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An Interview Regarding Enactivism

Ralph D. Ellis Interviewed by Samuel Maruszewski

Ralph D. Ellis, one of the strongest advocates of the enactivist approach to consciousness and cognitive theory, began his academic career as a phenomenologist, earning the Ph.D. at Duquesne University under Andre Schuwer, John Sallis and Amedeo Giorgi, and has taught at Clark Atlanta University since 1985. He subsequently received a post-doctoral M.S. in Public Affairs at Georgia State University, and worked also as a social worker in both Pittsburgh and Atlanta. Partly as a result of those experiences, as well as being a life-long practitioner of Gene Gendlin's focusing method, he gravitated toward emotion research and the intersection of philosophy, psychology and the brain sciences from the enactivist perspective, arguing that action, as opposed to mere reaction, has to be emotionally motivated, and that the understanding of

all modalities of consciousness should include that perspective. The author of many books and articles on these topics, he is interested in integrating the social sciences with phenomenology, ethics, and philosophy of mind. He is now trying to integrate enactive consciousness theory with moral and social philosophy, with relevance to our current world-wide crisis of internet disinformation. *The Moral Psychology of Internal Conflict* (Cambridge University Press 2018) is an attempted beginning in that direction. His latest book, *Action, Embodied Mind, and Life-World* (SUNY Press 2023) is a continuation of that project. His various books in these areas are listed at the Ralph D. Ellis page of Amazon.com.

SM: In your view, what are the most revolutionary and/or controversial aspects of enactivism in mind research? Is there truly a paradigm shift at play, or is it more of a reappropriation or renewal of ideas that have long been present in the history of philosophy, akin to Fodor's perspective on cognitive science ("everything in science happens twice")?

RE: At the end of the twentieth century, a Kuhnian revolutionary situation developed in the theory of mind, specifically with regard to consciousness, when the complete inability of the then-dominant computer analogy to explain consciousness became increasingly undeniable. By "consciousness," I mean the kind of subjective experience that we don't remember having had during a dreamless sleep. In the computational paradigm, cognition and even subjective consciousness had been thought to be explainable in terms of computational transformations of inputs, performed by the brain. But it was increasingly obvious that the computer analogy could never come close to explaining the difference between conscious and non-conscious information processing. In other words, information processing could never explain consciousness.

The dominant computational paradigm had evolved from a still older one, the stimulus-response approach. Our knowledge of the world was assumed to begin when we receive some sort of input from the world. After all, it seemed, how else could the knowledge "get into" us? The stimulus was thought of as the beginning of a chain of causes and effects, ultimately resulting in a state of consciousness.

The problem was that no matter how sophisticated a computational system was developed, the computer still had no more consciousness than the simplest machine. Even with imaginary systems constructed by theorists to be much more elaborate

than any existing nuts-and-bolts computer, there was still no reason to believe that the complicated computations couldn't be performed just as well without subjective consciousness as they could with it.

The stimulus-response approach, of which the computer analogy was a variant, was in turn derivative from an even older philosophical assumption – epiphenomenalism. Epiphenomenalism, the idea that consciousness is only an ancillary side-effect of the real causal processes in the brain, had long seemed superficially to be just common sense, even before Newton's system of physics implied that every event has to have a physical causal antecedent. In the case of mental processes, it seemed natural to assume that the sequence of causes and effects would begin with the stimulus, proceed through intervening mechanisms in the brain, and somehow result in a conscious experience. Since a cause can't literally be the same thing as its effect, it seemed that the underlying physical process – presumably the cause – couldn't literally be the same thing as the resulting state of consciousness. If X is caused by Y, it isn't the same thing as Y; but then what is it? A metaphysical ghost? That still wouldn't explain it.

But if we assume that the mental event *is* the same as some physical process, then we not only have to attribute causal power to consciousness itself – since all physical processes do have causal power – but we also fail to explain why that particular physical process is conscious whereas others aren't. This last point is what David Chalmers means by the "hard problem of consciousness," although that phrase has now been repeated and misused to the point where it has almost lost its meaning. What Chalmers really meant by "hard" was, basically, impossible in principle. No matter how effectively you explain what causes the physical process that seems to correlate with consciousness, you still have no clue as to *why* that particular physical process is accompanied by consciousness, while others are not.

