Enaction: Toward a New Paradigm for Cognitive Science, edited by John Stewart, Olivier Gapenne, and Ezequiel A. Di Paolo. Cambridge, MA: MIT Press, 2010. Pp. xvii + 463.

Radical Embodied Cognitive Science, by Anthony Chemero. Cambridge, MA: MIT Press, 2009. Pp. xiv + 252.

The New Science of the Mind: From Extended Mind to Embodied Phenomenology, by Mark Rowlands. Cambridge, MA: MIT Press, 2010. Pp. x + 249.

This review treats three books all of which promote what is known as an enactive view of cognition, more on which presently. The first of the three, *Enaction: Toward a New Paradigm for Cognitive Science*, consists of the editors’ introduction and fifteen chapters, written by philosophers and cognitive scientists. These essays address a fascinating range of topics, including the relation between primordial life and the appearance of consciousness (Chapter 3), the connection between action, life, and the emotions (Chapter 5), the development of the concept of the external objects of perception (Chapter 7) and of mathematical concepts (Chapter 11), the neural basis of human consciousness (Chapter 13), real-time problem-solving in the navigation of ships (Chapter 15), and more. Limitations of space preclude substantive discussion of these specific domains; instead, this review focuses on theoretical claims central to the enactivist approach.

 What is enactivism? (This usage of ‘enactivism’ follows that of prominent supporters of the enactive view – see Di Paolo and Thompson 2014, De Jaegher and Di Paolo 2012, Hutto and Myin 2012*,* and Menary 2006.) Enactivists hold that “Cognition is action” (222), that “A living organism *enacts* the world it lives in; its effective, embodied action in the world actually constitutes its perception and thereby grounds its cognition” (vii), and that “organisms create their own experience through their actions” (428). On this view, subjects do not encounter a “pre-given” world to be represented and then, subsequent to information processing, acted upon; instead, their actions bring forth the cognitive world (184, 220, 223, 224, 226, 246, 268, 307–308), via sense-making activity of the whole organism (39–40, 45, 60, 71, 73, 76, 77, 79, 139, 146–148, 189, 223, 246).

 These claims cry out for elucidation and evaluation. It will be helpful in this regard to create a composite picture of enactivist thinking, by weaving major enactivist themes into a single argument in support of one of enactivism’s central claims. A caveat is in order, however, concerning the composite nature this argument. Bear in mind that, although the rhetorical strategy taken here facilitates the fruitful analysis of many ideas and inferences at the core of enactivist thinking, not every contributor to *Enaction* accepts every element of the composite picture. Thus, apparent tensions or internal contradictions in this composite picture may represent disagreements among various enactivists, rather than shortcomings of enactivism as a research program. Such tensions should thus be seen as points of choice for enactivists and as criticisms of enactivism only where the claims that pull in different directions all constitute attractive elements of an enactivist picture.

 On to the argument, then:

*Premise 1.* Cognition is for action (281, 428).

*Intermediate conclusion 1.* Thus, cognitive science should focus, in the first instance and perhaps in the main, on action and its production.

*Premise 2.* The relevant form of action – cognitive action – rests on an organism’s contribution to, or initiation of, goal-directed interaction between the entire organism (3, 38, 79, 146­–147, 157, 225, 363, 379) and its environment; this kind of interaction is driven by the survival or health of the whole organism, relative to a given environment (36–41, 45, 48, 78, 96, 106, 119, 149–150, 166, 222 n3, 225).

*Premise 3.* The overall shape of an instance of such cognitive interaction is determined by its temporal components, each of which depends for its character on the fine-grained details of previous temporal segments of the interaction, as well as on the environmental context in which it appears.

*Premise 4.* Cognitive interactions often alter both fine-grained organismic and environmental structures, pushing the individual farther down a given developmental canal or changing the distribution of further options (including options for further canalization) available to the organism (9, 39, Ch. 4).

*Intermediate Conclusion 2.* Thus, the nature of a token cognitive process (or interaction) depends on (a) the state of the organism as it initially existed, (b) on its past actions and the resulting interactions with the environment (prior to the initiation of the process now in question), and (c) the specific series of interactions (including environmental contributions) that are parts of the larger-scale interaction in question, each component part being affected by the ones preceding it and the character of each part being affected by the organism’s previous actions (as component parts of the interaction in question) (432).

*Premise 5.* Thus, to a great extent, action determines the character of cognitive interactions (39, 72, 131, 167, 169, 172–175, 202–205, 221, 277, 307, 349, 351, 352); even with regard to the environment’s contribution, the way in which the environment contributes at a given moment depends on earlier actions taken by the subject.

*Premise 6*. One’s cognitive world is constituted by such interactions (150, 167, 349).

*Conclusion*. Thus, action determines the nature of one’s cognitive world. Alternatively, the cognitive world is not pre-given; or, the environment and the organism co-construct the subject’s cognitive world (although not, it would seem, not as equal partners).

 One might take away from this argument a merely practice-oriented message (238), reading the argument as a recommendation that experimenters pay greater attention to the organism’s interaction with its environment, to the history of such interactions, to the detailed nature of that environment, and perhaps to the broader cultural and social forces that structured the history of the environment in question (see chapters 2, 4, 8, and 15 for examples of such empirical work).

