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Brain, mind, man, and society: Naturalism with a human face

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When scientists are at work, they are busy 'naturalizing' their domain. This applies, without qualification, to natural scientists. In the sciences of man (which I will understand in the broadest sense, as including the social sciences), the issue is moot. This raises a problem for cognitive scientists, a vast majority of whom think of themselves as natural scientists. Yet theirs, to a large extent, is a science of man. Cognitive scientists are, it would seem, in the business of naturalizing man, and while this, to them, is unproblematic, it raises considerable difficulties to many, whether philosophers or social scientists of antinaturalist persuasion, or lay people wondering what the ultimate goals of cognitive science are and how far it should be expected to achieve these goals. Among his many duties, the philosopher of cognitive science, part of whose job is to clarify assumptions made, concepts used, methods deployed, at all levels of the field, and to try and situate the enterprise within the wider context, has the legitimate worry that misunderstandings, both within and outside cognitive science, might durably prevent the articulation of its viewpoint with those elaborated by the other sciences of man. The philosopher is thus intent on bringing forth an understanding of the enterprise of cognitive science, as free as possible of the 'idols of the tribe' (the field's own self-aggrandizing prejudices) and of the 'idols of the marketplace' (the allegations of 'tunnel vision' and 'reductionism'). The intuition here, in other words, is that both the self-image and the public image of the field need be examined and possibly modified, so that the naturalization which cognitive science is proposing can be made sense of from the standpoint of the other disciplines, and conversely the non-naturalistic background assumptions of these other disciplines be understood by cognitive science. The hope is that it can be done without compromising the original inspiration, and source of progress, of cognitive science.

But why should this present a problem? The fundamental reason is that the concept of naturalization is opaque. On the one hand, it is an analytic truth that man 'belongs' to the natural order (whatever kind of 'order' that is). On the other, it's a synthetic empirical truth that the way in which to construe this 'belonging' poses a problem: it is a fact but not a fully or readily intelligible one.

Naturalizing is an attempt of a *particular sort* at making this 'belonging' and its consequences (more) intelligible. Just asserting that Nature is such as to include man can therefore be seen as sterile. But on another level it becomes a gradual discovery. one which does not consist merely in uncovering the natural essence of man, but in disclosing the human-producing essence of nature.

The paper proceeds as follows : The first part discusses naturalization in general, and recommends a stance which accommodates a commitment to naturalistic research programs while maintaining a critical agnosticism with respect to their expected outcomes; the second part assesses the ongoing attempts at naturalizing the mind; the third is concerned with the work on the brain; the fourth with naturalistic approaches to society. The conclusion proposes a sober appraisal of the achievements and prospects of cognitive science, one which remains positive and forward-looking while making space for a genuine connection with mainstream social science.

1. The proper treatment of naturalism

a. The general shape of naturalistic theories

One can think of naturalism primarily as a broad outlook, a philosophical stance, somewhat in the style of R.B. Perry's definition: "the philosophical generalization of the sciences". But no interesting form of naturalism stops at this: it makes sense only in the context provided by a certain contrast between a class of *prima facie* natural entities, and a class of *prima facie* non-natural entities. The first class fixes the reference of 'nature', the second specifies the problem at hand. So for example, the first

class might be the set of entities postulated by our best current physical theories, and the second might contain mental states and processes; naturalism is then (one form of) physicalism about the mental. Or the first class might consist in the ontology of the natural sciences, and the second might be the set of social processes: naturalism in this situation might amount to the rejection of a bifurcation between the natural and the social sciences. And so forth: the structure of the issue consists in the specification of Class I and Class II, and the claim that Class II is in fact included in Class I. A final condition for a form of naturalism to be interesting is that this inclusion relation be non-trivial: it must be moot and require serious scientific and/or philosophical work. Dogmatic assertions of the form "Everything is (or: is at bottom) natural" trivialize the problem and deserve no consideration, no more than such counterparts as "Everything is (or: is in the last analysis) cultural, or socially constructed."

b. Anchored vs free-floating naturalism

I now come to a distinction which is not usually, if at all, made explicit, perhaps because it is too obvious, perhaps because most philosophers focus on just one side of the distinction, and/or take the other side for granted.

Some forms of naturalism, regardless of their choice of Classes I and II, include a proposed strategy for establishing the inclusion of Class II in Class I. Due to the non-triviality condition, it is not one bit *obvious* that the strategy will work, but the naturalist has arguments to establish that in the fullness of time, every member of class II will be shown, by some clever application of the proposed strategy, to belong to Class I. Programs of this sort are instances of what I call *anchored* naturalism. *Free-floating* naturalism, by contrast, consists in arguments of a general nature purporting to establish, in one fell swoop, the inclusion relation, so that, once the argument is accepted, there is no work left to be done. Although of course there is nothing to prevent a philosopher, or a scientist for that matter, from proposing both specific reductive strategies and general arguments, sometimes in different writings or at different moments of her itinerary, in fact philosophers tend to fall on one or the other side of the fence. Thus Quine, and those working in the naturalized epistemology tradition, tend to be free-floaters, while Putnam, whether in his former, optimistic mood, or in his present, pessimistic mood, is interested in anchored naturalism. And he becomes impatient with free-floating naturalism, which he finds "very puzzling", or a form of outright "I know not what" (see Putnam 1988, 1994). Poincaré's verdict on the matter is just as final: "The question we must ask is not whether nature is one, *but how it is one.*" (Poincaré 1902, IX, p. 161; my italics). In other words, the only question worth asking, if, for example, we are worried about the 'imponderable fluids' such as caloric, phlogiston etc., is not, *Can* we reduce or eliminate them?, but rather, *How* do we do it? In other words, what is called for is hard scientific work, genuine scientific imagination, possibly prodded and supported by philosophy, and not overarching, armchair considerations to the effect that necessarily, some research strategy or other will succeed in accomplishing the called-for naturalization.

