"   **(1959)**
                                          .(²   ) "
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1 The Metaphysics of Reduction

Functionalists think of themselves as "naturalizing" the mind, as ontologically
reducing (though of course not type-reducing) the mental to the physical or
material. But Chomsky questions this use of "physical" and "material."

> [T]he notion of "physical world" is open and evolving. No one believes that
> bodies are Cartesian automata . . . or that physical systems are subject to the
> constraints of Cartesian mechanism, or that physics has come to an end. It
> may be that

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> contemporary natural science already provides principles adequate for the understanding of mind. Or perhaps principles now unknown enter into the functioning of the human or animal minds, in which case the notion of "physical body" must be extended, as has often happened in the past, to incorporate entities and principles of hitherto unrecognized character. Then much of the so-called "mind–body problem" will be solved in something like the way in which the problem of the motion of the heavenly bodies was solved, by invoking principles that seemed incomprehensible or even abhorrent to the scientific imagination of an earliergeneration. (Chomsky 1980: 5–6)[6]

This passage seems to contain two pertinent claims:

> (a) that we have no compelling reason to expect that the mental will ever be reduced to the "physical" *as currently conceived*;

and

> (b) that even if the mental is reduced only to a hitherto unconceived scientific realm that "incorporate[s] entities and principles of hitherto unrecognized character," the result will still count as a fully adequate naturalization of the mental, a locating of mind entirely within the domain of natural science.

I believe most Functionalists would resist if not balk at (a), and at least wrinkle their noses at (b).

The tension increases when we consider Chomsky's later remarks on Cartesian dualism (unpublished d). He argues that Descartes's own dualism was rejected by the end of its own century, not because it said unacceptable things about mind but because it presumed a "contact mechanics" regarding matter.

> Newton exorcised the machine, not the ghost: surprisingly, the principles of contact mechanics are false, and it is necessary to invoke what Newton called an "occult quality" to account for the simplest phenomena of nature, a fact that he and other scientists found disturbing and paradoxical . . .
>
> These moves also deprive us of any determinate notion of body or matter. The world is what it is, period. The domain of the "physical" is nothing other than what we come more or less to understand, and hope to assimilate to the core natural sciences in some way, perhaps by modifying them radically, as has often been necessary . . .[7]
>
> With the collapse of the traditional theory of "matter" or "body," metaphysical dualism becomes unstateable; similarly, such notions as "physicalism" or "eliminative materialism" lose any clear sense – unless some new notion of "physical" is offered to replace the abandoned Cartesian concept . . . (Chomsky unpublished a: 1–2)

Thus:

> (c) Metaphysical dualism is "unstateable" in that it has been given no determinate sense;

and

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(d) the labels "physicalism" and "eliminative materialism" are in the same fix. Chomsky adds,

(e) "We can continue to distinguish 'physical' or 'material' from 'mental', but recognizing that the usage is only a descriptive convenience, with no metaphysical import" (ibid.: 2).

He accepts the thesis that "human thought and action . . . are properties of organized matter," but the indeterminacy of "matter" keeps that assertion from being a substantive metaphysical claim; I suspect the only "-ism" label of which he would think it worthy is "truism."

Let us consider claims (a)–(e) in order. (a) has been made before, notoriously by Wilfrid Sellars (1962, 1965, 1971, 1981) in mitigation of his outrageous ontology of microphysical sensa. For example:

> The important thing is not to let our reflections on the developing Scientific Image of man-in-the-world be tied too closely to the current institutional and methodological structure of science, or, above all, to its current categorial structure . . . Sensa are not "material" as "matter" is construed in the context of a physics with a particulate paradigm. But, then, as has often been pointed out, the more seriously this paradigm is taken, and the more classically it is construed, the less "matter" there seems to be. (Sellars 1971: 440, 446)

As microphysics continues to get weirder and weirder, it would indeed be idiotic to insist on a nineteenth-, twentieth-, or even twenty-first-century conception of ultimate matter; it is hardly our place to second-guess the physicist. For that reason, (a) as I have stated it is plainly true, since by the time the mental is actually reduced to anything (if ever), physics may well be other than physics as conceived in the 2000s.

But it is a separate question whether the mental *could* be reduced to the physical as currently conceived, holding contemporary physics fixed *arguendo*. Chomsky strongly implies that we have no compelling reason to believe that either. And here I have two qualms. Qualm the first I share with Jack Smart: it is that changes in the physics underlying biology and chemistry should not matter in any way to the mind, however much they matter to matter.