 This merely methodological reading leaves the enactivist’s philosophical sails flapping, however. For, genuine paradigm shift requires substantive theoretical differentiation, a point appreciated by many contributors to *Enaction*. Unfortunately, contributors’ attempts at theoretical differentiation typically take the form of somewhat superficial and dismissive jabs at functionalism, computationalism, information processing, and mental representation (vii–viii, 4, 39, 43, 45, 79, 167, 194, 199, 204, 219–222, 225, 237, 281, 290, 349–350, 444; but note that, at more than one point, enactivist authors themselves seem to appeal to internal, representational states (238 n3 [on mental computation], 374 [on spatial coding], 397 [on conscious simulation and global work spaces], and 427 [on representations used in navigation]). Orthodox cognitive science is criticized, for example, for presupposing that the mind possesses “complete representations of the outside world” (145). But, the reader should wonder whether this is a straw man. After all, computational theories of vision allow for the loss of a wealth of information about the organism’s immediate environment; it’s built right into the formal computation (Rupert 2006). More generally, there’s nothing at all jarring about the idea of a computational model of problem-solving that doesn’t represent all of the aspects of the situation in which the problem-solving process takes place.

 And, little effort is made in this volume to show in convincing detail why orthodox cognitive-scientific tools cannot handle the data produced by interaction-oriented experiments. For example, enactivists claim that the organism-environment interactions are active, whereas, in contrast, computational and information-processing models treat them as passive [39, 79]. But, it’s difficult to see the force of this criticism, once one looks beyond the pejorative metaphor. Standard computational models include goal-states that help to produce actions, which then produce representations of resulting environmental states, which can affect the system’s subsequent goal states, and so on (cf. Simon 1996, 121–122). Why isn’t this approach – regardless of whether it’s labeled ‘passive’ – sufficient to account for the data?

 Consider now the components of the argument pieced together above. Premise 1 represents a bit of received wisdom in the enactivist literature. But, contrary to what enactivists often claim (222), Premise 1, even if true, doesn’t entail that cognition *is* action. After all, how could cognition both be *for* action and *be* action (would it be for itself?)? According to a sensible reading of Premise 1, then, cognition is a process that facilitates or produces something at least partly distinct from cognition: action. That view is, however, hardly distinctive of enactivism: it could be that cognition best serves action if it’s a process of building and storing encyclopedic models of the world that guide action, as need arises, via the application of computational operations.

 The point here is, in the first instance, a logical one. This reader can make no sense of the claim that *a* is *for* *b*, where *a* = *b*. In order that *a* be *for b*, *a* and *b* must be distinct. And, if *a* and *b* are proper names for types, then the categories – cognition and action, in this case – must be distinct. Perhaps an enactivist will resist this kind of sterile analysis, saying (as one enactivist commentator did say, in reaction to a previous draft of this review) that she is interested in the kind of process whereby, for example, jazz musicians create meaningful lived experience in real time. That is a worthwhile *explanandum*, to be sure, but acknowledgement of it does nothing to dispel the current concern. If we call the process of creating meaningful lived experience ‘cognition’ *and*, at the same time, the phenomenon to be explained is the process of creating meaningful lived experience, then cognition doesn’t explain the phenomenon; it *is* the phenomenon. Of course, one could say something more subtle, such as that some instances of cognition-action are *for*,or explain, other instances of cognition-action. This is to abandon the categorical-sounding claim that cognition is for action, but it does open up worthwhile avenues for exploration, one of which is pursued below.

 The intended reading of Premise 2 recommends that cognitive science treat the organism as a single unit, as a cognitive black box; we are to attribute goals or purposes to the organism as a whole, then attempt to understand environmental interactions in light of that (47). The reader will wonder, though, how enactivism might accommodate the enormous range of successful work that has invoked internal, representational states. How does the enactivist model the acquisition and causal efficacy of grammars without positing repeatable cognitive units (neural or computational) with some form of semantic content? And, there’s nothing privileged about language. We are told, for instance, that “In play, the child begins to detach meaning from a situation and to regulate such meanings first with respect to objects and later to his or her own actions” (77), but we’re given no concrete model of detachment and transfer, of its mechanics or implementation. In defense of this way of thinking (and of rejecting cognitive interpretations of internal states or mechanisms), it is argued that we cannot appeal to internal states with content of their own, for there are no such states, because any given state can mean different things in different contexts (47). Such considerations may push us toward a sophisticated semantics for the states in question, a semantics sensitive to the broader context in which those states function or the particular history of a cognitive unit’s interaction with elements in the environment, but such considerations provide no reason to think that content can be attributed to, or borne by, the entire organism only (or only by something even more expansive, such as the organism and its environment together).

