

The emergence of emergentism in cognitive science

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This paper addresses, fundamentally, a single issue: assessing whether the currently very influential approach in cognitive sciences, i.e., Radical Embodied Cognitive Science (from now on, RECS), is committed to some version of emergentism. The structure of the paper is the following. In the first section I introduce the leading ideas of RECS. In the second section I compare certain standard formulations of emergentism with the main claims of RECS, trying to assess whether the latter involve some emergentist tenets. Some conclusions, in the third section, follow. My conclusion will be that, on the one hand, there are some substantive epistemological analogies between RECS and emergentism, but, on the other hand, the metaphysics of RECS is not of an emergentist kind, in spite of some shallow similarities. Therefore, depending on one's taking emergentism as an epistemological rather than a metaphysical thesis, RECS will be considered as being committed to emergentism or not (as it happens, I take emergentism in its standard formulation essentially as a metaphysical thesis, so my answer to the question addressed in this paper is more negative).

EMERGENCE

EMBODIMENT

ENACTIVISM

EMERGENTISM

DYNAMICISM

I. 4E–cognition and radical embodied cognitive science

Traditional explanations in cognitive sciences are *mechanistic*. There are two reasons for this:

1. Cognitive processes have been taken to be computations. In other words, the mind is described as an information processing system (which is of course a mechanical system).
2. The growing influence of neuroscience leads “naturally” to biological kinds of explanation, which are mostly mechanistic (at least in the case of functional biology).

The situation, however, has been changing, and the main tenets of classical cognitive science have been put in question, at least in part. According to a radically alternative point of view, traditional explanations are unable to account for some crucial features of cognition, namely, for its embodied, embedded, extended and enactive character. This is the so-called 4E-view of cognition. Let me shortly illustrate each of these features.

E1: Embodied

Admittedly, the concept of embodiment is ill defined, as is showed by the fact that several different phenomena are regarded as instances of embodiment. The clearest idea is that certain mental abilities are better to be conceived of as bodily skills.

A good example of embodiment is O’Regan & Noë’s thesis according to which perceiving consists in carrying out sensorimotor skills, that is to say, in the implicit knowledge of «sensorimotor contingencies» (see e.g. O’Regan & Noë 2001). Mastering a sensorimotor contingency amounts to knowing how the stimulus changes depending on how one moves (or, vice versa, knowing how one should move in order to have a different view of the stimulus).

E2: Embedded

Embeddedness is the idea that one cannot study mental processes making abstraction of the external (i.e., environmental) context in which they take place.

The behavior of an organism or agent is determined by the physical interaction with the environment, rather than by mental representations. For instance, in situated robotics (Mataric 2006) environmental information drives directly – without further elaboration – the actions of the organism. Agents are always “in touch” with the environment and the relation between the agent and the environment is dynamical.

E3: Extended

Here the thesis is that mind can bypass the borders of body, extending itself to encompass parts of the environment. More specifically, as Clark and Chalmers (1998, 8) put it:

If, in dealing with a certain task, a part of the world works as a process that we would take without hesitation as a part of a cognitive process *if it was realized in the head*, then that part of the world [...] is *part* of the cognitive process [...]. Cognitive processes are not entirely in the head.

This is arguably the most puzzling feature of 4-E cognition. Yet, the idea that a mental process does not need to be enclosed in the head in order to be mental is a quite natural consequence of functionalism, a cornerstone of classical cognitive science. Indeed, functionalism claims that mental properties need not necessarily to be realized by cerebral materials. What makes a property mental is its causal role, and a causal role can be filled by any physical property, irrespectively of being internal rather than external.

E4: Enactive

This concept is also ill defined. It can be interpreted in two different ways, a narrow one and a broad one.

In the narrow interpretation enactivism is O'Regan and Noë's already mentioned view of visual perception (see the point E1 above). I characterized this view as embodied since the practice of perceptual skills is a bodily know-how –it is the body that knows what to do in order to see. When one says that perception is enactive, he is focusing on the fact that perception is a kind of action. Against the traditional view according to which perceptual input is cognitively processed and this processing determines the right action, here perception and action are one and same thing. For instance, in order to see the hidden part of an object I have to move in a certain appropriate way.