> [I]f it be granted that the brain is essentially a nerve net, then physics enters our understanding of the mind by way of the biochemistry and biophysics of neurons. But neurons are, in Feinberg's sense, "ordinary matter." So whatever revolutionary changes occur in physics, there will be no important lesson for the mind–body problem or for the philosophy of biology generally . . . The situation is not like that in the eighteenth century, when physics was mainly mechanics, and needed to be supplemented by the theory of electricity and magnetism, even for the purpose of understanding the behaviour of ordinary bulk matter. (Smart 1978: 340)

Consider: if we were to take a collection of molecules, assumed to have just the properties they are thought to have at present, we could in principle build a

version of a human organism whose behavior, including verbal behavior, would

be like ours under appropriate circumstances. Would such a simulacrum not have a mind? *Maybe* not, but we would have every reason to think it did and no reason I can anticipate for denying that.[8]

The second qualm can be put in the form of a dilemma. If reduction of mind to "matter" requires a reconception and expansion of physics to "incorporate entities and principles of hitherto unrecognized character," then either those entities and principles will be localized where we now take minds to be, viz., in central nervous systems, or like other entities and principles of fundamental physics they will pervade nature. But (1), while perfectly coherent, the former hypothesis is loony; whyever would the new entities occur and principles apply only in regions of spacetime shaped like the heads of sentient creatures, or be specific to neural tissue, which regions and tissue are specified only at a level of organization far higher than that of microphysics? Why would their occurrence depend on their *so much* larger molecular environment? Possible, certainly, but grotesque. (2) The second hypothesis, that the new entities and principles will pervade nature, is far more likely, but it encourages panpsychism. If they are posited out of the need to reduce or explain mental phenomena, and they occur throughout nature, then so, presumably, do the mental phenomena. Again possible, but fanciful.

Of course these arguments do not prove Chomsky wrong. But they lend some support to the idea that reduction of mind to matter, if possible at all, does not in fact wait upon any expansion of physics.[9]

Claim (b), that even if the mental is reduced only to an expanded physics the result will still count as a fully adequate naturalization, confronts the foregoing dilemma also. A naturalization that leaves us either with shy new entities and principles that hide in brains, or with panpsychism, may be fully naturalistic but is not a fully *satisfactory* naturalization. Also, if the new entities and principles are posited out of the need to reduce or explain mental phenomena, it follows that there is something scientifically very *special* about the mind. Perhaps there is – and of course the mind is macroscopically very special – but wholehearted naturalists would have hoped otherwise. As I believe I once put it, there is nothing the mind does that calculators and automobile engines do not do, albeit on a smaller scale.

Claims (c) and (d), of the "unstateability" of mind–body theories on account of the underspecification of "physical," must be taken seriously. As Sellars said, there does not seem to be much "matter" any more, and characterizations of "the physical" should not be lashed to our own century's microphysics. Yet one feels there is still an important distinction to be drawn between the sorts of things Descartes or Hume thought minds were and the sorts of things present-day materialists think they are. The difficulty, of course, is that if we do not draw that distinction in terms of current science, we have to draw it *a priori*, which we cannot very responsibly do either.

Yet here are two ways of putting the materialist or physicalist thesis that are, I

believe, good enough to work with and do distinguish that thesis from the views of Descartes and Hume. The first is comparative: "Creatures with minds are made entirely of the same ultimate components as are ordinary inanimate objects, and their properties are determined by the ways in which those components are arranged and related to external things." Descartes could not accept that claim. (The case of Hume is more problematic, since strictly he did not believe in ordinary inanimate objects at all; but so far as he regarded such "objects" as collections of impressions and ideas, he had to insist that a mind is a very different sort of bundle of impressions and ideas.) For that matter, the materialist claim as I have stated it further rules out the view mentioned above, that the mind involves new entities and principles that are confined within central nervous systems and not found in computers and auto engines; I am happy with that result, for although the parochialist view would still be broadly naturalistic, it is not intuitively materialist, but is a form of what is often called "property dualism."