c. Seeking a third way, first shot: Methodological naturalism

It is time for me to draw a logical space of positions regarding naturalism. I will not use too fine a brush, and will restrict myself to distinguishing between bundles of related positions, and to positions which are actually occupied, not merely conceivable. My purpose is merely to locate the one I will spend the remainder of my time to defend.

The space is two-dimensional. On the horizontal axis figure the contrast class, viz. what 'natural' is contrasted with. The basic possibilities are: non-natural equals non-physical or non-material; not accessible by scientific means; and not accessible by the means of the natural sciences. On the vertical axis one finds the two basic kinds of commitment towards the naturalist thesis, full acceptance, which I call 'ontological' (some may prefer 'metaphysical' as a label); rejection; and in between, the cautious stance which I label 'methodological', after the name it receives in the literature regarding the version in the first column (methodological naturalism is, roughly, the stance recommended to those who are both scientists and believers).

Commitment ↓ / Contrast class →	Non-physical (non-material)	Non-scientifically accessible	Non-natural-scientifically accessible
Ontological	Atheological naturalism	Ontological naturalism	Physicalist (or more broadly natural-scientific, eg. biologicistic naturalism)
Methodological	Methodological naturalism, standard sense	Methodological naturalism, my sense (MENA)	Anti-bifurcationism

Rejection	Supernaturalism (theological dualism)	Atheistic dualism	Scientific dualism or bifurcationism
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Methodological naturalism, in my sense (I will abbreviate it as MENA), is the middle box. No great leap of philosophical imagination, MENA in one or another form is constantly re-discovered by philosophers who are either uneasy about the majority ontological doctrine in philosophy of mind, or uneasy about the underlying philosophy of science, or (like myself) about both.

My own version of MENA is expressed by the following maxim :

Engage in whatever inquiry ontological naturalism recommends with the aim of securing a positive result, but refrain from any commitment, explicit or implicit, regarding the outcome of the inquiry.

By a 'positive result', I mean a demonstration of the fact that some member of the class of prima-facie non-natural entities actually belongs to the other class. Non-commitment means : no assumption made that the naturalistic inquiry about one particular entity or process is bound to succeed, let alone that for each member of the non-natural class, some attempt or other is bound to succeed. Indeed, MENA rejects any commitment to a thesis of the form : everything is really, at bottom, natural, or to any other manifestations of free-floating naturalism.

d. Immediate worries

Two objections might be raised right away.

The first is the notorious precariousness of 'as if' positions generally. While, as the instrumentalist tradition in the philosophy of science shows, there is no logical inconsistency in defending MENA while rejecting ontological naturalism, there is a threat of pragmatic incoherence in (i) adopting a maxim or strategy or heuristic whose success depends on the existence of certain entities or processes while (ii) invoking ontological abstinence with respect to those entities and processes. My answer is this: MENA encourages piecemeal attempts, on hopeful candidates from Class II, to bring them into Class I, but it does so without postulating universal in-principle success ; it even supports a strategy of considering not-hopeful candidates in order to zero-in on what gets in the way. The history of logic provides an example which shows that this can be a good strategy: proving that certain number-theoretic functions are computable is a goal which one can rationally pursue without believing that all functions are computable. And failing to show that a function is computable is not necessarily failure tout court ; it helps one getting the knack, grasping a pattern, and guessing whether the case at hand fits the pattern.

The second objection is that despite its apparent opposition to free-floating naturalism, MENA actually comes perilously close to it; moreover that non-commitment to any particular naturalization strategy makes it, in combination with its as-if character, a little too bland to be of much theoretical or practical help. MENA needs to be strengthened, but upgrading it to full ontological naturalism would annihilate the whole point of this paper. I will try and show that an intermediate position can be reached, which is the minimal naturalism which I think we should countenance. But first I need to say a few words about the obstacles which I see prevent both a brutal upgrading or a brutal downgrading of MENA.

e. Lower and upper bounds

Downgrading MENA would surely reduce it to plain scepticism regarding naturalism: this route is closed. Upgrading it would require a modicum of anchoring. An obvious cure then would be to anchor it to one particular naturalistic strategy, chosen among those on offer. However, as will be explained below, I am less than fully convinced by any of the current proposals, and in fact suspect that overly ambitious, all-encompassing candidates are bound to fail. How can I pull in the reins on my free-floating methodological naturalism without anchoring it entirely?