 None of the preceding constitutes a Fodor-style “only president you’ve got” argument in favor of computationalism (Fodor 1975, 27); rather, it is meant to make a point about the dialectic. Contributors to *Enaction* dismiss orthodox positions, but this is relatively ineffective as an argument for paradigm shift if it rests only on the assigning of pejorative labels to orthodox cognitive-scientific approaches. Neither does it help the enactivist’s case to appeal to uncashed metaphors, which cannot do scientific work all on their own. In order to criticize the orthodox position effectively, enactivists must develop accounts of the mechanistic or physical implementation of the processes they tend to describe metaphorically and *also* engage in an informed way with the orthodoxy, by, for example, showing that enactivist models handle the data better than genuine, fleshed-out orthodox models do. Or, to think of this as a debate over a functionalist theory of mind, enactivists might do best to try to show that the causal (or otherwise natural) processes supposed by enactivists to explain the data cannot be captured adequately by a Ramsey sentence (Lewis 1970). Unfortunately, this kind of engagement with the opposition appears to be lacking from the volume, despite the confidence with which many contributors seem to dismiss appeals to computation and representation, as well as functionalist theories of mind.Some of this volume’s most provocative-sounding claims turn, disappointingly, on definitional stipulation. Readers are told, for example, that “[i]n sense-making, active coupling with the world brings forth a realm of significance” (71). Given the normal acceptation of these terms, readers will likely take the sense and significance in question to inhabit a realm of abstract ideas or an internal realm of mental states – perhaps conscious experiences – and take the relation between such states and human action to be an open and important question. But, for the enactivist, there are no such open questions, for ‘sense-making’, ‘significance’, and ‘meaning’, as well as ‘cognition’, are all characterized in the same way, as a certain kind of interaction between the organism and the world, in ways that further life (36, 39, 150). Thus, the quotation from a few sentences prior seems, in effect, to say “When we actively couple with the world, that active coupling with the world brings forth active coupling with the world.”

 This complaint holds without respect to the ways in which one might refine the definition of the sort of life-furthering activities in question. For example, Di Paolo, Rohde, and De Jaegher say:

Only adaptive autopoietic entities that improve the conditions for continued autopoiesis, by actively monitoring their own state, identifying at least some tendencies that bring them closer to the boundary of viability and counteracting these tendencies can be actual ‘sense-makers’.” (50)

Nevertheless, if this is not only the definition of ‘sense-making’ but also the definition of ‘cognition’ (as it appears to be), then to say that cognition is the act of sense-making is trivial. “Cognition is an act of sense-making” says no more than “the activity of adaptive autopoietic entities doing *A* is the activity of adaptive autopoietic entities when they do *A*.” To be fair, we might take interest in certain aspects of this definitional act, in particular, in the attachment of ‘cognition’ and ‘sense-making’ to *this* kind of biological process, if *this* kind of biological process (defined clearly, perhaps even operationally) is itself of interest and worth attending to. Nevertheless, the concern in question persists: by giving this important biological process such labels ‘cognition’ and ‘sense-making’, the reader is misled and the waters muddied; the reader is given the impression that such claims as “cognition is the act of sense-making” constitute empirical claims about the kinds and processes normally associated with the words ‘cognition’ and ‘sense’, when in reality, what’s being asserted is something of the logical form “*a* = *a,*” where the referent of *a* appears to have little to do with the phenomena normally associated with the terms in question. To be sure, there is at least one well-known way in which such claims can be of interest in a scientific context: they might be *a posteriori* necessities (Kripke 1980). If that, however, is what contributors have in mind, then the present complaint should be read as follows: contributors seem to make no attempt to show that such a Kripkean discovery has been made, that, for example, the various phenomena historically associated with ‘sense’ can now be seen, much to our surprise, to have been produced all along by a certain kind of admittedly interesting biological process, such as the one described by Di Paolo et al. (And, similar remarks apply to the enactivist’s claims about the contribution of values to action – 45, 48.)

 The composite argument’s conclusion is nearly as disappointing. Interaction between the organism and an environment stands at the heart of the enactivist picture, which presupposes the existence of an environment with which the organism interacts. Enactivists claim that the agent and environment co-construct the world, which requires that the environment exists to contribute its part to the process of construction. It strikes this reader as fantastical that there could be such an interaction in the absence, though, of an independently existing world. On pains of incoherence, the enactivist is committed to the existence of a pre-given world, metaphysically speaking, as one of the contributors to the interactive process.

 But, the use of ‘given’ in ‘pre-given’ is telling. It signals the enactivist’s interest, not so much in the question whether a mind-independent reality exists, but in what we might think of as the subjective world or as the portion of the world constituted by the specific elements of the independently existing world relevant to the action-based furtherance of the organism’s existence. If the enactivist is right, individual and species-based differences – including differences that affect an organism’s ways of acting on the world and interacting with it – ramify to such a great extent that various individuals interact with, and perhaps come to represent, wildly disjoint aspects of the single independently existing world. We are left, then, with a fascinating picture – *N.B.* one that a cognitivist can easily accommodate – of an independently existing world that contains an enormous number and variety of properties and processes. Which of those properties and processes a particular subject represents – that is, which of those come to be represented in her subjective or cognitive world – is then a function of that subject’s particular and species-specific bodily resources and her unique history of interacting with the world (Rupert 2009, 211–215, Shapiro 2010).

 This is a substantive and plausible claim. Consider, though, mitigating factors. Humans have proven ingenious in their efforts to come into contact with new aspects of the single external world, devising a wide range of ways in which to probe it. Science itself consists largely in acting on and interacting with the multi-faceted world to reveal facets of it – tectonic plates, solar flares, black holes, imaginary numbers – that aren’t directly related to the continuance of life or maintenance of the human organism. It is by this kind of exploratory process – one that expands the range of structures that the subject represents or is sensitive to in her interactions with the world – that an individual can a write compelling essay about the various ways different individuals and creature-types interact with the world.

