

Cognitive Science and its Discontents

Review of *Two Sciences of Mind* by S. O' Nuallain, P. McKevitt and E. Mac Aogain (Eds.)

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PSYCHE, 4(24), December, 1998

<http://psyche.cs.monash.edu.au/v4/psyche-4-24-marraffa.html>

KEYWORDS: cognitive science, computationalism, connectionism, consciousness, dynamical systems, embodiment, hard problem, information-processing, phenomenology, representation, situatedness.

REVIEW OF: Sean O' Nuallain, Paul McKevitt & Eoghan Mac Aogain (Eds.) (1997). *Two Sciences of Mind: Readings in Cognitive Science and Consciousness*. Amsterdam/Philadelphia: John Benjamins Publishing Company. xi + 498pp. ISBN 9-02725-129-0. Price: US\$79.00; pbk.

1. Introduction

As the electronic version of *The MIT Encyclopedia of the Cognitive Sciences* (Wilson and Keil, forthcoming) is on the verge of losing its disembodied (and unquotable) form and becoming incarnate as the official reference work of a vital and expansionary cognitive science, a less reassuring picture of the field is evoked by *Two Sciences of Mind*, the result of the workshop on *Reaching for Mind: Foundations of Cognitive Science*, hosted by the Society for the Study of Artificial Intelligence and Simulation of Behaviour and the Sheffield Computer Science Department, in 1995.

As Sean O' Nuallain--chair of the "Reaching for Mind" workshop and principal architect of this volume--points out in his Introduction, this ambitious collection of 21 essays is designed to discuss the perception that a crisis is currently shaking the foundations of

cognitive science. The epicentre of this "Kuhnian" earthquake seems to lie in a "tension" between cognitive science's claiming to be the "science of mind" and its adherence to the computational/representational theory of mind-- according to which intentional mental processes are computations over symbolic representations--which leaves out such important phenomena as motivation, emotion and consciousness, as well as social and cultural factors. The trouble, then, is that mainstream symbolic or classical cognitive science is an attempt to explain away rather than explain mind.

Over the last decade, the diagnosis that business-as-usual cognitive science is at a foundational impasse has taken one of two routes. The first route--let's call it *repudiationism*--leads to an obituary for cognitive science. To repudiate cognitive science is not to deny that we are cognitive organisms and think, remember, and so on; but it is to describe and try to explain these facts without making assumptions of the cognitive science type. Here are a few examples. Searle (1992) rejects the central doctrine of cognitive science, the claim that there is a level of analysis, the information-processing level, intermediate between the phenomenological level and the neurophysiological level (cf. Dennett 1993a). Similarly, Edelman (1992) calls for a *biological* counter-revolution to succeed the cognitive revolution. In the same vein, Bruner (1990, 1997) combats what he sees as the "trivializing" effect that AI has had on psychology and calls for a renewing and an *anthropological* reorientation of cognitive science. Even more radically, Penrose (1989, 1994, 1997) tries to replace the computationalist mind with a *quantum* one.

The other route--let's call it *revisionism*--heads to a reconceptualization of cognitive science, and takes pains to strike a happy medium between the aforementioned devastating attacks on cognitive science and the computationalist and representationalist orthodoxy. To revise cognitive science is to try to describe cognition and cognitive activity with different assumptions than classical cognitive science; but these different assumptions (somehow) still deserve to be classified as of the cognitive science type. Involved in this reformist project are "those researchers from inside cognitive science who are currently working on consciousness, affect and social factors and do not see any incompatibility between this research and their vision of cognitive science, which is that of a Science of Mind" (*Two Sciences of Mind*, p. 1; for the sake of brevity hereafter this work will only be referred to by page numbers). In the Internet workshop description we find mentioned as candidates for this less radical strategy the names of Dennett (1993a), McKeivitt and Partridge (1991), McKeivitt and Guo (1994), and O' Nuallain (1995). The latter is an attempt to propose a new common theoretical framework for cognitive science--called the "Nolian framework" (from John Nolan, an early author's pseudonym)--which is, inter alia, the editorial backbone of these workshop proceedings.