To solve this little riddle, it suffices to go back to artificial intelligence (AI). What is wrong with MENA is that, at the time, it would not have had the tools, nor the mission, to critically analyse AI (by which I mean 'good old-fashioned artificial intelligence' or GOF AI, in John Haugeland's terminology): at the time, it seemed that ontological naturalism's best guess as to what line of inquiry to pursue was AI, and so MENA had no choice then but to follow suit. At the same moment, avowed antinaturalists such as Hubert Dreyfus, and later Haugeland, as well as philosophers such as Robert Cummins, Hilary Putnam, or me, did have the means, and the mission, to do it, and did produce a convincing and enlightening critique of AI.

Now of course the cure cannot consist in amending our definition to read:

Engage in whatever inquiry ontological naturalism recommends with the aim of securing a positive result, except if it happens to be GOFAI, but refrain from any commitment, explicit or implicit, regarding the outcome of the inquiry.

Not only would it be useless and unprincipled, but it would also not prevent another possible disaster, the uncritical acceptance of the next fad in cognitive science. For example, even with the proposed amendment, MENA would have nothing to say about the excesses of fMRI-inspired research. As I will briefly argue later, the responsible naturalist cannot be content with letting cognitive neuroscience based primarily on fMRI and other brain-imaging techniques simply take over.

f. Seeking a third way, second shot: Minimal naturalism

Minimal naturalism, or MINA, in contrast with mere MENA, is not a laissez (science) –faire attitude. Perhaps one could characterize minimal naturalism as *critical* methodological naturalism. One further constraint might put this demand in sharper focus. What experience seems to suggest is that the mind as a topic tempts those that study it, again and again, whether they be philosophers, computer scientists or neuroscientists, to ride roughshod over the empirical evidence, and disregard large chunks of it. This includes not only *scientifically certified* evidence, but also that provided by commonsense or phenomenology (in both the technical and the loose sense of the word.) Thus the minimal naturalism I recommend adopts the following maxim:

Engage in whatever inquiry ontological naturalism recommends with the aim of securing a positive result, without foregoing a critical examination of the recommendation, and with due regard to the entire empirical evidence, whether available through phenomenology, commonsense, or scientific experimentation. And refrain from any commitment, explicit or implicit, regarding the outcome of the inquiry.

In a nutshell then, minimal naturalism is methodological naturalism with philosophically wide open eyes.

g. Naturalization as a two-way process

One thing a minimal naturalist notices right away is that a certain familiar picture of naturalization is faulty. The picture represents the process as a kind of pulling in, from the shores of Nature, of entities adrift in the ghostly sea of the non-natural. In other words, from the truism that nature is what it is, the uncritical naturalist infers that her concept or theory of nature, *i.e.* what is by her lights the best available natural science, has a fixed actual referent. Of course, this is not the case: as the naturalist, firmly anchored in her natural science, exerts a saving pull on the rope attached to the drifting naturalizandum, the latter exerts a pull on the naturalist's ground. Naturalization is not a one-way process: fitting a new item in the fabric of nature is sometimes achieved at the cost of some ripping. A famous historical example is provided by gravity. Nature, at Newton's time, was the sublunary world, whose best theory was medieval mechanics, considerably perfected by Galileo. The naturalizandum was the supralunary world in which such things as the moon moved about. Newton succeeded in hoisting the moon and the rest onto the firm ground of the sublunary, but at what cost, Locke eloquently explains:

"I have been convinced by the judicious Mr Newton's incomparable book that there is too much presumption in wishing to limit the power of God by our limited conceptions. The gravitation of matter toward matter in ways inconceivable to me is not only a demonstration that God, when it seems to Him good, can put into bodies powers and modes of acting which are beyond what can be derived from our idea of body or explained by what we know of matter; but it is furthermore an incontestable instance that He has really done so." (Letter to Stillingfleet, 1699)

Clearly, Newton's nature, and Newton's mechanism, extended far beyond the boundaries set by the limited imagination of his lesser predecessors. Effective (as opposed to free-floating, notional) naturalization requires new, often highly abstract, non-commonsensical concepts, leading to an enrichment of our concept of nature (and concurrently of our fundamental natural science). Poincaré

made a similar point two centuries later, in reference to the integration within core physics of the 'imponderable fluids' bequeathed by the XVIIIth century physicists.

This recognition of the bidirectional nature of naturalization can make the antinaturalist and the naturalist both (reasonably) happy. The antinaturalist can claim that she was right in thinking of Nature *as previously construed* as unable to accommodate the naturalizandum. The naturalist can maintain that Nature is just what it was previously thought to be, but that *some implications of its constitutive properties* were not adequately understood: Nature, he claims, is unchanged, but some of its hidden properties have been made apparent through regular (deep, creative, unpredictable) scientific labor.

2. Naturalizing the mind

Another immediate task for the minimal naturalist is to take a hard look at some conceptions about what we cognitive scientists (and philosophers) have achieved. Today's naturalists often seem to believe that they are the first true, scientifically-minded, uncompromising naturalists. That their predecessors were held back by dualist taboos. That their opponents are retarded theologians and irrationalists, whose voice will eventually die away as cognitive science reaches maturity. That they have discovered a sure path to non-reductive naturalism, allowing mentalistic psychology to stride forward alongside neuroscience, together with the right conceptual tools. That when a field finally opens up to scientific investigation, success has again and again been the outcome. And that the research program which we are all taking part in is on its way to complete success.

