomes blurred beyond redemption.

It is nevertheless a mistake to assume, as Churchland does, that anyone who supports a clear distinction between what is true analytically, i.e. by linguistic convention alone, and what is true

synthetically, i.e. by virtue of what is the case in the world, is thereby committed to the view that analytic propositions are mere tautologies which tell us nothing about how the world is constituted and only about arbitrary linguistic conventions. That this is not so can perhaps be appreciated when we realise that many of the most important Laws of Empirical Science (Ohm's Law is a prime example in this regard) are analytic truths made so by stipulative definition. It is difficult to imagine anything further from an empty tautology than analytic propositions such as these. But even if one is more impressed than I personally am by Quine's critique of the analytic/synthetic distinction in his 'Two dogmas of empiricism' paper, and concludes in consequence that no clear distinction can be drawn and maintained between conceptual and hence philosophical issues on the one hand and empirical and hence scientific issues on the other, it still does follow that one cannot distinguish along a continuum those issues that are predominantly conceptual and hence predominantly philosophical from those that are predominantly empirical and are hence predominantly scientific.

Indeed, without some such distinction as this, it is difficult to see what possible case can be made out for a distinctive role for the philosopher within the scientific enterprise. If the philosopher cannot contribute special expertise in the analysis of concepts, it is difficult to suggest any other distinctive contribution the philosopher might be supposed to make to the scientific enterprise. At one time philosophers or rather philosopher-logicians had a monopoly of expertise in the area of formal logic, but in its more technical aspects they have been increasingly compelled to give way to the superior expertise of the pure mathematician. The kind of high level top-down theorising that Churchland sees as the special contribution of the philosopher to the area of the neurosciences is something that in other empirical sciences philosophers have been content to leave to the scientific specialists in those disciplines. So why not in the neurosciences? Unless it be that this area of research presents us with conceptual problems of special difficulty which require the attention of someone with a special expertise in handling issues of this kind.

Having repudiated conceptual analysis and the philosophy of ordinary language, it is not altogether surprising to find that Churchland should perpetuate a number of popular misconceptions about our ordinary psychological language or "folk psychology", as she calls it, which

might have been avoided had she paid closer attention to what philosophers in conceptual analysis/ordinary language tradition have had to say about such matters.

The first of these misconceptions is that implied by her endorsement (pp. 395-6) of the doctrine of Eliminative Materialism advocated by Paul Feyerabend in his 1963 paper 'Materialism and the mind-body problem' and by Richard Rorty in his 1965 paper 'Mind-body identity, privacy and categories'. As originally conceived, Eliminative Materialism was designed to defeat a specific objection to the original version of the Materialist or Mind-brain Identity thesis. This is the objection that the introspecting subject ascribes to his or her private experiences "phenomenal" properties, such as having a particular colour, which the corresponding brain process could not conceivably possess. Hence by Leibniz's Law, there must be two distinct processes, a mental process with its phenomenal properties, and a brain process without them, and not just the single process postulated by the Identity theory. Eliminative Materialism aims to deflect this objection by suggesting that the ordinary psychological language in which the introspective protocols of the naive subject are framed embodies a number of pre-scientific theoretical misconceptions. Consequently wherever there is an apparent contradiction between properties attributed to the mental process in terms of the language of folk psychology and those attributed by scientific study to the corresponding brain process, the folk psychological story can be simply dismissed as a piece of pre-scientific mythology.

As I see the matter, both Eliminative Materialism and the objection it is designed to defeat are based on a radical misconstrual of the language in which the individual's descriptions of his or her own private experiences are framed. One of the implications of Wittgenstein's private-language argument is that, since *ex hypothesei* no one can observe another's private experience, such experiences can only be described in such a way as to be intelligible to another person by pointing to the standard "publicly observable concomitants" of experiences with which the listener is familiar and which resemble the experience in question in the relevant respect. These publicly observable concomitants may be either on the input side (It was as if ... were happening) or on the output side (It was the sort of experience that makes you want to ...).