In the broad interpretation enactivism is the very general view according to which the entire mental life is essentially the whole of actions performed by a body in the environment (= E1+E2+narrow E4 +, perhaps, E3). Instead of conceiving of action as the result of thought, the suggestion is that we think by acting in the environment. Therefore, on the broad interpretation, enactivism tends to be identical with 4E cognition taken as a whole. Also, it is part and parcel of broad enactivism the idea that the world is a sort of joint construction agent-environment.

Now, one could in principle endorse only a subset of the 4E features. He is not forced to buy all of them. And it is in principle possible to have different attitudes as to the relation between these ideas and classical cognitive science. That is, one can reject classical cognitive science across the board, or, more moderately, he can support a pluralistic picture in which computational models and 4E-inspired models can coexist.

Here I am interested, however, to the most radical positions, for two reasons. For one thing, assessing a stronger position is easier: there are more chances to arrive to some well-established conclusions. For another thing, the most radical positions are today much discussed; they are like sailboats catching the wind.

The most influential radical positions are today: (i) Gallagher (2017)'s enactivism; (ii) Hutto & Myin (2013; 2017)'s RECS (remember: Radical Embodied Cognitive Science), and (iii) Chemero (2009)'s RECS. A quick comparison of these three positions will show that they have undoubtedly much, yet not all, in common.

(i) Gallagher's enactivism

In his introduction to *Enactivist Interventions* (2017), Shaun Gallagher puts forward a list of seven main tenets of enactivism. Here I simplify a bit, re-elaborating these claims and reducing them to the following five:

1. Cognition emerges from processes distributed across the brain, the body, and the environment (hence a mental event is not merely a brain event).

2. «The world (meaning, intentionality) is not pre-given or predefined, but is structured by cognition and action» (2017, 6).
3. Cognitive processes acquire meaning in part by their role in the context of action, rather than through a representational mapping or replicated internal model of the world.
4. Enactivist approaches have strong links to dynamical systems theory, emphasizing the relevance of dynamical coupling and coordination across the brain, the body and the environment.
5. Higher-order cognitive functions, such as reflective thinking or deliberation, are exercises of skillful know-how and are usually coupled with situated and embodied actions.

(ii) Hutto & Myin's RECS

According to Hutto & Myin (2013), RECS is the conjunction of the two following theses:

1. Cognition is something an agent does (*pragmatist* view of cognition)
2. Cognition is realized by dynamic, cyclic and extended processes, i.e., by sensorimotor loops (*dynamicist* view of cognition)

(iii) Chemero's RECS

According to Chemero (2009), RECS is the conjunction of the following theses:

1. Mind is not representational
2. Mind is not computational (= mental processes are neither computational nor representational)
3. Cognitive abilities are best modeled by non-linear dynamical systems ("dynamicism")

As the reader can easily realize, there is substantive agreement between Hutto & Myin and Chemero. Indeed, Hutto & Myin's thesis 2 is identical to Chemero's thesis 3; and Hutto & Myin's thesis 1 entails Chemero's theses 1 and 2. Therefore we will talk from now on simply of RECS, without further specification (as we shall see, there is much useful in Chemero's book for the comparison with emergentism).

There is also substantive agreement between RECS and Gallagher's enactivism. Gallagher is more specific on some points. ¹ RECS is certainly committed to embodiment, embeddedness and to most (at least) theses of Gallagher's enactivism. The attitude as regard to extended mind is much more cautious, in spite of some analogies with embeddedness.

¹ Note that in Chemero's version negative theses have a prominent role.

II. Is RECS (or enactivism) an emergentist view?

Now we are ready to discuss the central issue of this paper: Is RECS *alias* Enactivism an emergentist view? One could legitimately ask why posing this question. After all, the notion of emergence occurs only in the first claim of Gallagher's list, and the use of the word 'emerge' in that claim seems to be non-technical, not specifically referring to some metaphysical or epistemological view. Hence, why thinking that there

could be a relation between RECS and emergentism at all?