It is not difficult in fact to see that none of these beliefs is justified, although they contain some grains of truth. This does not require engaging in a deep critique nor being particularly pessimistic about the field. The historical record suffices to put to rest the claims concerning the past (see Hatfield 1995) and the reasons for the rise of cognitive science (see *e.g.* Andler 2005). As for the present state of the art, from the foundational point of view or the certainty of success, one need not go for all-out criticism as *e.g.* the authors collected in Johnson & Erneling (1997), the indigenous literature actually offers a wealth of arguments.

Cognitive science in its present state of development presents a characteristically gappy structure. Jerry Fodor's diagnosis in 1983 was that cognitive science is most clearly successful for 'input systems', and his prognosis was that it would score poorly for 'higher' or 'central' processes. This particular way of drawing the contours of the gap is outdated, and in fact one can be cautiously optimistic about the possibility of interesting work in the area of higher processes in the coming years. But Fodorian doubts persist (see Fodor 2000). More directly to the point, moreover, the very proliferation of neuroscientific investigations retroactively proves how deeply ignorant we were all along about countless functions of the brain/mind. What we are acquiring right now is not only new knowledge in cognitive science, or perhaps only brain science, but a lot of negative introspective knowledge on the cognitive science we do have.

Second, the only strategy available to cognitive science is the one at work in biology in general: it consists in combining a top-down and a bottom-up approach. Bottom-up naturalization of the mind is the goal of neuroscience. Top-down naturalization is offered by two distinct research programs: functionalism (the information-processing paradigm, also known as computationalism, classical or otherwise), and evolutionary psychology. Full vindication of ontological naturalism about the mind requires a triple success: completion of the top-down analysis; completion of the bottom-up analysis; and, importantly, articulation of the two approaches. In the pioneering stage of cognitive science, this articulation was thought to be provided by an existence proof: the computer was seen as an information-processing mechanically-realized cognitive organ: however defective in its details, it did show what sense could be made of an articulation of the top-down and bottom-up analyses. That was the whole idea, the grand idea of functionalist neo-mechanism (or logical mechanism, or Turing mechanism). The hope was that suitable complexification of this paradigm would yield a satisfactory notion of a natural mind.

Success has been notable, though still quite limited, on both fronts (metaphorically, the tunnel is making substantial progress on both ends), but on the articulation problem, things don't look as good:

- We have ceased to be confident that we possess an overarching principle of articulation; a witness to this is provided by the proliferation of neuroimaging experiments, usually unrelated to computational accounts, showing that right now, computationalism is inoperative as a global strategy in cognitive science. In fact, it is no longer even obvious that the aprioristic, or 'structural hypothesis' (Newell and Simon's phrase) of computationalism would have been sufficient to insure the articulation. It would seem that some strong additional

assumptions (such as the uniqueness of a structure filling a given sufficiently complex function, as in Shapiro in Walsh 2001) are required.

- On the other hand, neuroscience alone cannot provide the key to the foundational problem: at every juncture it requires the resources of intentional psychology; somewhat like AI, neuroscience can do no better than reconstruct psychology, linguistics, logic in a hybrid vocabulary which it cannot reduce to a homogeneous, recognizably biological language. (I will return to this issue in section 3).

- We are not very clear yet about how the evolutionary constraints, which bear on the structure of the brain, are to be combined with the information-processing constraints, which concern the 'architecture' of the mind.

- There is no agreement on whether the 'explanatory gap' can be filled for the 'deep' faculties (consciousness, intentionality, spontaneity).

Thus it would seem that however fascinating, impressive, and useful, the knowledge we have acquired about the mind has not reached the level where we can confidently predict the vindication of ontological naturalism about the mind. And following, *inter alia*, Chomsky's recommendation, the naturalistic spirit itself recommends heeding this consideration.

Lest the antinaturalist, at this point, think his case made, I hasten to add that despite its limited success, and despite its shaky foundations, cognitive science is thriving, that it is pointing philosophy of mind and epistemology (briefly, philosophical psychology) in directions which they hadn't visited before, and that our views about the mind and its natural underpinnings are undergoing rather profound changes.

It is not easy to provide a crisp argument in favor of such a view. It is actually more a question of judgment than of argument. Familiarity with the field, not just its results but its inner processes, its ongoing discussions, its speculative energy, induces a strong impression of a thriving research program. Of course, the same impression was certainly conveyed to optimistic, sometimes perhaps even gullible, witnesses or participants in scientific programs which have since reputedly gone bankrupt, such as Gestalt psychology, behaviorism or early artificial intelligence. Indeed, as we saw, this consideration plays a crucial role in the move from mere methodological to minimal naturalism. We must be content at this juncture to record as a fact that a form of philosophical antinaturalism which would purport to show that what is going on in cognitive science today is essentially a waste of time would be greeted with considerable skepticism, and that the burden of the proof would rest on the antinaturalist. He would have to show not simply that some claims are exaggerated, some phenomena likely to remain untouched, some tensions or even contradictions exist between subfields and schools, etc.: he would have to make a convincing case that a majority of results are either unsound, or uninformative, or again require a complete reinterpretation in order to fit into some conceptually acceptable picture. A tall order. Meanwhile, the realistic spirit again commends rejecting a view which would all but deny existence and coherence to this scientific and philosophical activity.