Not only is it possible to show that all actual self-descriptions of private experience are of this form; but if Wittgenstein's argument is correct, no other way of using language to communicate private experience is conceivable. This being the case, we can safely conclude, as I put it in my 1956 paper,

> that there is nothing that the introspecting subject says about his conscious experiences which is inconsistent with anything the physiologist might want to say about the brain processes which cause him to describe his environment and his consciousness of that environment in the way he does. (Place *op. cit.*, p. 49)

Churchland's second misconception about the nature of folk psychology manifests itself when she links Feyerabend's 1963 statement of the Eliminative Materialist position with the position adopted by Wilfrid Sellars in his book *Science, Perception and Reality*, published in the same year (p. 301). For Sellars' book is concerned with a quite different aspect of folk psychology from the self-descriptions of private experiences which are the original target of Eliminative Materialism. What Sellars is concerned with is the explanation of thought and behaviour in terms of the beliefs or "propositional attitudes" of the agent/thinker. The implication here is that when we explain the behaviour of an individual in terms of what that individual knows, believes, wants and/or intends we are imputing to that individual an inner state which is available to that individual's introspective self-description in the same way that his or her private experiences are. Given this assumption, Churchland can invoke Eliminative Materialism to dismiss such explanations as pre-scientific mythology, if the explanation that is thereby given of the individual's behaviour conflicts in any way with the description provided by neuroscience of the states of the brain that are causally effective in generating the behaviour in question. In particular it enables Churchland to deal with the thorny problem that presents itself to all those who have tried to represent propositional attitudes and other mental dispositions as states of the brain of accounting for the intentionality (in the sense of Quine's "referential opacity") that is so striking a feature of the grammatical objects of the psychological verbs used to characterise them.

As I see the matter, there are a number of related misconceptions at work here. In the first place there is the failure to appreciate the point which Ryle made in *The Concept of Mind* that dispositions (and this is true as much of physical dispositions like the brittleness of glass and the

flexibility of rubber as it is of mental dispositions like knowing, believing, wanting or intending something) are a matter, not of what is happening or is the case here and now, whether inside or outside the body of the entity whose disposition it is, but of what *would* happen or be the case if at any time in the future the conditions necessary for the manifestation of the disposition *were to be* fulfilled. In other words the brittleness of a piece of glass consists in the fact that it would break if struck with sufficient force by or against a sufficiently hard object or surface. The individual's belief that it is going to rain consists in the fact that he or she would say that it was, if asked for a weather forecast under conditions where there is no incentive to mislead the questioner, and would take the appropriate steps to protect himself or herself against getting wet, if he or she was going outside and was motivated by the normal desire to keep dry, rather than to do penance by standing in the rain like Dr. Johnson in Uttoxeter market place.[2]

Unfortunately, Ryle allowed critics of his position like Geach (1957) and Armstrong (1968) to win the point against him by failing to acknowledge that the principle of Causality requires that for every dispositional property that an entity possesses there must be an internal state of that entity which causes it to possess that property. Had he appreciated that point he could have answered his critics simply by pointing out that the possession by the entity of its disposition and what has been called that disposition's "categorical basis in the microstructure" of the entity concerned are two distinct and causally related things and not one and the same thing. The brittleness of glass and the flexibility of rubber are not the same thing as the molecular structure of the entity on which its possession of those properties depends. For, as Hume has taught us, if two things are causally related, they must be "distinct existences".

When applied to mental dispositions, the assumption which is not, of course, peculiar to Professor Churchland, that dispositional properties are identical with rather than causally dependent on their categorical basis in the microstructure of the entity concerned is the source of her, to my mind, mistaken view that the folk psychological explanations of behaviour which involve the ascription of such mental dispositions to the agent are a primitive and, in the light of current

[2] Geach (1957) p. 8)

knowledge, unsatisfactory attempt to depict the brain states which in fact control the behaviour in question. It is also the source of her failure to appreciate that the real point of such explanations is to facilitate the prediction and control of human behaviour by relying on the existence of a consistent and rational connection between the way an agent talks about a situation (when he or she has no temptation to mislead the listener) and the way he or she subsequently behaves with respect to that situation or other situations relevantly similar to it.

The presupposition underlying this form of explanation is that the embedded sentence in *oratio obliqua*, usually preceded in English by the pronoun "that", following verbs like "know", "believe", "think", "remember", etc. expresses what Geach (*op. cit.*, p. 9) has called "the gist or upshot" of a self-directed verbally formulated thought which occurred as a crucial premise in the thought process which led to the agent's decision to perform the action which is thereby explained either at the time or, in the case of an action that has become habitual, when the decision so to do was first taken. The virtue of such explanations is that they enable the listener both

(a) to make predictions as to an agent's future behaviour from knowledge of what the agent is inclined to say about situations of that kind, and

(b) to modify the agent's future behaviour by persuading him or her to reject the premises on which the decision to perform the action in question was based and substitute others which lead to the adoption of a different course of action.