 One must wonder, then, to what extent a plausible version of the enactivist’s claims about world-constructing actually limits the nature of the worlds constructed. Think of this in connection with the emphasis some contributors place on reflexivity (xv, 27, 268, 271, 273), the idea that a theory of cognition should account for the cognitive activity that produces the very theory of cognition in question. The desire for reflexivity seems to cut against the enactivist’s emphasis on limitations determined by individual and species-based differences, as well as the supposed importance of the observation that there is no pre-given world; for, in the production and consumption of *Enaction* itself, humans’ flexible exploitation of their biologically limited resources allows them to come into contact with an ever-expanding range of the plethora of properties and processes in the independently existing world. This flexibility and ingenuity allow various contributors to explain the range of possible ways creatures can interact with their environments, thereby broadening the reader’s perspectives so that *her* thinking can encompass the variety of ways in which individuals and species interact with various aspects of the independently existing world. Such feats of human cognitive flexibility (and, again, consider this in connection with the writing, editing, and reading of *Enactivism* itself) allow humans to transcend the enactivist’s apparently strict biologically based limitation on the world we co-create (compare, for example, enactivist strictures on learning [9]).

 In other words, in order to appreciate the motivation for enactivism, it seems that one must transcend a stricture implied by the most plausible interpretation of the enactivist’s rejection of a pre-given world; but this very act of transcendence, our ability to understand the variety of biologically grounded ways different creatures might interact with and make sense of their worlds, shows that we are not stuck in our own idiosyncratic world, limited strictly by our particular bodies, species-specific bodily resources, and individual histories. Instead, partly via the kinds of processes enactivists draw our attention to, we wrest from the independently existing world an ever-more-comprehensive representation of the vast multiplicity of processes and properties in that world; in which case, any restriction associated with the idea that create (or co-create) our world – say, the restriction that we live only in the world we enact – begins to look thin or misleading. Instead, we actively explore the world in order to discover an ever-greater range of its various aspects and dimensions, which is a fairly traditional view of scientific enquiry and certainly one that computationalists can accommodate (see Rupert 2009, 213–215), not a radical new paradigm.

 We turn now to some enactivist themes that made no appearance in our composite picture. Some contributors claim that enactivism solves the traditional mind-body problem and problems to do with consciousness (xiii–xv, 1), but this reader did not see how. Enactivists focus on interactions between the organism and environment, but this does not, by itself, offer any progress on problems to do with the relation between the mental and physical realms and the related problems to do with reduction and multiple realizability. The maintenance of organismic identity across various bits of material constitution (95, 101) shows that the organism is multiply realizable (cf. 1, where the author seems to appreciate this). Moreover, enactivist cognitive science investigates patterns or structures as *types* of interaction, not mere collections of tokens. Are these types of patterns and structures not multiply realizable (Clark 2008)? If not, why not? And if they are multiply realizable (as the rejection of monism suggests [1]), the enactivist is left facing many of the standard problems that attend nonreductive materialism, functionalism, and mental causation (Kim 1993). Think of this in connection with claims about embodiment. Orthodox cognitive science is often derided for its so-called disembodied approach to cognition. But according to standard functionalist-computationalist metaphysics, the body provides as strong a constraint as a body can on mentality, short of the literal identity of physical property-types and psychological property-types: according to a standard materialist functionalism, a thinker’s bodily properties and processes fully determine the properties she instantiates *qua* thinker. Given that enactivists are committed to multiple realizability and thus to the denial of type-type property identities, their metaphysics is no less “disembodied” than the functionalist’s, and the enactivist has no special advantage when addressing the metaphysical problems associated with functionalism and multiple realizability.

 Turn now to consciousness. It may be that, in some sense, conscious phenomena are metabolism-serving or continuance-of-life serving processes, but, if so, that alone doesn’t close the explanatory gap (Levine 1983). It doesn’t tell us why the what-it’s-like to taste an apple, for example, should accompany the physical processes in the brain that the conscious experience of tasting an apple does happen to accompany; after all, why shouldn’t the apple-tasting what-it’s-like be very different than it actually is, for all that’s entailed by the physical processes that accompany that experience in our world? Analogous and equally difficult questions naturally arise when one is told that mind and consciousness *are* life and are best modeled using the tools of dynamical systems theory (Rupert 2006). (Perhaps Cosmelli and Thompson recognize this implicitly when they bracket the “hard problem” of consciousness – 379 n2.) This is not to recommend that we take the hard problem of consciousness seriously (Chalmers 1996), but rather to say that those who do take it seriously make no headway on the problem simply by adopting enactivism.

 Regarding the relation between consciousness and cognitive science, many of the authors take various aspects of conscious experience and of the phenomenological tradition in philosophy to constrain the cognitive-scientific project (43–44, 75–76, 103, 106, 110, 112, 154–155, 157, 168, 187–190, 246, 255, 261, 268, 281 307, 337, 352, 356). In some contributors’ hands, this emphasis on phenomenology appears to introduce a deeply nonscientific, even antiscientific (92, 108, 114, 118, 121, 336, 356), element into the enactivist picture, which takes enactivism out of the running as a potential scientific paradigm. This phenomenological constraint sometimes takes the form of an assumption that consciousness-related phenomena are *explananda* in cognitive science – that is, data (in the broad sense) to be explained by cognitive science – and that we have private, first-person access to them (22, 89–92, 183–186, 191, 209 n1, 246, 249, 270, 372, 389, 413). On its face, this is puzzling. The ultimate *explananda* of any science *–* to which the positing of all theoretical entities, forces, etc. must answer – are publicly accessible data. Of course, if consciousness just *is* the organism’s interaction with the environment, then consciousness provides the kind of third-person data that is *de rigeur* in the sciences. But, in that case, there’s nothing special about so-called conscious phenomena; they stand as one more kind of observable data. It goes without saying that scientific approaches to the mind should not ignore consciousness-related data (verbal outputs that purport to describe internal goings-on, for example), but these play no privileged role, distinct from, say, categorization behavior or eye-tracking data (Dennett 1991). (This reader suspects equivocation in the enactivist literature, which treats consciousness as an internal phenomenon when emphasizing consciousness-as-constraint or conscious-experiences-as-*explananda*, while at the same time officially defining consciousness, sense-making, and significance as kinds of observable interaction.) One should also bear in mind that a wealth of empirical work recommends skepticism regarding the content of verbal reports on the details of one’s own cognitive processing (Nisbett and Wilson 1977).