In fact, *Two Sciences of Mind* is organized into three thematic parts, each preceded by an introduction by O' Nuallain which, drawing on the Nolian framework, outlines how the contributions relate to the specific theme. The first part ("Cognitive Science in Crisis? Cognition and Mind") contains papers which agree (Bickhard, Dartnall, Kime, Narayanan, O' Nuallain) or disagree (Scott, Watt) with the premise of the workshop, that is, that there is a crisis in cognitive science caused by a tension arising from the constraints imposed by the idea that the mind is a digital computer. The second part

("Epistemology and Methodology") includes papers relating such "educational experiences in the field" as the symbol-grounding problem (MacDorman, McKeivitt & Guo), the systematicity argument (Aizawa), functionalism and parallel distributed processing (Berkeley), the consequences for computationalist cognitive science of emotion's informational role (DeLancey), and aspects of the dynamic approach to cognition (Dautenhahn & Christaller). Finally, the third part ("Consciousness and Selfhood") features contributions to two workshop sections: "Cognitive science and the Person" (Barnden, Brook, O' Nuallain) and "Architectures for Consciousness" (Hoffman, Katz & Riley, Newman, Baars & Sung-Bae Cho, Sabah, Taylor).

To review a hefty anthology on such topics you have to pick and choose. So I'll be picky and choosy. I will focus on the papers directly relevant to the diagnosis of a crisis in classical cognitive science, and to the project of creating a separate science of consciousness. I will be critical in this review, but it is consistent with this criticism that the book is a worthwhile read.

2. From Cognitive Science to the Science of Mind: Reform or Revolution?

In his contribution to the first part of the book ("The search for mind: A new foundation for cognitive science", pp. 37-49), O' Nuallain offers a precis of his (1995). His *bête noire* is Pylyshyn's (1984) view of cognitive science as a discipline founded on a number of tenets: the acceptance of a level of representation, the use of computers, the demotion of emotional and cultural factors, an interdisciplinary style (cf. Gardner, 1985). He also adds materialism to the list. Of these tenets, he foresees, "only the interdisciplinary ethos is likely to survive the decade" (p. 38). The rationale for such a shocking prediction would lie in all the recent work in cognitive science that does not fit the orthodox materialist-computationalist framework. But is this really cogent evidence for the idea that "extraordinary science" is underway or, as Dennett (1993b) wonders about Varela et al. (1991), "is it just a modest revision of emphases in response to an assemblage of familiar criticisms?" Sometimes, it seems, it was all much ado about nothing. For example, O' Nuallain espouses Edelman's claim that functionalism prevents cognitive science from being biologically grounded. But the latter is not a good ally in this polemic. As Dennett (1992) has remarked, Edelman misidentifies cognitive science with "High Church Computationalism", an out-to-date, antibiological involution of the good idea that there is a computational level of description between folk psychology and brain science (Dennett, 1998, pp. 216-17). However, the re-biologization of cognitive science has been making great strides over the last decade. And it is true that neuroscience is left out in some cognitive scientists' attempts to achieve a metatheoric self-understanding (cf. Thagard, 1996; Von Eckardt, 1993); nevertheless, some of the most sophisticated recent discussions of the structure of cognitive science (see, for example, Hardcastle, 1996) view the search for a multidimensional understanding of cognitive phenomena at a number of interlocking levels of description--including that of the neural implementation-

-as one of the important defining characteristics of cognitive science as a discipline (cf. Garfield, 1998a, b). So the revolutionary rhetoric appears inappropriate here. (Greco, 1997, thinks the opposite; he laments that O' Nuallain does not take "the bigger step, to go beyond cognitive science, and to declare that a new science is needed" (p. 256). Note that the magnitude required of an innovation before someone or other is tempted to call it a revolution has diminished alarmingly.)

Some of the newest work on "situatedness/embeddedness" (Suchman, 1987), "symbol grounding" (Harnad, 1990) and the dynamical approach to cognition (Port & van Gelder, 1995) looks much more menacing to classical cognitive science, but never to the extent of foreshadowing an imminent disappearance of such pivotal concepts as computation and representation. In Part 2, MacDorman ("How to ground symbols adaptively, pp. 135-78), Mc Kevitt and Guo ("From Chinese Rooms to Irish Rooms", pp. 179-96), and Dautenhahn and Christaller ("Remembering, Rehearsal and Empathy", pp. 257-82) discuss some aspects of connectionist grounding, the dynamical systems approach and behavior-based robotics which share a deep dissatisfaction with the "solipsistic" or "individualistic" slant to cognitive science. Instead they emphasize the environmentally embedded, corporeally embodied, and neurally "embrained" character of natural cognition. O' Nuallain enthusiastically agrees with this emerging focus on the physical, environmental, and social contexts for cognition--an agreement expressed, alas, in the trendy idiom of existential phenomenology: "We can usefully discuss cognition only in terms of the organism's being enmeshed in a Life-world" (p. 43). Does all this work on "embodied, active cognition" show that representational and computational views of cognition are just mistaken? Brooks (1991) thinks it does; and some authors (e.g., van Gelder & Port, 1995) explicitly draw upon Kuhn's notion of a paradigm and of paradigm change in describing dynamical systems theory as the death knell for the computational/representational theory of mind. But again, this verdict is, at the very least, controversial. Dennett (1993b), for example, maintains that the trouble with Brooks' anti-representationalism is that once we try to extend his "interesting and important message beyond the simplest of critters (artificial or biological), we can be quite sure that something *awfully like* representation is going to have to creep in like the tide, in large waves" (p. 126). Similarly, Clark (1997, p. 148) has persuasively argued against what he calls the thesis of "radical embodied cognition", according to which mind "is best studied by means of noncomputational and nonrepresentational ideas". What we need, he argues, is not a non-representational theory, but a *better* representational theory, one that leaves room for other explanatory strategies (Chemero, 1998, emphasizes this point). Bickard ("Is cognition an autonomous subsystem?", pp. 115-31; see also Bickard & Terveen, 1995) has been working on this for about 20 years. He identifies a particular misguided, deep assumption concerning the nature of representation ("encodingism") and develops an alternative model ("interactivism") which is supposed to avoid that assumption and find a natural home in situated cognition, autonomous agents research, and dynamic systems approach. All in all, there is little evidence here to support the prediction that the appeal to representation is unlikely "to survive the decade".