Perhaps the moral to draw at this point, in line with the general point made at the end of the first part of the paper, is that cognitive science, by combining vocabularies and levels of explanation, mentalizes nature while physicalizing the mind.

3. Naturalizing the brain

Raising a question about a project aimed at naturalizing the *mind* seems quite legitimate in the philosophical context which we all share. But what is there to worry about when it comes to the *brain*? Isn't it a matter of definitions that there exists a natural science of the brain, however still in its youth, a science (recently) baptized neuroscience?

In response to this raising of eyebrows, it might first be recalled that for a long time, and to this day in some circles, there is a question of how much of a naturalization the biological sciences perform on the phenomenon of life. The hard part for naturalism, it is held in that tradition, concerns *life* more specifically than *thought*. We shall not pursue this line of inquiry here, but before relinquishing it might be worth drawing attention to the tension which exists within cognitive science between the majority conception which holds, tacitly, that a reduction to, or integration within, or convergence with, biology, is all that they are after, and those, philosophers for the most part, who insist on a fully *physicalist* reduction, integration, or convergence. The first group puts aside the issue of the relation between the life sciences and the physical sciences, the second claims that the issue is all but settled.

A second preliminary remark is that naturalizing the brain surely appears no easier today than naturalizing the physical world appeared in Newton's and Locke's time. One thing is to register the

success of physics, another is to take the success of neuroscience for granted. It is a brute fact that colossal efforts were required from physics, from Newton to Helmholtz and Maxwell, to fulfill the aims of naturalism regarding the realm of planets and rocks, of light and heat, etc.; the task of neuroscience today in order to achieve the same regarding the brain is not one bit easier, and that again is a brute fact.

This leads us to the heart of the matter. As Poincaré might say, the question is not *Is* the brain part of nature, but *How* is it to be seen as part of nature? The point is that there is no obvious, non-question-begging answer. The nominal answer is, of course, that *integrated cognitive neuroscience* in the generic sense is in charge of the *how*. *Of course* any research program purporting to provide a scientific account of the structure and function of the brain is part of that discipline.

But the issue remains: 'Integration' is ambiguous. In the narrow, local sense, it refers to the classical conception in biology of a series of 'levels' of aggregation, each one 'emerging' from the one below it. In the wide sense, it refers to what Poincaré calls 'unification': It is, precisely, a conception of how the various takes on the phenomenon are to be connected and jointly comprehended. The narrow, local, sense takes for granted the general shape of the solution to the problem raised by the wide construal. It assumes that the standard levels picture, which is widely regarded as satisfactory for many central parts of biology, is also the one which fits the scientific account of the brain (or the central nervous system). But however plausible it might appear from a certain specific naturalistic standpoint, it is by no means unquestioned. As will be argued below, even if it should turn out to be on the right track, this majority view raises some further problems. But it is also challenged by the fact that there are several contenders, and not just one, for the role of integrating paradigm. The list includes at least the following:

- Cognitive neuroscience as is usually understood, *i.e.* the majority paradigm today, a branch of integrated neuroscience devoted to the brain and based on extensive use of neuroimaging;
- Basic (cellular and molecular) neuroscience;
- Theoretical neuroscience (including computational neuroscience or neurocomputing, and involving the development of new physical tools);
- General biology;
- Theoretical biology and Artificial Life;
- Evolutionary biology;
- A yet to be articulated paradigm based on self-organization and 'engagement', as adumbrated in the work of Walter Freeman and others.

This list calls for an extensive discussion which would take us too far afield. Many neuroscientists would argue, first, that several items should be consolidated, and second, that the job of cognitive neuroscience is to gradually integrate everything which will turn out to be valid or fruitful in the list, so that presenting its items as competitors is a complete mistake: they are engaged in, or poised for, collaboration. This is true, in a very vague and general sense, but misses the point: it engages, once again, the free-floating sense of unification, not the anchored, Poincaré-an sense. As the most superficial examination of the field reveals, there are, indeed, competing viewpoints on how to develop a science of the brain which includes an account of its cognitive functions. For example, the role of evolutionary thinking is hotly debated. So is that of cellular and molecular neuroscience (see Bickle 2003).

The central point however, one which has escaped hardly anyone's attention, is that the sought after unification would seem to require some notion of information. The standard neuroscientific claim is that such a notion is made available by theories of neural coding. But although this is a *reasonable* claim to make, it is not one which is obviously true. Just as McCulloch and Pitt's 1943 proposal for a logical calculus 'immanent in nervous activity' (in McCulloch 1988) is a far cry from what cognitive science seems to need, just as Shannon's 1949 notion of information turns out to be equally lacking (see Andler 1992; and Dretske 1981 for an attempted remedy), it remains to establish that today's neural coding deserves its status as a natural base for information in the sense where students of mind and language use the notion. The manner in which this problem is handled in practice makes sense: while the *mind* 'processes information', the *brain* undergoes dedicated, specific physical (chemo-electrical) transitory events which are cashed in terms of (neural) 'signal processing'. But in order to move from the observation of this kind of correlation to an integrated account, neuroscience has no choice but to adopt a hybrid, physical *cum* intentional vocabulary. In the present state of the art, insofar as neuroscience achieves a naturalization of the mind, its cost, unacceptable to many, is a mentalization of nature.