 Some of the deepest disagreements between orthodox cognitive scientists and enactivists seems to arise in the vicinity of consciousness. Orthodox cognitivists most definitely embrace the science of consciousness (see, for instance, Baars and Franklin 2003). But, in this tradition, consciousness is not taken to be a special phenomenon that provides private data, for reasons given above. In contrast, some enactivists take their approach to have an advantage over mainstream cognitive science precisely because they take lived experiences to be private, individually given *explananda* for cognitive science. To the extent they do so, however, enactivism falls outside of the realm of and thus can’t provide a new paradigm for cognitive science. If, on the other hand, the enactivist wants to avoid this perhaps unappealing result, she must treat the consciousness-related data as measurable data (taking the form of verbal reports, reaction times, button-pressing responses to visual identification tasks, etc.) to be modeled in the same way that scientists model data in the full range of successful scientific disciplines. In which case, while consciousness-related data must be taken seriously, as orthodox cognitive scientists do take it, we should reject the idea that consciousness-related phenomena (lived experience, etc.) constitute private *explananda* that constrain cognitive science in a *sui generis* way or in a way that privileges it above all other data that must be accounted for by a comprehensive, coherent model of cognition.

Much of what seems most promising in the enactivist program is its emphasis on the dynamical modeling of an organism’s interaction with its environment. This dynamical stance lies at the heart of Anthony Chemero’s vision for cognitive science. In *Radical Embodied Cognitive Science*, he sets two primary goals for himself: to advance the cause of a certain kind of nonrepresentational, dynamical-systems-based (DS-based) cognitive modeling and to establish Gibsonian psychology as an appropriate theoretical framework in which to set the DS-based approach to cognitive modeling. The book contains multi-chapter parts pursuing each of these two goals, and it contains two additional parts as well: Chemero devotes an initial, two-chapter segment to stage-setting, and, after working his way through the two central parts, he discusses philosophical consequences of the entire project. These four parts are discussed in turn.

 Chemero’s stage-setting is mostly methodological. Chemero contends that grand philosophical arguments have typically had little effect on the progress of scientific research programs. He thusly signals what not to expect in the remainder: the chapters to follow do not engage with sweeping, theoretical arguments against the DS-based approach.

 The other primary point of the first two chapters sets *radical* embodied cognitive science (RECS) apart from more conservative forms of embodied thinking about cognition. In contrast to the others, RECS is nonrepresentational; its theory, models, and practice make no explanatory use of representing units (29). A methodological point appears in this vicinity as well: “This entire book has been making the case that representationalism is optional when explaining coupled animal-environment systems” (180). Chemero distinguishes this epistemological claim from the metaphysical claim that there are no mental representations, and he brackets the latter, metaphysical reading of his anti-representationalism (72). One might reasonably wonder, though, whether Chemero’s arguments do in fact promise metaphysical bite. For, if Chemero succeeds in showing that a nonrepresentational DS-based cognitive science carries the day, across the board, then the positing of representations appears unnecessary, and representations should, by Occam’s razor, be eliminated from our set of ontological commitments – *even if* those who squint in the right manner (Rupert 1998) can make representations appear in DS models.

 Part II focuses on representations and their role in cognitive science (chapter 3), introduces the reader to the tools of DS-based modeling (chapter 4), and illustrates the DS-based approach in some detail, while also arguing that the DS-based approach does not alone provide a guide to discovery (more on which below) (chapter 5). Central to Part II is the claim that the DS-based approach has borne more impressive empirical fruit than many of its critics acknowledge: Chemero’s discussion of a DS-based model of a clearly cognitive task (93–96) confronts head-on the concern that DS-based approaches apply only to such not-particularly-cognitive forms of behavior as finger-waggling. Chapters 4 and 5 also demonstrate a certain coherence to the DS-based research program, showing how a simple model has been articulated, tweaked, and extended to cover a broader and broader range of phenomena.

 Dynamical-systems-based research has indeed produced some impressive results to do with cognition. Nevertheless, these results concern a very highly constricted range of cognitive processes, and this reader was struck by how little progress has been made in the DS-based modeling of high-level forms of intelligent behavior, such as engaging in a substantive conversation or analyzing a data set.

 Part II’s discussion of representation looms large in the chapters that follow. For the most part, Chemero resists the temptation to adopt an especially demanding, straw-sounding characterization of representations (66). In the end, however, Chemero’s attempt at even-handedness falls short, in one central respect. Chemero insists that representations (or at least the most basic representations) be about things outside the organism (65) (or at least that a representation, traditionally understood [180] must be about external things). This conflicts with a wide range of work in contemporary cognitive science (Rupert 2011). It’s also at odds with common sense; of course, one can think about one’s own hand, and one can think about one’s own hand in the process of picking up a cup. C*ontra* Chemero, then, there’s no reason to think that the emulator circuits guiding reaching don’t represent one’s hand (or its position, or one’s internal sensation of it), as well as, for instance, the cup for which one is reaching. This is no small point, for Chemero leans heavily on the proscription in question to close off any representation-based co-opting of Gibsonian psychology.