Even at the time of Descartes, there were unsolved anomalies with the epiphenomenalist approach. If consciousness itself had no causal power, then the decision to raise my arm shouldn't be capable of resulting in the physical movement of the arm. Something with zero mass should cause zero movement for an object such as an arm with substantial mass. Thus, the mind must be equivalent with some physical mechanism in the brain. But most philosophers, like Descartes, had major problems with that option: notably, as Frank Jackson succinctly puts it, if two things were literally the same, then complete knowledge of one should equal complete knowledge of

the other; but obviously, a scientist who knows only empirical information about the brain of a music listener would still lack understanding of how it subjectively feels to listen to a Chopin ballade. (That's my example, not Jackson's.) Even if earlier studies had confirmed a correlation between brain states and subjective feelings, those studies would already have presupposed some sort of non-empirical knowledge of that with which the brain states were to be correlated – the subjective feelings themselves. Given the stimulus-response paradigm, even if we assume that consciousness is the same thing as a brain activity, but maybe viewed from a different perspective, there is still no explanation for why some cognitive processes are conscious, while others, like those in digital computers, completely lack consciousness.

Over the ages, elaborate ad hoc explanations to avoid this anomaly have been generated. Most recently, Daniel Wegner, subsequently endorsed by Daniel Dennett, misinterpreted the results of a Libet study in a way that Libet himself has repeatedly warned against. Wegner thought the Libet study showed that conscious choice is an illusion because Libet had found that even before we are conscious of deciding to move our arm, the brain substrates of the movement have already begun. Libet himself, in an article in the *Journal of Consciousness Studies* and other places, showed the fallacy of the Wegner interpretation: before we decide to execute the movement, we first imagine it; but the brain substrates of imagining a movement are almost the same as the substrates of executing the movement, except that we then dis-inhibit the forwarding of the brain's signal to the rest of the body. Marc Jeannerod had already shown the brain processes involved here. That was what Libet meant when he spoke of the choice as having a "veto power" over the execution of the movement whose brain substrates were already being instigated. The conscious choice is complete when the prefrontal cortex stops inhibiting the signal from feeding forward.

An abnormal shortage of those frontal inhibitory neurotransmitters is why patients with the strange clinical condition of utilization behavior can't understand an object without physically performing some routinized action relative to the object. In order to understand a coffee cup, they impulsively pick it up and drink from it; if they see a bed, they automatically lie in it. Having first formed the action imagery in terms of which the object could be understood, they lack the frontal inhibitory neurotransmitters needed to inhibit the action command, and as a result they just go through with the action.

Part of the implication here is that we all understand objects by forming action imagery relative to them. The difference is that most of us can then inhibit the action command from feeding forward, so that the motor imagery we have formed remains only imagery, not overt movement. One might say that, for the patient with the utilization behavior syndrome, conscious choice might be more often an illusion than for the rest of us.

From that example, you can already get a hint as to how the enactivist approach will turn the old paradigm on its head. The normal brain is able to inhibit action commands, and thus imagine actions without actually performing them. Enactivism proposes that we understand the world not only by acting relative to it, and then noticing how the world resists our attempted actions, but also crucially, by imagining acting. We can imagine how the coffee cup could afford drinking without actually drinking. By imagining what will happen if we do so-and-so, we end up with a realm of logical possibilities, counterfactuals, contingency maps, and ultimately abstractions. The action imagery can have various degrees of subliminality, as when a musician memorizes music by imagining playing it on an instrument, but without any fully realized conscious thought about what it would be like to move the fingers in that pattern. With very routinized situations, the action imagery involved might be almost completely subliminal. But if someone asks us "how do you know this is a coffee cup?" the answer seems immediately obvious.

But there is a larger problem. If we really want to go outside of the old paradigm, and move to an enactive one, the biggest challenge is to develop a theory of self-organization capable of explaining how a system can initiate its own actions without those actions just being indirect causal results of what happens at the micro-level. How can there be self-initiated actions? In other words, how to make a clear distinction between action and reaction? We can discuss that problem later in the interview.

It's also important to remember that a Kuhnian revolutionary situation, like any other revolutionary situation, doesn't guarantee any particular outcome. Merleau-Ponty once remarked that the ruling classes before and after a revolution usually have more in common with each other than either does with the people. When the revolutionary situation opened up in the theories of mind and consciousness at the end of the twentieth century, there was openness to listening to any new approach that might promise to overcome the obstacles that had developed against the old paradigm.