This problem, if it is one, is compounded as cognitive science increasingly turns its attention to the social dimension of the mental. Some important developments bring into question the well-

entrenched belief that mentality is a resource resting entirely in the individual organism. Under the general label of 'externalism', several authors (Clark 1997, Rowlands 2003, Wilson 2004) have recently argued that externalism, the classical doctrine in the philosophy of mind, inspired by Putnam 1975 and Burge 1979, concerning the relational character of propositional attitudes, should be considerably broadened. They propose, under the same label of 'externalism', to view the mind and cognition as extending beyond the individual skull, and resting on complex and dynamic interactions involving the bodies, brains included, of more than one human agent, as well as artefacts and other elements of the environment (see also Hutchins 1995). To the extent that there is some validity in these considerations, the project of naturalizing the brain by the normal means of anatomy and physiology coupled with individualistic intentional psychology runs into the following branching point: *either* it renounces the ambition of providing a full naturalization of the brain insofar as the mind no longer entirely 'resides' in the brain the way, say, the respiratory function resides in the lungs, *or* it finds a way of integrating the social dimension in a 'social' theory of the brain. The latter choice is more congenial to neuroscientists, and the neo-constructivist program of Quartz and Sejnovski (1997), or Changeux's 2002 multi-level synthesis, are moves in that direction.

4. Naturalizing society and culture

Going from the brain to society and culture takes us from one extreme to the other. To inquire into the meaning of naturalizing the brain appeared odd at first sight because too straightforward to deserve examination. To do the same regarding society and culture invites the opposite reaction: Isn't it stipulative that what properly belongs to the social-cultural realm is excluded from the natural realm? But of course that is the whole point of a naturalization program (see Sperber 1996). Still, it may be argued that the track record of naturalization programs for the social realm is such that one would need good reasons to feel optimistic about a fresh attempt. Two such reasons might be offered. First, the assumption that the social and natural realms are disjoint results from theoretical and methodological decisions which have shaped social science in the XXth century, but was not always taken for granted, and need not be accepted as what Wittgenstein (posth./1969) calls a hinge proposition, one which we know with certainty although it is not a matter of logic or convention, and which we would not know how to falsify. The second reason is that science (and philosophy) can learn from their mistakes. Just as we came to realize that the naturalization of the mind would not follow from unaugmented neuroanatomy, as some XIXth neurologists believed, nor from a reduction to learned behavior, as behaviorism held, social-cognitive scientists have surmised that the naturalization of the social realm will require resources going beyond those of unaugmented physical and biological science. In fact, the missing ingredient is thought by a number of authors to be precisely the mind, which the ongoing program of cognitive science, according to them, is bringing into the fold of Nature.

However, we need to ask how promising the proposed naturalization appears, what it is really achieving and at what ontological cost. This is, again, a large question which cannot be seriously examined here. Nonetheless, it is worth taking a superficial look at the situation.

Most of the results in the area of cognitive approaches to mind and culture belong to one of two broad classes. What one may call the 'weak program' is predicated on methodological individualism (the assumption that social phenomena are to be analysed solely as straightforwardly summative effects of individual decisions and dispositions), combined with modest attempts at making one's psychological assumptions more realistic (see Sperber 1996, and Andler *et al.* 2003, chap. 6). The 'weakness' implied concerns the grounding of these realistic assumptions: they usually owe little to cognitive science, and tend to rest on plausible refinements inspired by commonsense objections to clearly extreme idealizations of the human agent. Most of the work done in cognitive economics, sociology, social psychology, anthropology, is of this kind, and the point is not to disparage it, but merely to point out that very little is achieved in terms of naturalization: insofar as the psychology remains rudimentary and thoroughly intentionalistic, its net effect on the clearly non-naturalistic frameworks of classical social science remains modest. Not much progress is made in the understanding of how natural beings give rise to human society or culture, although what is achieved may serve as a stepping-stone to more momentous reconceptualizations.

The second kind of approach is more ambitious (see Barkow *et al.* 1992, Hirschfeld & Gelman 1994, Carruthers & Chamberlain 2000, Carruthers *et al.* 2005). This 'strong' program has been pursued on two fronts. On the one hand, according to one school of thought, social competence turns out to rest on *specific* abilities which cognitive science has the tools to study directly, relying mostly on developmental and neuropsychological material, but also, more recently, on anthropological evidence. The central claim is that normal humans develop a specific ability to view conspecifics as endowed