 What of the Gibsonian view, then? According to Chemero, DS-based modeling cannot stand alone as a framework for cognitive science, for it does not provide a guide to discovery: it does not, by itself, “predict new phenomena and generate new experiments” (85). Instead it is “fact dependent” (*ibid.*), simply a way of modeling relationships in data after they’ve been collected. In contrast, the Gibsonian view constitutes a broad theoretical perspective on action and perception: perception is direct, perception is for action, and perception is of affordances (98). As Chemero sees things, this perspective provides the kind of motivating conceptual framework that normally guides a thriving empirical science, in this case, a framework that can motivate the development of new DS-based models and experimental designs.

 Consider, in this regard, the idea that perception is for action, which connects affordances to the supposedly direct nature of perception. On this view, information (or the value of some quantity) in the environment directly controls action or behavior (101) or is at least correlated with it by mutual dependence. Moreover, mental representations do not contribute (or need not be seen as contributing) to the process by which this relation of mutual dependence obtains. The methodological upshot – part of ecological psychology’s guide to discovery – recommends that cognitive scientists look for relations between environmental quantities and forms of behavior, relations that can be characterized dynamically, by, for example, sets of differential equations.

 Part III elaborates on and ties together much of the material discussed in Part II, as a nonrepresentational framework for cognitive science. This reader did not quite see the purported merits of said framework. One worry concerns the richness of information in the environment (122). Of the vast (infinite?) number of quantities present in the environment, what determines which one controls behavior, if it’s not that the subject represents that quantity? Casting these environmental properties (or features, or aspects) as affordances doesn’t solve this problem. “Why did the environment cause the subject to sit in that chair?” one might ask. The response “because there was an affordance of sitting in the environment” makes almost no progress, because the chair and its properties – not to mention the properties of other things in the environment – provide a vast number of other affordances as well; yes, there was an affordance of sitting, but there was also the affordance of heating (the chair can be burned by humans), the affordance of attacking (the chair can be used to hit someone over the head), the affordance of gift-giving (the chair can be presented as a good-will offering), the affordance of holding doors open, etc. Why does one affordance rather than another control the subject’s behavior? Here’s a possibility: certain quantities in the environment stimulate the organism’s receptors so as to cause the perception-based representation of a chair’s presence, which is linked to a wealth of knowledge the organism has concerning what she herself can do with the chair; the subject’s currently represented goals and which objects she perceptually represents as present in her environment determine which aspects of that external environment guide her behavior (that is, guide the selection of an affordance to resonate to, as it might be). On this picture, though, the human represents various things, including herself doing various things with the chair. Chemero’s proscription on representing oneself, things inside oneself, or parts of oneself rules this out; but so much the worse for his proscription.

 A DS-based theorist might retort that it matters not whether we understand why one affordance rather than another controls behavior; rather, it matters only that there exists a correlation between a measured quantity in the environment and the behavior in question. Fair enough, except that experimenters detect such correlations only when they’ve gone to some length to ensure that they’ve put their subjects in the right sort of motivational states (and perceptual states, and belief states). Thus, unless a plausible nonrepresentational gloss can be given of such states as the desire to give someone the gift of a chair, the response offered on Chemero’s behalf does not support an anti-representational view of cognition.

 In Part III, Chemero develops certain metaphysical aspects of his program, including views about the nature of affordances and the distinction between properties and feature. Properties are had by objects, according to Chemero, while, in contrast, features – such as *that it’s raining* – hold of situations in general (140) (which is also meant to hold of affordances), and thus aren’t the sorts of things that can be represented; this, in turn, is meant to support a form of RECS based on ecological psychology. But, so far as this reader could tell, the existence of features poses no particular problem for orthodox cognitive science. If there are mental representations, subjects can just as well represent features as they can represent properties of objects. Chemero’s own view of DS-based cognitive-scientific method requires the measuring of quantities of the environmental situation – that is, features – and modeling their correlation with behavior. If DS-oriented cognitive scientists can measure such quantities, then, presumably, the brain can measure them as well, including those that involve relations between the self and aspects of the environment (and subjects, or their brains, can not only measure these features but represent them, for reliable measurement is typically what cognitivists take representation to be). Thus, even if Chemero is right about the importance of features in cognitive science, his being so provides no distinctive evidence against representation-based approaches.

 Part IV recommends against a certain reductionist approach, one that identifies cognitive types with types of neurochemical states or processes. As against this approach, Chemero offers a case study, the investigation of exploratory behavior in animals and its use in the investigation of such further capacities as recognition memory (170­–178). Chemero’s own experimental work suggests that much of the literature in this area ignores a significant confound: the affordances provided by the objects used as stimuli. Novelty engages exploratory behavior in rats (e.g., the rat’s climbing on an object), while lack of exploratory behavior provides evidence that rats recognize the object in question. Chemero’s survey of previous studies done in this area shows that, for the most part, objects have been coded – and thus the data encoded – in ways that are insensitive to variations in the affordances the objects, relative to the animals used. When, in contrast, experimenters code for differences in affordances of the objects used as stimuli, experimenters can account for more of the variance in, for example, rats’ exploratory behavior. Thus, because affordances are relations between quantities in the environment and the individual organism (or are features of the entire situation that includes aspects of the environment and the organism), and variation in affordances accounts for a significant part of the variation in behavior, the cognitive process involved isn’t identical to a neurochemical process. The environment matters.