The answer is: *dynamicism*. As we saw above, references to dynamical systems theory or to dynamicism in general are present in all the positions introduced in the first section; and dynamicism, as we shall see shortly, has clearly much to do with some aspects of emergentism. Therefore, there is room to search for a relation between RECS and emergentism, even if there is a major difficulty in this comparison: emergentism is a *metaphysical* thesis or, at least, a metaphysical thesis is a necessary component of the emergentist view, whereas RECS is in the first instance an *epistemological* thesis, a thesis concerning how the mind should be studied –and comparing epistemological claims with metaphysical claims is arguably a typical philosophical error.

This difficulty is not an insurmountable obstacle, however, because it is possible to extrapolate from RECS a metaphysical view, though there could be some disagreement on what is RECS' metaphysical view. I will proceed, therefore, in the following way. First of all, I shall take into consideration an epistemological version of emergentism (I will consider emergentism as an epistemological thesis) and compare it with RECS (taken, I repeat, as an essentially epistemological claim too). Then I will take, so to speak, the opposite path: I shall compare the metaphysical theses that can be reasonably drawn from RECS with the standard metaphysical formulations of emergentism. Finally, I shall crosscheck the results of the two comparisons and try to sketch a single, comprehensive answer to our main question. There is a point, in particular, in which we have to be especially careful: there are two ways of deriving from RECS a metaphysical thesis. Either we can read dynamicism as a metaphysical thesis (this amounts to deriving from RECS' explanatory model a corresponding metaphysical view of the mind); or we can take into consideration the *explicit* metaphysical claims made by RECS' supporters. We will explore both the ways and verify whether they lead us to the same place.

Let us start by giving a simple and usual definition of emergentism.

E1) High level properties, e.g. mental properties, are really novel and endowed of causal powers.

'Novel' means that high level properties, though being in some way dependent on low level properties, in the sense that the latter are required for the instantiation of the former, are not reducible to them. It is as if, once appeared, high level properties acquire a fully autonomous status. As O'Connor & Wong (2015) put it, «emergent entities (properties or substances) “arise” out of more fundamental entities and yet are “novel” or “irreducible” with respect to them». Most important, emergent properties can play a causal role, even towards low-level properties; this is usually expressed by saying that emergentism is committed to downward causation.²

E1 is clearly a metaphysical claim. Therefore, in order to make our first comparison with RECS, we need an epistemological counterpart of E1; in other words, we have to find an epistemological definition that fits E1 reasonably well. A good starting point for this purpose is the irreducibility of emergent properties, whose epistemological counterpart is the claim that high level properties cannot be either predicted or deduced from low level properties (though “arising”, in some sense, out of them). This has the defect of being a negative claim. Yet, even if we do not have a clear answer to

² It is worth to note, however, that downward causation is not necessarily part of the emergentist view. Alexander (1920), for instance, did not believe in downward causation, though believing in the genuinely *new* status of emergent properties.

the question of *how* high level properties can be accounted for, we are able to give a partly positive sketchy claim:

E2) Emergent properties (and laws) are *systemic* features of *complex* systems which cannot be predicted or accounted for by the laws governing its parts.

This suggests that the behavior of complex organisms is determined by emergent properties. The behavior of complex systems is standardly nonlinear, meaning that (i) the system may respond in different ways to the same input depending on its state or context, and (ii) a change in the size of the input does not produce a proportional change in the size of the output. For this reason, the behavior of complex systems has to be described by non-linear dynamical models. And here we found the touch point with RECS: dynamicism. So there is room to compare RECS and emergentism, both taken as epistemological claims.

II.1. Comparing the epistemological claims

There are two (related) reasons for thinking that RECS is a form of epistemological emergentism:

1. The mathematical models usually employed to describe the behavior of systems characterized by emergent properties are non-linear dynamical systems.
2. RECS' explanatory model is not mechanistic: it is impossible to reconstruct in a componential way the behavior of the system from the behavior of its parts.

As to 1, there is not much to add. Non-linearity is the mathematical counterpart of the impossibility to predict the behavior of the system. Physical complex systems are non-linear.