A second characterization of materialism, perhaps not perfectly coincident with the first, is Sellars's, in terms of spacetime. The physical, we may say for purposes of the mind–body problem, is the spatiotemporal, meaning that to be physical is to be located within the same spacetime as are MIT, North Carolina, the Andromeda galaxy and the Sydney Harbour Bridge. (A qualification may be needed, in case it should turn out under some version of relativity theory or cosmology that there are multiple spacetimes; then we would have to speak of spacetimes similar to ours in such-and-such topological ways.) Descartes and Hume denied that mental states and events occurred in ordinary spacetime, even if there is such a thing as "phenomenal space." (Recall that Princess Elizabeth scored a telling hit against Descartes, when he had attempted to solve the interaction problem by comparing mental causation to gravity: gravitational fields are not physical in the sense that billiard balls are, but unlike Cartesian egos they are thoroughly spatiotemporal).[10] I do not say that the spacetime criterion is philosophically unproblematic, but it saves mind–body dualism, materialism and eliminativism from meaninglessness.[11]

Incidentally, I think we should resist Chomsky's suggestion that "the domain of the 'physical' is nothing other than what we come more or less to understand, and hope to assimilate to the core natural sciences in some way," for that characterization is entirely epistemic, couched in terms of propositional attitudes; and whatever "physical" was supposed to mean exactly, it has always been an ontological term rather than an epistemic one.

Finally, claim (e): that the dichotomy of "mental" vs. "physical" or "material" is of no metaphysical import. There is at least a grain of truth to this, in that naive uses of "mental" to *mean* something nonphysical are misguided. For example, medical science should stop distinguishing between mental illnesses that "have a neurobiological basis" (and so are really physical illnesses potentially treatable with drugs or surgery and carry no social stigma) and mental illnesses

that by implication have no such basis; that distinction really is no more than epistemic, since every mental illness in fact has some neurobiological basis or other, known or unknown. But Chomsky overstates the case considerably in saying that the mind–body distinction has no metaphysical import.

Actually there are two distinctions one might mean in talking of "mental" vs. "physical," and I am unsure which of them Chomsky has in mind here. First, if one is a materialist, one still distinguishes between the physical things that are also mental and those that are *merely* physical. That distinction does not have *a lot* of metaphysical import, but it has some. In particular, physical things that represent the world have whole ranges of interesting properties that merely physical things do not, such as truth-value and entailment relations. Organisms that have (however physical) minds are capable of agency, which affords them yet another wide range of interesting features unavailable to the merely physical, and so on. (Perhaps that is not metaphysical enough, or important enough, for Chomsky.)

The other "mental"/"physical" distinction is deeper, and does not presuppose the truth of materialism in any sense. *Au contraire*, it is the distinction between putative things that are mental in ways that could not be accommodated by any readily imaginable expansion of physics and things that are either not mental at all or mental but also physical in some generous sense. Now, it may be thought that Chomsky would object to, indeed has just been vigorously objecting to, that very distinction; is it not precisely what he has been inveighing against, a secondguessing of physics and such?

No, because it is clear that there are metaphysical conceptions of mind that, even for Chomsky, are too non- or anti-physical on any permissible reading of "physical." He holds, after all, that human thought and action are properties of organized matter, which doctrine taken in any sense of "matter" has some substantive metaphysical implications. Moreover, he even himself quotes some of Descartes's metaphysics with which he certainly disagrees: that "there is within us but one soul, and this soul has not in itself any diversity of parts."[12] That Descartes's thesis is wrong, that whatever soul there is is an *organization* or arrangement of matter and so must have parts, is an ontological thesis and still (I myself regret to say) a somewhat controversial one even in current mainstream American philosophy.[13] Or consider the putative indestructibility of the soul, defended by Socrates. If, as Chomsky believes, soul or mind is really an arrangement of matter in any sense of "matter," it is presumably not indestructible (for the matter could be rearranged in, or disorganized into, a non-mindrealizing state). But if minds or souls are "mental" in Socrates' sense, then they – and we – are immortal and will survive our bodily death, even unto eternity. Is that metaphysical import enough?

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2 The Ordo Cognoscendi

Once Chomsky has set aside Functionalists' Procrustean concern with reduction of mind to "matter" while accepting the thesis that human thought and action are properties of matter, he says, "the next question is how organized matter can have these properties"; this is "the new version of the unification problem" (Chomsky unpublished d: 2). And the "mode of connection" between a fairly abstract level of description of a system and other such levels "may involve reduction, expansion, or modification of several levels: the unification problem may take any course" (ibid.: 12). But Chomsky believes philosophical Functionalists have approached this unification problem in an unmotivated, perhaps arbitrary way:

> In the case of language and other cognitive functions, it is common to try to relieve the fear [unpublished c: 14: "the sense"] that something is amiss with such slogans as, "The mental is the neurophysiological at a higher level," taken as a characterization of the mental [unpublished c: 14: "as a kind of definition"] . . . [This is a] strange move . . . From a naturalistic perspective there are just various ways of studying the world, with results of varying firmness and reach, and a long-term goal of unification. We assess the credibility of assumptions at various levels on the basis of explanatory success. In the case of language, the most credible assumptions about what the brain is and what it does are those of the computational theories. We assume, essentially on faith, that there is also an account in terms of atoms and molecules, though without expecting the operative principles and structures to be identifiable at these levels. And with a much larger leap of faith, we also tend to assume that there is an account in neurological rather than vascular terms, though a look at the brain reveals huge amounts of blood [unpublished c: 14: "reveals blood as well as neurons"] . . .
>
> The familiar slogan about the mental and the neurophysiological has the matter backwards: it should not be taken as a characterization of the mental, [unpublished c omits "has . . . it"] but rather as a hypothesis [unpublished c: 14: "tentative hypothesis"] about neurophysiology: perhaps the neurophysiological is the mental at a "lower" level, perhaps not. As of now, we have more reason to feel secure about the mental than about the neurophysiological. (Chomsky unpublished d: 12–13)

So:
(f) we should reject or at least not accept the Functionalist characterization of the mental as the neurophysiological at a higher level of organization or more abstract level of description.

Yes, of course from a naturalistic perspective there are just various ways of studying the world, their respective vocabularies, and the long-term goal of unification. But the rest of what Chomsky argues here has to do with inquiry

and with the state of our knowledge, not about the respective natures of mind and brain, so it is not obvious how he means thereby to establish (f). Perhaps the argument is this: "We know that mental states of kind K are real. Although we know that neurophysiological states are real also and we tend to assume that they realize the mental states, there is no actual evidence indicating any such relation between any neurological state, however abstractly described, and kind K – the assumption is little more than an article of faith. Therefore one cannot fairly build a *basic characterization* or definition of K on its putative type-identity with any functional or other abstract kind."

There is some historical accuracy to Chomsky's suggestion that Functionalism stems from "the fear [unpublished c: 14: 'the sense'] that something is amiss." For we did back into Functionalism; the main reason we believe it is that it is the least bad way of not being a Cartesian dualist. Behaviorism proved inadequate in ways that were happily overcome by the Identity Theory propounded by Place and Smart, but then Putnam noticed the Identity Theory's species chauvinism and suggested characterizing the relevant neurophysiological states abstractly rather than neurophysiologically. We (at least those of us who insist that mental states are real) have been Functionalists ever since.

But if this provenance is slightly pusillanimous, the corresponding argument is not a bad one: for well-known reasons, most notably the interaction problem, Cartesian dualism is repugnant; behaviorism is superior, but inadequate in ways that are uniformly and dramatically improved upon by the Identity Theory; the Identity Theory is excellent but has one troubling flaw that is repaired by Functionalism. That is a fairly strong letter of recommendation for Functionalism.

The argument does ignore at least two alternatives: eliminative materialism, and Davidson's (1970, 1974) "Anomalous Monism," the view that although all mental state-tokens are neurophysiological state-tokens, there is no correct typeidentification
of the mental with anything else. Each of those competitors
emerged after the nervous birth of Functionalism, and each would have to be confronted by a proponent of the foregoing argument. But each has been so confronted,[14] and after due consideration the vast majority of philosophers of mind have chosen to stick by Functionalism.

And there are further, more direct arguments for Functionalism. For one thing, the theory shows how mental types can be natural kinds without being human-biological kinds. For another, the computer analogy is a powerful attraction (but see section 3 below). In addition, Armstrong (1968) and others have argued that mental *concepts* are even functional concepts to begin with.

Finally and despite that last point, we should not be misled by Chomsky's phrase, "taken as a characterization of the mental [unpublished c: 14: 'as a kind of definition']." The Functionalist is far from saying either that mental terms *mean* functional things or that the mental should initially be picked out in functional terms. Epistemically, the Functionalist proposal is like the Identity Theory, in being a metaphysical *speculation* held, for reasons, to be more credible than other such speculations, and it must continue to take its chances against competitors.
chomsky on the mind–body problem [19]

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3 Computer Models

Unexpectedly, Chomsky distances his own computationalism somewhat from the computation actually performed by computers.

> Another common way to relieve uneasiness about computational theories [in psychology] is to invoke computer models to show that we have robust, hard-headed instances of the kind: psychology studies software problems. That is, again, a strange move, remote from the naturalist perspective. Artifacts raise all kinds of questions that do not arise in the case of natural objects. Whether some object is a key or a computer depends on designer's intent, standard use, mode of interpretation, and so on . . . There is no "natural kind" or "normal case" in the study of keys or computers; virtually anything could be one. The hardware–software distinction is a matter of interpretation, not simply of physical structure . . . Such questions do not arise in the discussion of organic molecules, nematodes, the language faculty, or other aspects of the natural world. (Chomsky unpublished d: 13–14)

(g) Functionalists have erred in appealing to the computer analogy, because computers "compute" only in a different and more suspect sense from that in which biological organisms do.