 It is unclear to this reader how Chemero’s impressive experimental work bears on questions about radical embodied cognition or ecological psychology. For, neither affordances nor representations play any specific role in Chemero’s argument. His critique would unfold in the same way if one were to adopt a representational outlook: a given rat represents properties of objects (e.g., their width, their height) and represents the rat’s own relation to objects with those properties (“I can’t climb that,” in the rat’s neural code), and thus it affects the rat’s behavior whether the novel object to which that rat is exposed is represented by that rat as one she can climb or as one she cannot climb. If experimenters were to ignore the exploration-relevant features or properties of the stimuli in the coding of their results, that would undermine an orthodox representation-based approach to these experiments as much as it would undermine a Gibsonian approach. Generally speaking, in experimental contexts, properties of objects (or features, or affordances) in the environment must be coded properly, and Chemero’s work shows this to everyone, whether Gibsonian or computationalist, without providing any particular support for RECS.

 In addition, it’s unclear how Chemero’s insights bear on the question of neural reduction. He seems to reason in the following manner: because external features causally affect – that is, make a difference to – rats’ exploratory behavior, the cognitive processing that produces such behavior isn’t of a neural type. But, virtually every form of intelligent behavior works in a like manner; some features, properties, or processes beyond the brain causally affect cognition and thus the behavior produced by cognitive processing. So, unless Chemero can show that “makes a difference to behavior in the way in which the climbability of a block does” entails “is part of the cognitive process in question,” the rat studies are otiose in respect of the evaluation of neural reductionism. To be fair, Chemero steps briefly into the extended-mind debate (31–32), but in this author’s opinion, his discussion is cursory and inconclusive.

 In the final substantive chapter, Chemero pursues the implications of his view for questions regarding scientific realism, consciousness, and mental causation. The discussion of realism focuses on the treatment of affordances, and here Chemero makes a strong case that, because manipulation of affordances allows manipulation of other quantities or processes, we should be realists about affordances (191–197).

 The discussion of mental causation was less helpful. According to Chemero, correlations between values of collective variables and forms of behavior solve the problem of mental causation (199). But, it is not clear how. The value of a collective variable is determined by the values along individual dimensions of the system in question. And, those values correspond to property instantiations that deterministically cause the ensuing states of the system. Thus, the strategy of invoking collective variables differs in no material way from a strategy available to theorists of every stripe (including computational functionalists); they, too, can invoke the epistemic utility of our knowledge of regular relations between high-level properties and behavior. At the same time, if such an epistemic strategy, as employed by orthodox cognitive scientists, fails to satisfy those troubled by the problem of causal exclusion (Kim 1993), the DS-based version of the strategy offers no consolation. The synchronic determination of the values of collective variables by the set of values along the full range of individual dimensions of the system, together with deterministic relations between the aggregation of individual-dimension values at different times, leaves no causal work for properties corresponding to collective variables to do, regardless of how epistemically useful it might be to track the values of collective variables.

 With regard to consciousness, Chemero seems to put himself in the same position as do many of the contributors to *Enactivism*. He argues for the relevance of affordances to phenomenal experience (201), and here he seems correct; nevertheless, such observations do nothing to assuage standard concerns in the literature on the metaphysics of consciousness. If one is the sort of person who worries about the explanatory gap, Chemero’s claims about affordances will not allay one’s concern. Why should *that* affordance-based interaction with the environment give rise to *this* particular “what it’s like,” rather than a different one?

 Various qualms noted, Chemero’s book is rich and stimulating and provides a coherent, compact manifesto for a strikingly anti-orthodox movement in cognitive science.

In *The New Science of the Mind* (*NSM*), Mark Rowlands argues that mental processes frequently comprise both neural and nonneural bodily processes, as well as processes beyond the boundary of the organism; he calls this an ‘amalgamated’ conception of mental processes.

 In *NSM*’s early chapters, Rowlands identifies four species of what’s sometimes called the ‘situated’ view of cognition (Robbins and Aydede 2009). The first holds that human cognition is constituted partly by elements or processes beyond the boundary of the organism, a version of what’s commonly known as the extended-mind thesis (Clark and Chalmers 1998). According to the second – the embodied view – cognition is constituted partly by nonneural, bodily processes. Rowlands accepts the extended and embodied views but is critical of a third, the embedded approach. On the embedded view, genuine cognition occurs inside the organism only – perhaps only in the skull – but cognitive processing depends, in surprising and extensive ways, on the contribution of the environment (Rupert, 2004, 2009). The fourth situated perspective, the enactive view, further complicates these taxonomical matters. As enactivists see things, the enacting of cognition typically includes nonneural bodily movements and organismic interactions with external materials; thus, the enactive view seems to entail the embodied or the extended view and, most likely, Rowlands’s amalgamation of the two. Note, too, that, although Rowlands criticizes leading enactivist views (in chapter 3), his own view has an enactivist flavor; according to Rowlands, an object has cognitive status when (and perhaps only when) it is involved in the right way in a process by which the subject actively extracts information from that object (63, 67).