I think that the premise of the "Search for Mind" workshop is an artifact that has been engendered by O' Nuallain's espousal of the Kuhnian philosophy of science (cf. pp. 37,

40). O'Donohue (1993) has cogently argued that Kuhn's apparatus is totally unfit to model the structure and dynamics of psychology, and urged psychologists to consider other metascientific theories in studying their discipline. And this is a fortiori true of cognitive science. [1](#) It is no surprise, then, that the tired Kuhnian concepts caused O'Nuallain to misinterpret his own work. He wants to review any discipline which claims any province of the science of mind in a presuppositionless way, in the hope that a framework can emerge relaxing the grip of mainstream orthodoxy over cognitive science (p. 41). This appears to be in accordance with a normative-naturalist strategy trying to extract the principles of cognitive science from a study of its actual practice, as opposed to a commitment to abstract rational reconstruction. However, O'Nuallain describes the output of his survey as a "paradigm" competing with the received one in the same way as quantum physics fought against classical physics, with such "anomalies" as consciousness, emotion and social factors in the role of black-body radiation (p. 40). But a cursory examination shows that his supposed "paradigm" turns out to be nothing but a snapshot of current cognitive science, that is, a cluster of problems, projects and programs "related to one another more by relations of family resemblance than through sharing some common essence" (Garfield, forthcoming). Any attempt to squeeze this plurality into a common theoretical framework will inevitably either leave a lot out (as in the case of the aforementioned monographs by Thagard and von Eckardt) or issue in a trivial account, as is evident in this passage of O'Nuallain's: "No assumption about cognitive science need be made other than it is *the science that deals with cognition* and thus, to this extent, Mind. In this version of cognitive science, we can encompass Gibson, Edelman and Fodor with the same sweep that netted Pylyshyn and Johnson-Laird" (p. 46; emphasis added). Therefore post-classical cognitive scientists would do better to look at models of cross-scientific relations which focus on local integration rather than global unification. Darden and Maull (1987), for example, have rejected the insistence on a common theoretical framework and proposed instead that *interfield theories*, which establish connections between phenomena that have been studied in two or more fields of inquiry without making any one of them more basic, constitute the vehicle of integration (see Bechtel, 1988, for some historical instances of the fruitfulness of such interfield theorizing within cognitive science). Another fine example is McCauley (1996); his analyses show how upper-level research often plays central roles in justifying lower-level proposals, motivating innovative research at intermediate levels (such as connectionist modeling), and stimulating research in what Hardcastle (1996) calls "bridge sciences," sciences whose domains and explanations cross and link levels of description in cognitive science (such as ERP studies).

3. The Science of Consciousness

According to O'Nuallain, the processes of mentation "which can be characterized in bits" are the domain of the resurgent cognitive science. Here the concept of information must be broad enough to include not only rule-governed symbol manipulation, but also embodied, situated, and distributed cognition. Although this emphasis on information processing per se, and the author's insistence that symbolic cognitive modeling does not

exhaust cognitive science proper is to be applauded, his concept of information is too broad for cognitive science. As Bickhard (1997) has pointed out, "information in the mathematical or covariational sense is ubiquitous throughout the universe. Every instance of every physical law provides an instance of something carrying information in this sense about something else." Therefore some constraints on "information" as delimiting cognitive science are required.