This is refreshing. I think most people see *teleology* as paradigmatically located in artifacts, and the notion of natural teleology as highly dubious (perhaps as requiring belief in a superhuman artificer). To the contrary, Chomsky seems to see biological teleology as straightforward and that of artifacts as vexed.

I am somewhere in between. I love natural teleology (see Lycan 1987) and agree that it is ontologically prior to artifactual teleology; I also share Chomsky's misgivings about the ascription of functions to artifacts and especially about the "hardware–software" distinction (see again, even more urgently, Lycan 1987: ch. 4). But, sad to say, natural teleology is hardly unproblematic. There is a huge literature devoted to its explication and vindication.[15] Note, vindication is needed, not just explication, because of the understandable suspicion that literal ascriptions of natural function really do presuppose a superhuman designer.

4 Eliminative Materialism (and Connectionism)

Functionalists of course reject eliminative materialism, since in type-identifying the mental with the functional we affirm the reality of each. But we have two things importantly in common with the eliminativists: what Adam Morton (1980) called the " 'Theory' theory" – the claim that mental expressions are the theoretical terms of a folk or commonsense theory[16] – and accordingly the belief that even the reality of the mental is an empirical question and needs vindication of some substantive sort. This agreement spills over into a willingness to play

devil's advocate for the eliminativist from time to time, so I shall do a bit of that in this section.

Here is Chomsky on eliminativism:

> The idea that cognitive psychologists should drop the inquiry into computational systems [unpublished c: 14: "rule systems"] in favor of the study of neurophysiology seems about as reasonable [unpublished c: 14: "reasonable today"] as the [unpublished c: 14: "as a"] proposal that embryologists should keep to [unpublished c: 14: "drop their inquiries in favor of"] superstring theory; arguably less so, given the status of the theories. As for eliminative materialism, the very doctrine remains a mystery until some account is given of the bounds of the material, and given that account, some reason why one should take it seriously or care if successful theories lie beyond its bounds. (Chomsky unpublished d: 13)

(h) Eliminative materialism, far from being recommended by serious scientific and scientistic reflection, is methodologically just silly.

The proposal that "cognitive psychologists should drop the inquiry into computational systems [unpublished c: 14: 'rule systems'] in favor of the study of neurophysiology" is more demanding than the official eliminativist thesis, and the latter is much stronger than any claim actually made by self-styled eliminativists in person, but the eliminativists themselves have been deliberately unclear about those distinctions. The official thesis is that no mental ascription has ever been true (or less ambitiously, no propositional-attitude ascription, or no sensation ascription, or whatever, has ever been true – I shall hereafter take such restrictings for granted); nothing has ever been in a mental state. But it is rare for anyone to have asserted that outrageous thesis flatly. The claim is normally just that the official thesis is a strong possibility or at least must be taken seriously. And that claim, Chomsky would be right to insist, does not entail or even suggest that cognitive psychologists should drop their inquiry into computational systems.

But what if the official thesis is or were true, as is at least possible? Then it still would not follow that cognitive psychologists should drop their computational inquiries. For even if our ordinary folk mental concepts are ultimately unexemplified and our Functionalist type-identifications are empty, the brain still performs computations and our behavior can be explained in such terms. To motivate dropping computational psychology, the eliminativist would have to eliminate not just commonsense mental items but all computational ones as well, a more taxing project. Chomsky is surely right to find this idea methodologically outlandish. (However, I shall return to this theme shortly.)

I would put in a word in favor of one eliminativist theme: eliminativists are impressed by a disparity in robustness between mental states (especially propositional attitudes) and neurological states. At the current stage of science, there is

simply no denying that brains are full of neurons organized into fibers, nets, and larger systems, and that behavior is caused by fantastically complicated electro-

chemical activity in the nervous system. It is less obvious that mental states such as beliefs and desires occupy real physical locations inside our heads and interact causally with each other in order to produce behavior in turn. Forced to bet on one or the other, neural states as inner causes of behavior and mental states as the same, I too would have to choose neurophysiology. (As a Functionalist, of course, I do myself believe that mental states are internal physical states that play characteristic causal roles. But that is a controversial philosophical view, not a plain fact like the fact that coordinated neural firings cause behavior.) Note, eliminativists often motivate their view by hinting or pretending that we do have to choose between commonsense mental states and neurophysiology; that is one place where they go wrong.