As to 2, even if we assume (at least for the sake of argument) that the mind of an agent can be decomposed in a collection of parts or subsystems, the working of each part is not independent from the working of the other parts: the relation between subsystems is not linear (or, equivalently, subsystems are not modules). Therefore, the behavior of the whole system cannot be linearly obtained from the behavior of its parts. We could say that what is common to RECS and to emergentist explanatory models is a kind of *holism*. It is the methodological principle that the whole is more than the “sum” of its parts. As Chemero put it, «in dynamical explanations, the behavior of a system is typically explained in terms of collective variables (...). A collective variable describes the *emergent*, coordinated activity of the parts that compose a dynamical system, and in some cases this collective variable is causally responsible for the component parts» (2009,199).

The best way to understand what is a collective variable is giving an example. A very oft-cited example is finger wagging (and limbs movement in general). In finger wagging the relative phase is a collective variable whose state determines the behavior of the system. A collective variable is a variable whose values are determined by a *relation* between the values of other variables, i.e. the variables that describe the movements of each finger. Usually, collective variables refer neither to internal aspects of the agent, nor to external aspects: «Relative phase, in other words, is a higher-level entity, which is composed of lower-level entities, but also controls the

behavior of those very same lower-level entities. This sort of explanation implies that the lower level is not causally complete, but is subject to constraint from the higher-level collective variable» (2009, 216).

Therefore, there are good reasons to conclude that RECS' favorite explanatory tool or model is non-linear dynamical systems theory, and for a substantive reason: mind is a paradigm case of a complex system, whose behavior and properties are emergent. In this sense we can find more than an epistemological analogy between RECS and emergentism: there are similar epistemological assumptions at their base.

Note, moreover, that finger wagging is a case of downward causation, since the relative phase is a causally efficacious emergent property. This might suggest a metaphysical interpretation of dynamicism as a kind of emergentism. In the next subsection we turn to analyse the perspectives for a metaphysical analogy.

II.2. Comparing the metaphysical claims

From a metaphysical point of view, emergentism is *prima facie* a kind of properties dualism such that high level properties are causally efficacious, having effects on low level properties. Is it possible to give a metaphysical reading of dynamicism, based on its apparent commitment to causally efficacious high level properties, such as relative phase in finger wagging? If this were the case, RECS would be committed to emergentism even from a metaphysical point of view, to the extent that there is downward causation and (arguably) properties dualism both in RECS and emergentism. However, as we shall see, RECS' metaphysical commitments are somewhat unclear.

An argument to the effect that RECS is a form of metaphysical emergentism could be developed along the following lines. On RECS' view collective variables are crucial explanatory properties; and collective variables are high level properties that control the behavior of low level entities. This entails that the lower level is not causally complete; quite the contrary, the lower level is constrained by the high level collective variables. But then –as Chemero argues– RECS provides a solution to the mind-body problem, because the causal closure of the physical world is defeated. Indeed, the mind-body problem arises by the tension between the causal closure of physics and the causal efficacy of the mental *qua* mental; giving up the causal closure is usually considered as an emergentist solution to the mind-body problem.

To sum up:

- Collective variables are high level emergent properties, not predictable from low level properties;
- Collective variables have causal powers, involving downward causation. Hence the physical world is not causally closed.

Therefore, RECS is committed to an emergentist solution of the mind-body problem; in the light of this, it seems as if RECS is a form of emergentism across the board, both epistemological and metaphysical. However, this conclusion faces at least three problems:

1. The thesis that mental properties are collective variables is unclear.
2. RECS seems not to be committed to multi-level explanations, which are more “at home” with mechanistic/computational explanations.
3. The emergentist interpretation of RECS' metaphysics is in conflict with other assumptions of the theory.

Let me expand each point a little.

As to 1, finger wagging is hardly, if anything, a mental task. For sure, it is not a prototypical one. Indeed, assessing the ratio of phases as a mental property is almost unintelligible, since there is no relation at all between common-sense mental states and collective variables.³ Also, what is the relation between collective variables and neural patterns is left unspecified. One is free to approach psychology using a physico-mathematical apparatus, but then he can hardly escape the consequence of being considered as an eliminativist about mental states and a behaviorist in psychology (cf. *infra*). Until the explanatory model based on dynamical systems theory is confined to highly automatic physical behaviors (such as finger wagging), it will hardly be accepted as an explanation of how the mind works.