Anyway, information processes, so conceived, include not only perception, cognition and language, but also aspects of motivation, emotion, and consciousness. According to O' Nuallain, however, they cannot capture some fundamental aspects of consciousness; phenomenal aspects and higher forms of consciousness, in particular, are beyond the explanatory power of informational models. This leads O' Nuallain to divide the study of mind into two sciences: the science of information processes, or cognitive science, and the science of consciousness (p. 290). Against any deflationary approach to the "hard problem", the latter science should be divided into "outer empiricism", a mainly informational characterization employing the methods of natural sciences to solve the "easy" problems (well exemplified by Newman, Baars & Sung-Bae Cho's paper); and "inner empiricism", that is, phenomenological, "first person exercises, physical and emotional as well as intellectual, that have been preserved in the religious traditions" (O' Nuallain, 1998). In this perspective, an exemplification of how consciousness research must proceed is Taylor's "relational mind" ("Modeling consciousness", pp. 419-57; see also Taylor, 1998); for he attempts to conjoin the two empiricisms, drawing both on Searle's phenomenal data and current scientific methodology to offer a "synthesis of *Naturwissenschaft* and *Geisteswissenschaft* which is a break from modern western science" (p. 285). This break does not come as a surprise since consciousness is viewed as something supra-computational (Penrose), capable of evaluation of the salience of signals entering from a variety of modalities (Edelman), and "culminating in a subjectivity which yet is pure observation" (Gazzaniga and experientialist traditions); it is, O' Nuallain dramatically concludes, "of an ontological nature new to us natural scientists" (p. 290).

This case for a fruitful coexistence of the first- and third-person point of views is reminiscent of Varela's (1997), probably the most authoritative proponent of a phenomenological approach to the hard problem. Now, it is true that it is our own phenomenology that provides the data that need to be explained. But on my view, the trouble with the project to marry cognitive science and the continental tradition of Phenomenology or meditative traditions is that a *scientific* study of consciousness cannot but adopt an *anti-phenomenological* orientation, <2> i.e., it must treat consciousness as an "*advanced or derived* mental phenomenon, not the foundation of all intentionality, all mentality" (Dennett, 1993a; emphasis added). In other words, the study of consciousness cannot be carried on in a *top-down* way, as happens in phenomenology-inspired approaches starting from an ontological subjectivity *à la* Searle; it must instead follow the Darwinian lesson and proceed *bottom-up*, i.e., attempting to explain how complex mental functions evolve from the more basic ones. This does not require the introspective exercises of the meditative traditions, but animal and developmental psychology. What these traditions offer is nothing but introspection; and as Dennett has argued--

generalizing Nisbett and Wilson's (1977) classical finding that introspective judgments frequently result from confabulation--all introspective reports can be treated as reports of useful fictions. Introspection is a self-deception; and any scientific theory of consciousness must be counterintuitive.

I conclude with an example of the serious methodological errors which may result from a commitment to "internal empiricism". According to O' Nuallain, "the analysis of egocentrism is the royal road to the study of Consciousness"; egocentrism is "an indifferentiation between subject and object. The child who in the state often described as 'Narcissism without Narcissus' fails to distinguish physical self and world is egocentric"; we have here "an unauthentic projection of self: 'I am the world'" (p. 345). But this reveals a commitment to a pre-Darwinian methodological principle according to which some consciousness of objects can form only when it is no longer confused with self-consciousness. This methodological error--induced by introspection --presupposes just the pre-existence of what is to be built, i.e., takes for granted the presence, though in a primitive and confused way, of some form of self-consciousness. But this is a derived mental phenomenon, not a primary datum. What we need then, is a *counterintuitive* distinction between representation as a form of simple consciousness, present in animals and infants, and self-conscious representation (cf. Russell, 1912; Edelman, 1992); as well as a distinction between the subject as a mere functional center organizing action, existing in any animal with a brain, and the self-conscious subject. So it is very likely that since the first day of life a child forms a series of representations of objects automatically, pre-reflexively, without any feeling of subjectivity, or cognition of a corporeal or "inner", experiential space (cf. Lichtenberg, 1989). In short, one-year-old infants and animals (except some primates) have no consciousness of their own existence; they suffer from the limitation of Flaubert's Catoblepa, one of the monsters tempting Saint Anthony: this beast did not distinguish itself from the panorama, and being hungry, devoured its own front paws.

Notes

<1> However, as George Graham (personal communication) interestingly suggests, the Kuhnian model might work for the origins of cognitive science, helping to clarify the scientific scene when behaviorism was rejected. So, Kuhn-talk, of paradigm shifts and the like, might apply to cognitive science at one point in its history without being illuminating at other points.

<2> Cf. Ricoeur (1969): "[Psychoanalysis is] une anti-phÈnomenologie, qui exige, non la rÈduction ý la conscience, mais la rÈduction de la conscience".

Acknowledgements

Thanks to George Graham for helpful comments on an earlier draft of this review.

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