 Chapter 5 sets out Rowlands’s theory of the cognitive, in the form of a four-part criterion, satisfaction of which is sufficient, although perhaps not necessary, for a process to be cognitive:

A process *P* is a *cognitive* process if:

1. *P* involves *information processing* – the manipulation and transformation of information-bearing structures.

2. This information processing has the *proper function* of *making available* either to the subject or to subsequent processing operations information that was, prior to this processing, unavailable.

3. This information is made available by way of the production, in the subject of *P*, of a *representational* state.

4. *P* is a process that *belongs* to the *subject* of that *representational state*. (110–111)

Condition 4., the ownership condition, is the most difficult to spell out clearly. In consequence, much of the remainder of *NSM*, chapters 6–8, develops a theory of ownership meant to undergird the amalgamated view.

 Here is the gist of that discussion. Processing is owned by the subject when it brings the subject into the relation – the disclosing relation – to an intentional object via a mode of presentation. In respect of many of our personal-level cognitive states, embodied and extended processes make just this sort of causal contribution; subjects achieve this connection to intentional objects via bodily actions and interactions with environmental resources (that are not themselves the intentional objects in question). Thus, in such cases, if the processes in question also satisfy the other three relevant conditions, cognition is either embodied or extended, or both.

 In this reader’s estimation, *NSM* came up short in certain respects. Although *NSM*’s titular project concerns the science of the mind, the discussion takes place at a surprising remove from contemporary cognitive science. Nearly all of the scientific literature surveyed is at least fifteen years old, some of it decades old. Readers may thus find themselves puzzled at certain points, such as when Rowlands claims to defend his criterion of the cognitive by “examination of cognitive-scientific practice” (119). To be fair, Rowlands does state, early on, that his new science is “largely aspirational” (25), that he speaks to a science “that does not yet exist” (*ibid.*); but this takes much of the punch out of his arguments, at least as they might speak to readers attempting to evaluate current trends in cognitive science and philosophers’ claims about them.

 This concern about scientific grounding arises in a particularly pointed way in respect of Rowlands’s treatment of the self and ownership and their connection to his condition 4. Here Rowlands draws largely on the work of Frege, Husserl, Heidegger, and Sartre and endorses a robust form of the personal-subpersonal distinction. What, the reader might reasonably wonder, does this have to do with cognitive science? Moreover, to the extent that working cognitive science marks a personal-subpersonal distinction, the personal-level states involved do not have the essential properties (nonreducible normativity, for example) that do heavy lifting when philosophers invoke distinctively personal-level states. Rowlands’s own discussion muddies the waters in this respect. To support the view that there are distinctively personal-level states, Rowlands often relies on a thin form of argument, which might be called the ‘argument from italicized pronouns’ (and related words, such as ‘author’ and ‘owner’) (141-142, 145, 151, 215-216): that it is *I* who sees the tree, not my occipital cortex. The reader may well doubt that this style of argument carries weight in cognitive science or reflects working science. Moreover, this appeal to a robust personal level seems to be at odds with Rowlands’s sometimes deflationary attitude toward minds, selves, and persons (8–9, 145) as well as his ambivalence toward the frequently made philosophical claim that personal-level states are all and only the conscious ones (144). Rowlands would have made a more effective case for condition 4., as part of a new science of the mind, if he had extracted a criterion of ownership from results in contemporary cognitive science.

 Where might such a criterion of ownership be found? Some authors recommend attending to the boundaries of “integrated cognitive agents or thinking subjects” (Rupert 2004, 425; and see Segal 1991, Wilson 2002), thereby locating the boundary between those causal contributors to the production of intelligent behavior that are cognitive, on the one hand, and those causal contributors that are not, on the other. As the present author sees matters, we justify the choice of such a boundary by examining the range of successful forms of cognitive-scientific modeling to see whether they manifest a consistent division between two kinds of causal contributors to the production of the relevant data. When prosecuted, this project seems to yield the following result: the central theoretical construct of cognitive science – whether connectionist, computationalist, dynamicist, subsumption-architecture based, evolutionary-robotics-based, or brute biological in its orientation – is the integrated, persisting cognitive architecture (Rupert 2009, 2010, 2013); and in the human case, such architectures seem, for the most part, to be instantiated (only contingently) within the boundary of human skin and skull. This perspective offers a scientifically grounded solution to Rowlands’s problem of ownership: the subject owns processes that take place within the persisting cognitive system. This solution to the problem of ownership does not, however, deliver Rowlands’s amalgamated view of cognition; condition 4. is met only by processing that happens within the relatively stable architecture – the persisting integrated system – which, for most humans most of the time, happens to appear within the boundary of the organism.

 Rowlands takes the reader on a clear and provocative philosophical romp. He offers philosophical arguments for an activity- or process-oriented theory of intentionality and pursues its implications for a situated view of the mind. The resulting package runs more toward historically informed philosophy of mind than it does toward philosophy of cognitive science, and approached in this spirit – which may well be the spirit in which Rowlands offers the book – *NSM* is a delightful and satisfying read.

In these three books, readers will find much of interest concerning both cognitive science and philosophical interpretations of it. The philosophical interpretation of primary interest here, enactivism, is theoretically rich and its empirical implications worthy of investigation. Nevertheless, as this review has perhaps made clear, the prospects for enactivist revolution remain mixed at best.

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