Not only is this method of predicting and controlling the behaviour of others extremely effective, it is also the only method of controlling the behaviour of others that is socially acceptable within human society. But its effectiveness depends not on its accuracy as a description of the way behaviour is controlled by the brain, but on the maintenance of a social convention whereby those who fail to demonstrate a consistent rational connection between their actions and the verbally formulated thoughts that are offered in justification of those actions are stigmatised as insane.

Unfortunately, because of its effectiveness, in those cases where it is effective, and because of the special moral status it enjoys as the theoretical underpinning for the only socially and ethically acceptable method of controlling the behaviour of others, the explanation of behaviour in terms of

the agent's propositional attitudes has been extended to cover all human and animal behaviour and hence to behaviour such as the behaviour of animals, prelinguistic children, the exercise of both verbal and motor skills and the kind of behaviour which Freud attributes to the operation of an unconscious mind, where the presupposition that the behaviour in question occurs as the result of a conscious decision based on a verbally formulated thought process, manifestly does not hold.

It is this extension of propositional attitude explanations to cover cases where the presuppositions of such explanations fail to hold which is the substance behind both Churchland's claim that much of Folk Psychology rests upon a myth and the traditional behaviourist objection to "mentalistic" explanations of behaviour. But the nature of the mythology is misunderstood. It is not, as she supposes, a pre-scientific misunderstanding of how the brain works, it is an extension of the principle whereby all adult human behaviour is assumed to be under the control of a rational and verbally formulated thought process to aspects of human and animal behaviour where that principle does not apply.

What has misled Churchland and many of her contemporaries with respect to the role of propositional attitudes in the explanation of behaviour is the fact that the operations of a digital computer when construed at the level of its so-called "software" can readily be understood as matter of deducing one set of propositions (conclusions) from another set of propositions (premises) by the rigorous application of strict logical principles. The discovery that it is perfectly legitimate and indeed non-metaphorical to describe the workings of a machine in the language of propositional attitudes when combined with the hypothesis that the brain is a form of digital computer leads directly to Churchland's view according to which folk psychological explanations in terms of the agent's propositional attitudes are not, as I have suggested they are, attempts to account for behaviour in terms of correlation between what the agent says or might be expected to say on the one hand and what he or she otherwise does, but, as Churchland believes, pre-scientific attempts to characterise the computational processes in the brain which control the agent's behaviour.

The analogy between the brain and the digital computer on which this interpretation of propositional attitude explanations depends has, unfortunately for those whose theories rely on it, a

fatal flaw. The digital computer is a device designed to perform quickly and efficiently those mental operations of calculation and computational processes using words and symbols which even the most intelligent of human beings perform relatively slowly and inefficiently. Moreover it is precisely the control of behaviour by such verbally and symbolically formulated computational processes which is presupposed by the appeal to propositional attitudes in the explanation of behaviour and which is absent in the case of the behaviour of animals, prelinguistic children and the exercise of verbal and motor skills by human adults. Two consequences follow from this:

(1) Since the digital computer is designed to carry out the kind of verbally or symbolically formulated mental processes presupposed by propositional attitude type explanations, it is hardly surprising that their operations lend themselves to explanation and description in terms of the language of propositional attitudes.

(2) Since digital computers are designed to perform quickly and efficiently those computational tasks which human beings perform slowly and inefficiently, if at all, it is *a priori* highly unlikely that the digital computer will prove to be a good model for human computation, let alone for the control of those aspects of human and animal behaviour that are not subject to control by verbal and other kinds of symbolic thought processes.

It so happens that practitioners in the fields of artificial intelligence and cognitive science are slowly becoming aware of the force of these arguments by the development of a new generation of computers which operate according to the principle of what is known as "parallel distributed processing". Parallel distributed processors differ from the now traditional digital computer in two respects:

(a) they are designed to perform quickly and efficiently tasks such as shape recognition which the human and animal brain performs quickly and efficiently, but which the digital computer performs slowly and inefficiently, and

(b) they are constructed in the form of a network of interconnected memory units, thus corresponding rather precisely to the networks of synaptically connected neurons of which the nervous system consists.

Churchland discusses parallel distributing processing as a model for brain functioning in her penultimate chapter on Theories of Brain Functioning, but though her presentation of it is both exemplary and wholly sympathetic, it is evident that its impact is too recent for its revolutionary implications for some of the ideas expressed earlier in the book to have been fully absorbed.

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