Turning to Chomsky's claim that "the very doctrine remains a mystery," I want to register a solid objection, over and above the rebuttals I have made to theses (c) and (d) in section 1. He says that eliminativism remains a mystery "until some account is given of the bounds of the material"; this is evidently a reprise of his complaint that the notions of "matter" and "the physical" are undefined. But here the eliminativist does better than the various psychological realists, for strictly, s/he need not presuppose anything about "matter" or "the physical" but can continue to say merely that no mental ascription has ever been true because nothing has ever been in a mental state. It may be that to *defend* that official thesis, the eliminativist would have to allude to "matter," but that is hardly obvious, and in any case, the thesis itself simply does not presuppose any such notion, so in this case Chomsky's criticism just goes wide.

I agreed that it would be silly to advocate giving up computational ideas and dropping computational inquiry. But there is a weaker suggestion that is not silly and that has been seriously defended by opponents of Chomsky's particular computational approach to natural language. It is the connectionist proposal that we abandon Chomsky's "rules and representations" paradigm and investigate language by means of connectionist modeling, training up networks to perform grammatical feats such as inflection formation, prediction of succeeding words, and detection of well-formed strings.[17] The argument here abandons neither folk psychology nor the idea of computation, but urges a different, more brainlike computational architecture.

Chomsky addresses that proposal as such:

> Perhaps it will turn out that connectionist models are more adequate for a system of 10^{11} neurons than one with 300, but one awaits an argument. The discussion of what it would imply about computational systems [unpublished c: 15: "rule systems"] if such theories were to become available in some distant future [unpublished c: 15 omits "in some distant future"] is as interesting as a debate over what it would mean for embryology if unstructured systems, now entirely unknown [unpublished c: 14: "if it were shown that some unstructured system"], could achieve the explanatory power

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    that biologists seek in terms of their complex notions. (Chomsky unpublished
    d: 13)

At the very least:
    (i) There is (at present) no reason to think that connectionist models of
    cognitive capacities such as language processing are superior to the classically
    computational models already being built.

    This seems fairly clear. Though connectionist models have done better at
certain sorting tasks than has classical AI at those same tasks, e.g. at discriminating
sonar echoes produced by undersea mines from those produced by rocks,[18] I
know of no evidence that connectionist models of syntax or semantics will ever
do better than classical rules-and-representations models.

    Also, two caveats: first, even if a network were to start from scratch, with the
customary random connection strengths and levels of unit activation, and learn
English syntax, in much the way that NETtalk[19] very impressively learns English
phonology, it would very likely do this by coming to implement a classical syntax
recoverable at a higher level of functional abstraction – in much the way that a
mature NETtalk comes to implement all the *phonemes* and phoneme classifications
of English phonology.[20] (One must avoid the fallacy of inferring properties
of a trained network from properties of its training. That a network is given
no classical rules and representations prior to or during training does not entail
that it does not grow representations and rules on its own.)

    Second, one must be a bit careful about impressionistic claims of connectionist
superiority even in domains that are widely thought impervious to classical AI.
McLaughlin and Warfield (1994) have argued that contrary to advertising and to
widely shared assumptions, connectionist networks have not historically proved
to be better than classical programs either at modeling standard patternrecognition
tasks or at learning to perform those tasks. In particular, comparative
studies as between connectionist networks and "Top-Down Inductive Decision
Tree" algorithms have revealed no such superiority.[21]

5 Mysteries

I close with some remarks on a side issue raised by Chomsky, not because he
relates it particularly to the mind–body problem, but because others have done
so citing his authority, and because I believe his general idea is philosophically
important. Methodologically, Chomsky (1975, 1980, unpublished a, d) distinguishes
between mere "problems" and what he calls "mysteries," "the former
being questions that we seem to be able to formulate in ways that allow us to
proceed with serious inquiry and possibly to attain a degree of understanding,
the latter including questions that seem to elude our grasp, perhaps because we
are as ill-equipped to deal with them as a rat is with a prime number maze"
(Chomsky unpublished a: 41). He suggests, more dramatically, that some of the
"mysteries" may be permanently and systematically intractable for us because of
innate structure in the human mind.