³ Friends of RECS could intend their use of the term "mental" as revisionary.

As to 2, RECS seems to be committed, at least in certain versions, to a single-level explanatory model, the *agent-environment* level. This is particularly manifest in the case of ecological psychology, which Chemero regards as a pillar of RECS. Therefore, it is unclear whether the distinction high level vs. low level makes sense in this context.

As to 3, the pragmatic view of cognition and the related rejection of representations seem to be at home with behaviorism. However, behaviorism is more a rejection of metaphysics than a metaphysical view of the mind. It is arguably a sort of eliminativism of mental properties. In the light of this, emergentism seems to be quite different from eliminativism.

In the light of these difficulties, we would better take into consideration what is explicitly said by RECS' supporters on the issue at stake, rather than speculating on alleged metaphysical interpretations of dynamicism.

In the first chapter of *Radical Embodied Cognitive Science* (Chemero 2009), the author claims that the metaphysical view closest to RECS is Gibson's ecological psychology, described as a «unifying background theory», and classifies ecological psychology as a variety of eliminativism. Indeed, to the extent that RECS gives up representations across the board, it can be regarded as an eliminativist account of mental states. This clashes with the emergentist interpretation of RECS, at least as far as the mind/body problem is concerned. If mental states do not exist, they are not emergent either.

However, according to Chemero there is another metaphysical view that can be associated to RECS: *phenomenological realism*. What is phenomenological realism?

It is a position concerning the relation between the mind and the world opposed to metaphysical realism. As Chemero put it,

If the animal and the environment —the thinking and the thought about, the perception and perceived— are taken to be an inseparable unity, one cannot first try to understand what the world is like and then, given that, work on how animals know about it. These questions must be understood simultaneously, or, worse from the point of view of realism, by beginning with understanding the nature of the cognitive system (2009, 183-184).

As far as I can tell, here Chemero is tentatively supposing that RECS is committed to a sort of neutral monism: reality is experience. This has an anti-realist (somewhat Kantian) flavor, to the extent that it is claimed that the world is a joint construction made by agents and the environment. Gallagher would agree (see e.g. *supra*, §1, his second claim constitutive of enactivism). «Although we may be justified in believing

that there is an animal-independent external world, we have no justification to believe that our perceptions, thoughts, and theories are accurate reflections of it» (2009, 188). In a slightly different (and arguably more Kantian) way, what we take to be the real world is rather just our environment. But it is environment that matters.

Clearly, phenomenological realism *per se* has little to do with the mind-body issue. However, since mental states are conceived of as the result of the construction out of organismic abilities and the world, mind-body supervenience is out of question. In this perspective the following claim by Chemero is enlightening: «the problem of qualia does not arise in radical embodied cognitive science» (2009, 197). If we understand why the problem does not arise, then, probably, we will be able to answer the central question of this paper.

According to Chemero the problem does not arise in RECS because the problem is a consequence of (computational) functionalism, which defines *qualia* as what remains once one has subtracted functional properties: «There is a widely shared intuition that understanding meaningful cognition as computation leaves the experience out» (Chemero 2009, 198). Hence phenomenological realism entails that «conscious experiences are genuinely existing aspects of animal–environment systems».

To sum up, there is no a single metaphysical claim concerning the mind in RECS. There are at least two, one concerning the relation between mind and brain, the other concerning the relation between mind and world. In both cases, however, there seems to be, though very roughly, a commitment to a sophisticated variety of eliminativism, insofar as the common sense view on mental states is rejected. Perhaps the most correct way of framing the metaphysics of RECS' is to say that the classical metaphysical models of the mind (such as supervenience, identity, etc.) are all wrong, and in order to make sense of the mind we need to free ourselves from that way of thinking. In both cases, assimilating RECS to emergentism (from a metaphysical point of view) seems to be hazardous at the very least.