with a mind, understood as an ability to hold desires of its own and beliefs which are not rigidly connected to what they are about, in particular can be false and/or differ from those of the interpreter (hence 'theory of mind' as one label for this interpretive ability, next to 'naïve or folk psychology'). A link is thus provided from social to mental to neural phenomena. The other line of work extends the program of sociobiology by introducing, between social behavior and natural selection, the brain of *Homo sapiens*. This evolutionary cognitive-social science is regarded by its proponents as a radically novel and hopeful naturalization program for society and culture. It has the resources to attack, next to traditional sociobiological themes such as parental care, mate choice, aggression etc., such central social and anthropological phenomena as religion or the evolution of culture. However, it is becoming increasingly clear that the direct constraints which the species-specific endowment exert on culture and social structure leave a huge slack, which is taken up by bootstrapping effects well documented in other areas of application of evolutionary theory (see e.g. Diamond 1997). Hence the motto 'Not by Genes Alone' which serves as a title for a recent work by Richerson and Boyd (2005), who grant culture a position half-way between autonomy and dependence with respect to the genetic endowment. More specifically, humans use their native capabilities to construct cultural niches in which these native capabilities are deployed in a fashion which is removed by one or more degrees from the brain/mind-shaping forces of evolution (see Sperber in Hirschfeld & Gelman 1994 and Sterelny 2003).

Both directions of inquiry are strongly cognitive in that they do not force the influence of nature on culture through the narrow passage of the conscious individual. They allow a direct route from 'subpersonal' processes to cultural phenomena, and have the potential, clearly demonstrated in the details of the theory of folk psychology and related abilities, to engage non-commonsensual concepts and conjectures from cognitive science.

What are we to make of these developments? They lend support to the naturalistic stance, yet they are a striking illustration of the benefits of minimal naturalism. On the one hand, the partial naturalization of the social realm which they seem in a position to accomplish changes or at least enriches in unexpected ways our conceptions of the mind, hence of nature. Possibly the same may happen with the direct 'brain-naturalization' of the social which is beginning to take hold. Another contribution is to show what an essential role is played by the evolutionary dimension, just as Darwin himself pleaded—a lesson to those who would presume to predict what resources need be tapped in order to fulfill a scientific project, as evolution figured nowhere in the early phases of cognitive science.

On the other hand, the naturalization which is perhaps on its way does not conform to what earlier physicalists had in mind. What it brings to light has the form of constraints, which shape a dynamic landscape on which the actual trajectories of social and cultural phenomena are drawn as human groups form and evolve according to contingencies and conscious choices. But this way of construing the contribution of cognitive science, in particular the concept of niche construction, paves the way for a much richer interaction with mainstream social science than had previously been thought possible on either side.



Naturalizing man is a risky business. Eliminating phlogiston, impetus, temperature, or crystalline spheres is one thing. Eliminating entities deemed essential for millennia to mankind's self-conception is quite another. Naturalistic programs must make it clear that elimination is not on their agendas. Reduction is a possibility for some cases, and it raises issues which will gain importance in the years to come. Giving a chance for a rational discussion of these issues requires gaining a perspective on what sort of reduction is in the cards, and what the implications are from the point of view of those who are working at achieving it. A self-examining attitude and an openness to dialogue are critical.

It is equally important to stress that nothing like a physics of mind or society is a realistic prospect, regardless of what dreams may still be entertained by some. The immediate reason is that such a physics would require a degree of completion at every level which is utopian to envisage. The more general reason is that there is no example of a science of highly complex systems endowed with the certainty and determinacy associated with Newtonian mechanics, which remains, despite later developments, and despite the failure of previous attempts at constructing a physics of anything but simple material systems, the archetype of 'physics'.

Finally, as it is unlikely that theoretical tensions between traditional social science and cognitive-scientific approaches will subside overnight, it would be wise to pursue collaborative research on real-life problems arising in decision-making, grassroot politics, economics, education,

health, media, administration, and so forth: such enterprises are likely to ease the theoretical tensions and to offer a chance for the elaboration of mutual understanding and common conceptual tools.