The human mind is a biologically given system with certain powers and limits . . .
The fact that "admissible hypotheses" are available to this specific biological system
accounts for its ability to construct rich and complex explanatory theories. But the
same properties of mind that provide admissible hypotheses may well exclude other
successful theories as unintelligible to humans. Some theories might simply not be
among the admissible hypotheses determined by the specific properties of mind
that adapt us "to imagining correct theories of some kinds," though these theories
might be accessible to a differently organized intelligence. (Chomsky 1975: 15–56)

> [T]he naturalistic temper . . . takes for granted that humans are part of the
> natural world, not angels, and will therefore have capacities with specific
> scope and limits, determined by their special structure. For a rat, some
> questions are problems that it can solve, others are mysteries that lie beyond
> its cognitive reach; the same should be true of humans, and to first
> approximation, that seems a fair conclusion. What we call "natural science"
> is a kind of chance convergence between aspects of the world and properties
> of the human mind/brain, which has allowed some rays of light to penetrate
> the general obscurity, excluding, it seems, central domains of the "mental."
> (Chomsky unpublished d: 3)

Strong stuff, but plausible. Chomsky makes no definite pronouncement on
what "central domains of the 'mental' " he thinks may harbor mysteries. He does
speculate that one such domain may be that of "will and choice" (Chomsky 1980:
7): as Descartes said, we human beings are not "compelled" to perform most of
the actions we do, as lower animals are compelled, but only "incited and
inclined." The human power of choosing, "[t]his essential capacity of the human
to act as a 'free agent', able to choose to follow or to disregard 'the rule that is
prescribed to it' by nature," is a good candidate for the status of mystery. As
another candidate he adds what may be a related point: "Human action is
coherent and appropriate, but appropriateness to situations must be sharply
distinguished from the causal effect of situations and internal states" (Chomsky
unpublished a: 41).

Colin McGinn (1989, 1994) has picked up Chomsky's theme of mysteries, and
argued that the mind–body problem is insoluble because, in addition to free will,
the qualitative character of experience is a mystery. (To my knowledge, Chomsky
nowhere mentions phenomenal experience, though he cites McGinn (Chomsky
unpublished d: 3) without evident disapproval.)

This is not the place for me to expound and assess McGinn's arguments.[22]
Let me just record my opinion that they are unsound, and add a hearty plug for
my own solutions to problems of free will (Lycan 1987: ch. 9) and the qualitative
character of experience (ibid.: ch. 8, 1996a). My solutions may be inaccurate,
even squarely false.[23] But *if* correct they *would* solve the problems at issue; they
are good answers to the corresponding "how-possibly" questions. And I think

that suffices to show that the problems are only problems, and not mysteries.[24]

However, I offer two further candidate groups: (1) central questions in the philosophy of time, and (2) the puzzles of predication. It seems likely that

because of the complex ways in which we are ourselves located in time, we will never gain an objective philosophical and conceptual understanding of time (even though some of us can understand the mathematical representation of time employed by contemporary physics). It seems even likelier that subject-predicate structure is somehow fundamental to our thought, and we will never be able to look under or into it and figure out its ontological workings. I stopped thinking about time in around 1975, and I have tried fairly hard never to think about predication at all. If those topics are indeed mysteries in Chomsky's sense, then he has given me not only an excuse but a good reason for my omissions, and I am very grateful.

Chomsky's reply: pp. 255–63.

Notes

1   Chomsky (unpublished c: 14), slightly out of context.
2   However, see also Craik 1943; Piaget 1954; Bruner, Goodnow and Austin 1956; Miller 1956; Broadbent 1958; Newell, Shaw and Simon 1958; and Miller, Galanter and Pribram 1960.
This is a good opportunity for me to thank Professor Chomsky for his kindness thirty-plus years ago, when I was an Amherst undergraduate writing an honors thesis on the then new discipline of mathematical linguistics. (My advisor, Robert Tredwell, a Frederic Fitch Ph.D., had pressed a copy of *Syntactic Structures* upon me, and two days later I had abandoned mathematics for the philosophy of language.) I contacted Chomsky and asked for further materials; he sent an entire microfilm copy of his then unpublished 1955 monsterpiece, *The Logical Structure of Linguistic Theory*.
3   But for similar criticisms, see also Rosenberg 1967 and Landesman 1970. Quine (1968) replies to Chomsky, and Quine (1970, 1972) turns to address syntax; Chomsky (1975, 1980, unpublished b, and elsewhere) rejoins.
4   Putnam 1960; Fodor 1968. I am using the label "Functionalism" with its original meaning (and with a proud capital "F"), as naming the *a posteriori* scientist speculation that mental states and events are functional states and events in either a computational or a teleological systems-theoretic sense of "functional." This is the doctrine called "Psychofunctionalism" by Block (1978), as opposed to the *a priori* commonsense Causal Theory rooted in Sellars and developed by David Armstrong and David Lewis, which Block viciously neologized as "Functionalism" and which has since come to be called, only slightly more appropriately, "Analytical Functionalism."
(It is analytical – and thereby incurs some convincing objections – but there is nothing functionalist about it in either the computational or the teleological sense.)
5 There are encouraging passages, too, e.g.:
When I use such terms as "mind," "mental representation," "mental computation,"