Interestingly, Gallagher (2017) has a slightly different view on this point, stemming from the holistic conception intrinsic to dynamicism. ⁴ Gallagher sees a problem in holism, namely, the difficulty of taking into consideration all the relevant factors in an experimentally controlled scientific investigation; or, as he put it, the difficulty to operationalize holism. A good example of this is the “clunky robot problem”. This is the problem of putting together the different modules that, taken together, constitute the control structure of a robot. Even though each module, taken in itself, performs correctly its function, there is no warranty that, when the modules are integrated, the robot works, showing the expected behavior. Indeed, this difficulty is exactly what we should expect when the dynamicist view is endorsed: it is only in modular systems that interconnections between modules do not arise problems.

As Gallagher points out,

The same problem can be found in theory construction. Scientific experiments, designed within the framework of their own particular paradigm, often study the pieces of a system but don't always consider how the dynamical relations among those pieces work, and don't always have the vocabulary to address those relations. Even working in an interdisciplinary way we often find ourselves building a clunky theory where insights from different disciplines don't integrate well (2017, 22).

⁴ «Enactivists, by focusing [...] on the rich dynamics of brain–body–environment, offer a holistic conception of cognition» (Gallagher 2017, 21).

Therefore, although enactivism makes empirical claims, holism presents problems for empirical investigations. Gallagher's suggestion to cope with this problem is a view of enactivism as a very general framework: a "philosophy of nature", which «takes seriously the results of science, and its claims remain consistent with them, but it can reframe those results to integrate them with results from many sciences» (2017, 22). Enactivism is a philosophy of nature because it offers, rather than a peculiar view of the mind, a peculiar view of the nature as a whole ("a rethinking of the concept of nature itself").

Now, it is unclear to me to what extent this makes a difference (with respect to Chemero's position) for the issue discussed in this paper. Does a philosophy of nature involve a certain, well specified, metaphysical view of the mind? Or, is a philosophy of nature compatible with several different views, imposing merely some modest constraints on what the mind could be? Be that as it may, this discussion concerning the problems raised by holism for scientific investigation is essentially epistemological. As before, if we want to understand what the metaphysical view of mind endorsed by enactivism amounts to, we should better look for the explicit claims (if there are) made by the authors, in this case, Gallagher. He rejects the charge of being a behaviorist; at the same time, however, he urges a re-thinking of what the behaviorism is, as a consequence of a re-thinking of what behavior is. References to Merleau-Ponty suggest that there are strong similarities between the enactivist view of the mind and what Chemero calls 'phenomenological realism'. Therefore, again, the assimilation to (metaphysical) emergentism does not work. The issue would deserve a much longer discussion, but the core point is the following: emergentism, from the enactivist perspective, is still a view of the mind committed to the traditional distinction between mental properties and physical properties. By contrast, enactivists aim to sketch a different view in which the classical distinction does not make sense. The dynamical relations between brain, body and environment are not mental anymore than they are physical.

III. Conclusions

RECS' explanatory model is a version of epistemological emergentism, at least in the sense that the linguistic and modeling tools used in RECS are appropriate for describing emergent phenomena. It is much more difficult to establish analogies between RECS and metaphysical emergentism. One reason of this difficulty is that RECS tends to reject the multilayers picture involving the distinction between high level and low level properties. Moreover, and most important, RECS's crypto-behaviorism is more at home with an eliminativist view of the mind.

Unfortunately, it is very difficult to understand what exactly are mental processes in RECS picture. On the one hand, the insistence on embodiment seems to entail a monist view in which what we are inclined to call "mental aspects" are actually *bodily* aspects (even if not in a systematic and coherent way). On the other hand, the terms 'mind' and 'mental' are often used as referring to dynamical relations between the brain, the body and the environment.

I would say, in the end, that the position on the mind-body problem closest to RECS is a peculiar version of *eliminativism*. Indeed, Chemero explicitly characterizes eliminativism as a legacy of American pragmatism (see 2009, chap. 1). The peculiarity consists in the fact that eliminativism typically goes hand in hand with physicalism, whereas RECS takes physicalism just as a description among the others of the world. On RECS' view, the furniture of the world seems not to be simply physical.

Therefore, RECS, in spite of the epistemological analogies, is not a version of (metaphysical) emergentism, and is not committed to the main assumptions underlying the idea of emergent mind.

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