- Andler, D. (1992), From paleo to neo connectionism, in van der Vijver, G., ed., *New Perspectives on Cybernetics*, Dordrecht: Kluwer, p. 125-146
- Andler, D., ed. (2004), *Introduction aux sciences cognitives*, Paris : Gallimard
- Andler, D. (2005), " Les neurosciences cognitives: une nouvelle « nouvelle science de l'esprit ?" *Psychiatrie, sciences humaines, neuroscience*, 3 12 , pp. 74-87
- Andler, D., Fagot-Largeault, A., Saint-Sernin, B. (2003), *Philosophie des sciences*, Paris
- Barkow, J., Cosmides, L., Tooby, J., eds, (1992), *The Adapted Mind. Evolutionary Psychology and the Generation of Culture*, New York & Oxford: Oxford University Press
- Betzig, L., ed. (1998), *Human Nature, a critical reader*, Oxford: Oxford University Press
- Bickle, J. (2003), *Philosophy and Neuroscience. A Ruthlessly Reductive Account*, Dordrecht: Kluwer
- Burge, T. (1979), Individualism and the mental, in French, P., Uehling, T. & Wettstein, H., eds., *Midwest Studies in Philosophy*, Minneapolis, MN: University of Minnesota Press, p. 73-121
- Buss, D. (1997), *Evolutionary psychology*, Cambridge, MA: Harvard University Press
- Byrne, R. & Whiten, A., eds. (1988), *Machiavellian Intelligence*, Oxford: Oxford University Press
- Carruthers, P., Chamberlain, A., eds. (2000), *Evolution and the human mind. Modularity, language and meta-cognition*, Cambridge: Cambridge University Press
- Carruthers, P., Laurence, L. & Stich, S. (2005), *The Innate Mind*, New York & Oxford : Oxford University Press
- Changeux, J.-P., (2002), *L'homme de vérité*, Paris : Odile Jacob
- Chomsky, N. (2000), *New Horizons in the Study of Language and Mind*, Cambridge: Cambridge University Press
- Clark, A. & Chalmers, D. (1998), The extended mind, *Analysis* 58, pp. 7-19
- Clark, A. (1997), *Being There. Putting mind, brain and world back together again*, Cambridge, MA: MIT Press
- Dennett, D.C. (1995), *Darwin's Dangerous Idea. Evolution and the meanings of life*, New York: Simon & Schuster
- Diamond, J. (1997), *Guns, Germs, and Steel. The Fate of Human Societies*, New York: Norton
- Dretske, F. (1981), *Knowledge and the Flow of Information*, Cambridge, MA: MIT Press
- Dreyfus, H.L. (1972), *What Computers Can't Do. A Critique of Artificial Reason*, New York: Harper and Row.
Revised edition (1979). Augmented edition (1992), *What Computers Still Can't Do*, Cambridge, MA: MIT Press
- Dupré, J. (2001), *Human nature and the limits of science*, Oxford : Oxford University Press
- Fodor, J.A. (1983), *The Modularity of Mind*, Cambridge, MA: MIT Press
- Fodor, J.A. (2000), *The Mind Doesn't Work That Way. The Scope and Limits of Computational Psychology*, Cambridge, MA : MIT Press
- Freeman, W.J. (1999), *How Brains Make Up Their Minds*, London: Weidenfeld & Nicolson
- Godfrey-Smith, P. (1996), *Complexity and the Function of Mind in Nature*, Cambridge: Cambridge University Press
- Hatfield, G. (1995), Remaking the Science of the Mind, in Fox, C., Porter, R. & Wokler, W., eds., *Inventing Human Science: Eighteenth-Century Domains*, Berkeley, CA: University of California Press
- Haugeland, J., ed. (1981), *Mind Design*, Cambridge, MA: MIT Press.
- Haugeland, J. (1985), *Artificial Intelligence, The Very Idea*, Cambridge, MA: MIT Press
- Hirschfeld, L. & Gelman, S., eds. (1994), *Mapping the Mind*, Cambridge: Cambridge University Press
- Hutchins, E. (1995), *Cognition in the Wild*, Cambridge, MA: MIT Press
- Johnson, D. & Erneling, C., eds. (1997), *The Future of the Cognitive Revolution*, New York, Oxford: Oxford University Press
- Levinson, S. & Jaisson, P., eds. (2006), *Evolution and Culture*, Cambridge, MA: MIT Press
- McCulloch, W., (1988), *Embodiments of Mind*, Cambridge, MA : MIT Press
- McKinnon, S. & Silverman, S., eds. (2005), *Complexities. Beyond Nature & Nurture*, Chicago: University of Chicago Press, 2005
- Papineau, David. *Philosophical Naturalism*, Oxford : Blackwell, 1993.
- Poincaré, H. (1902), *La science et l'hypothèse*, Paris: Flammarion
- Putnam, H. (1975), The meaning of 'meaning', repr. in Putnam, *Philosophical Papers*, vol. 2, *Mind, Language and Reality*, Cambridge: Cambridge University Press
- Putnam, H. (1988), *Representation and Reality*, Cambridge, MA : MIT Press
- Putnam, H. (1994), *Words and Life*, Cambridge, MA : Harvard University Press
- Quartz, S. & Sejnowski, TJ (1997). The neural basis of cognitive development: A constructivist manifesto. *Behavioral and Brain Sciences* 20 (4), p. 537-596
- Quine, W. v. O. (1969), *Ontological Relativity and Other Essays*, New York: Columbia University Press
- Richerson, P. & Boyd, R. (2005), *Not by Genes Alone: How Culture Transformed Human Evolution*, Chicago : University of Chicago Press
- Rosenberg, A. (2000), *Darwinism in Philosophy, Social Science and Policy*, Cambridge: Cambridge University Press
- Rowlands, M. (2003), *Externalism. Putting mind and world back together again*, Montreal & Kingston : McGill-Queen's University Press, 2003

- Sperber, D. (1996), *Explaining Culture: A Naturalistic Approach*, Oxford: Blackwell
- Sterelny, K. (2003), *Thought in a hostile world*, Oxford : Blackwell
- Tomasello, M. (1999), *The Cultural Origins of Human Cognition*, Cambridge, MA: Harvard University Press
- Walsh, D., ed. (2001), *Naturalism, Evolution and Mind*, Cambridge: Cambridge University Press
- Wilson, R. (2004), *Boundaries of the Mind. The individual in the fragile sciences*, Cambridge : Cambridge University Press
- Wittgenstein, L., (posth./1969) *On Certainty*, Oxford : Blackwell