and the like, I am keeping to the level of abstract characterization of the properties
of certain physical mechanisms, as yet almost entirely unknown. There is no further

ontological import to such references to mind or mental representations and acts.
(Chomsky 1980: 5)
[W]e may think of the study of mental faculties as actually being a study of the
body – specifically the brain – conducted at a certain level of abstraction. (ibid.: 31)

6 There will be many such long quotations in the expository sections of this paper, as
Chomsky speaks so well for himself.

7 A stronger claim is made in Chomsky (unpublished a: 38–9):
[The terms] "body" and "the physical world" refer to whatever there is, all of
which we try to understand as best we can and to integrate into a coherent
theoretical system that we call the natural sciences . . . If it were shown that the
properties of the world fall into two disconnected domains, then we would, I
suppose, say that that is the nature of the physical world, nothing more, just as if
the world of matter and anti-matter were to prove unrelated.
(Yet on the same page (39) of the same article, Chomsky repudiates Thomas Nagel's
(1979) ascription to him of "the prediction that mental phenomena will eventually
come to be counted as physical, once we understand them systematically – even if
they are not reduced to terms already admitted as physical." Chomsky's objection is
that he makes no such *prediction*, but holds only that *if* mental phenomena should
come to be understood systematically, they would or should then be counted as
physical. The "if" is a big one; see section 5 below.)

8 I made a similar argument against Sellars in Lycan 1987: 103, in terms of super-
venience. Roughly: since molecules are made of atoms, molecular facts supervene on
already familiar microphysical facts; biological facts supervene on molecular facts plus
ordinary macroscopic surroundings; psychological facts supervene on biological facts
plus ordinary macroscopic surroundings; so, given transitivity of supervenience,
psychological facts supervene on microphysical facts of the sort that are already fairly
well known.

9 Actually there is a third qualm, but I am not equipped to enforce it by means of
argument: I have heard at least one respected physicist aver that "physics is finished,"
meaning that even microphysics is already empirically adequate and its *physical*
ontology, its ontology of substances, is reasonably well understood; the remaining
projects of microphysics – positing superstrings, constructing a unified field theory
and the like – are only matters of interpreting and mathematizing the physical
ontology. If that is so, then there is no reason to think that physics will expand its
ontology in so fundamental a way as to afford a reduction of the mental that was not
already available. But I am unqualified to judge whether it is so.

10 See her letter from The Hague, June 10–20, 1643.

11 Anent eliminativism, actually, I believe claim (d) is just mistaken; see section 4 below.

12 Chomsky 1980: 30; the quotations are from Article XLVII of *The Passions of the Soul*
and *Meditation* VI.

13 See, e.g., Chisholm 1976.

14 For a review of the most compelling arguments against eliminative materialism, see Lycan 1996b; for a sustained defense of Functionalism as superior to Anomalous Monism, see Lycan 1981.

15 To hit only a few high spots: Wimsatt 1972; Wright 1973; Cummins 1975; Millikan 1984; Bigelow and Pargetter 1987; Neander 1991; Godfrey-Smith 1994.
16 On which at length, see Lycan 1996b.
17 See, e.g., Rumelhart and McClelland 1986; McClelland and Kawamoto 1986; Elman 1991, 1992. There are hybrid and compromise proposals, such as Horgan and Tienson's (1989, 1996) format of "representations without rules."
18 Gorman and Sejnowski 1988.
19 Sejnowski and Rosenberg 1986; Rosenberg and Sejnowski 1987.
20 This is defended in Lycan 1991.
21 See, particularly, Shavlik, Mooney and Towell 1991.
22 Regarding the one directed at phenomenal experience, however, see Flanagan 1992.
23 In fact, they are no such thing.
24 But that is a bit hasty, because in Chomsky's vocabulary a "problem" is a question which has been well enough formulated that we can "proceed with serious inquiry." If by that phrase he means, proceed with serious *empirical* enquiry, I am not ready to claim such for my solutions to the mind–body problem or for almost anyone's philosophical theory on any subject. Perhaps there is a middle category, of, say, philosophical problems as opposed to scientific problems.

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