INTRODUCTION:
REINVENTING THE CONNECTIONIST CHALLENGE

Whatever happened to good old fashioned connectionism? Do you remember the time when our choices looked, if not easy, at least relatively clear-cut? On one side, there was classical Artificial Intelligence, replete with syntactically structured symbol strings, a processing/memory distinction, and a vision of semantically coherent behavior as resulting from the application of (implicit or explicit) rules to the symbol strings. On the other side, there was parallel distributed processing – a mushier, but nonetheless attractively robust approach which seemed to do away with syntactically structured internal representations altogether and, a fortiori, to succeed without ever invoking rules defined over such structured items. Symbols and rules were displaced by myriads of smaller, local interactions between (optimistically called) artificial neurons, and semantic coherence was an emergent property of the satisfaction of multiple small constraints.

Those days of innocence are surely no more. For one thing, it soon became clear that our understanding of the key terms in the debate (terms like ‘rule’, ‘symbol’ and even ‘syntactic structure’) was not yet deep enough to support claims of such a clean-cut contrast. And for another thing, Fodor and Pylyshyn’s (1988) paper (which painted classical syntactic structure as a vital component of any empirically plausible model of cognition) caused a great wave of connectionist attempts to incorporate, re-define or otherwise appropriate at least some notion of syntactic structure. The best way to conceptualize the connectionist/classicist dispute was thus left undecided, and the foundational differences (if any) separating the two camps became, to say the least, muddied.

It is into this rather interesting state of disequilibrium that I am pleased to launch the present vector of papers. Almost all of the contributions selected for this special issue are best understood as responses to the rather more unsettled conceptual climate just described. The opening paper (Horgan and Tienson ‘A Nonclassical Framework For Cognitive Science’) suggests an alternative framework for cognitive science built out of the mathematics of Dynamic Systems Theory. This

framework, the authors claim, provides a natural milieu in which to understand connectionist networks. Within this framework, Horgan and Tienson propose to retain the classicist assumption concerning the need for syntactically structured representations but to reject the idea that these representations are the objects of familiar algorithmic, computational transformations. The resulting vision concedes much to the classical syntactic approach while nonetheless departing from classic computational stories in some clear and well-delineated ways. Aizawa's paper ('Representations without Rules: Connectionism and the Syntactic Argument') addresses itself to a version of this argument and tries to show that despite its initial attractiveness, Horgan and Tienson's general position is inconsistent with the kind of connectionist approach to which they are attracted. Indeed, Aizawa goes so far as to suggest that the kind of hybrid vision they endorse may be inconsistent with any physical implementation whatsoever.

McLaughlin and Warfield ('The Allures of Connectionism Reexamined') aim to temper the general excitement about connectionism by arguing against three of its primary perceived attractions. First, they dispute the claim that classical architectures are known to be neurally implausible. Second, they note that pattern recognition abilities are susceptible to classical, as well as connectionist, explanations. And third, they note that learning abilities, likewise, admit to a variety of successful classical explanations. In short, the authors claim that attempts to isolate practical successes which favor connectionism over classicism are less convincing than many philosophers have thought and that connectionism may yet turn out to offer at best an account of the neural implementation of classical processing strategies. Bechtel's piece ('Natural Deduction in Connectionist Systems') attempts to respond to just such a line of argument by offering a practical demonstration of a connectionist solution which, even though it deals with highly syntactically structured objects (logical formalisms) is nonetheless nowhere close to a mere implementation of a classical system. A second strand in Bechtel's treatment stresses the important role that syntactically structured external symbols may play in accommodating some of the classical intuitions (concerning systematicity, productivity, etc. – see Fodor and Pylyshyn (1988)) in a framework in which all the internal processing events are nonetheless of a fundamentally nonclassical variety.

In many of the above pieces, the challenge posed by Fodor and