One of the options available was that the old guard way of thinking would slightly modify itself – just enough to seem new, but without changing the basic categories and ways of thinking. The old stimulus-response approach, with its well-developed computational and micro-reductionist explanations, could simply be preserved within a new kind of language. And one of the big players in that dynamic was the computer industry itself, which offered lucrative grant opportunities – a temptation dangled most tantalizingly of all to researchers at the most prestigious universities, who still retained the most influence in their sub-fields.

For example, what does "action" mean? Could any activity, even of a purely re-active nature, be called "action"? If so, then the term "enactive" loses its meaning, and can be re-appropriated within the old reactive paradigms. Similarly, what does the term "embodiment" mean? To some, it means nothing more than that consciousness and mind depend on the physical body for their enactment – an idea with which hardly anyone would have disagreed for at least the past 400 years, and arguably for much longer than that. Everyone always knew that a blow to the head can knock out consciousness.

Nonetheless, by the end of the twentieth century, cognitive theorists at least had to admit that they were no closer than ever to being able to understand the difference between conscious and non-conscious information processing by means of the computer metaphor, or indeed any other variant of the epiphenomenalist stimulus-response paradigm. One of the new possibilities opened up by the revolutionary situation was the long-suppressed idea that the living organism might be able to understand the environment in terms of how the world resists or affords our own self-initiated actions. This would mean that the way living organisms process information is very different from the way computers do it.

In the first quarter of the twenty-first century, enactivist answers have been proposed for the question of the difference between action and reaction. Many versions of self-organization theory have been developed, sometimes called dynamical systems or chaos theories. What they all have in common is that there are systems that are organized in such a way that they can appropriate, replace, reorganize, and reproduce their own micro-components rather than letting the system of organization just be a summation of the causal powers of the micro-components themselves. To be sure, biologists have long understood that this is what distinguishes life from the non-living. The challenge for dynamical systems theories is to reconcile this

phenomenon with what we also understand about linear causal sequences – chemical reactions, ion channels, and the like. How does a theory of self-organization, or neural plasticity, manage to be consistent with well-known causal processes in the chemical reactions within the nervous system? Is the real causal power purely at the micro-level, or does the whole system have a genuine causal power over some of its own micro-constituent processes? A coherent self-organization theory has to accommodate those micro-processes as well.

With that caveat, the new ideas about dynamical systems and neural plasticity can lead to a different understanding of consciousness itself. The mind can direct its own attention processes, as motivated by self-generated action proclivities, which then are afforded or blocked by elements of the environment. When the world resists the actions, we feel their success or failure in terms of information about the world. In that sense, we understand the world in terms of the motivated actions that it affords or blocks.

So, the short answer to your question is yes, if enactivism is defined in a certain way, it can be a very promising paradigm shift. We understand our environment not by making inferences from received inputs, but by trying to perform actions or imagining performing actions relative to the environment. The blind person's stick can reveal contours of reality when the world resists the movements, but first the stick has to move. The analysis of what motivates someone to move the stick this way or that way is part of understanding why the world appears to have such-and-such shape. This approach leads to very different ways of thinking about perception, action, motivation, the mind-body relationship, value theory, and the ontological status of consciousness and mind.

SM: Which books, articles, lectures, debates, *et cetera*, do you consider *ultimately* most pivotal in driving this paradigm shift in mind research? What were people discussing, debating, and how did they contribute to (or limit) the development of the paradigm?

RE: For me, what initially persuaded me was a two-step sequence of arguments. The first was the old idea of multiple realizability, which was being discussed by philosophers as early as Putnam and Fodor in the 1970s. A pattern of activity might be realizable by multiple alternative combinations of micro-constituents. But that alone didn't overcome the linearity of causal processes, but only made them a little more

complicated. After all, even if process A could have been realized by multiple sets of substrates, x, y, or z, the fact is that in the given circumstance, A is only being realized by one of them, x. The causal power in the current circumstance therefore rests with x, not y or z.

The second step was when a philosopher named Robert Francescotti , in the late 1990s, argued that, when a cause A is necessary and/or sufficient for an effect B, it isn't the specific micro-constituents realizing A that are necessary or sufficient for B, but rather the *pattern* that constitutes A, regardless of which micro-constituents realize A. Given that A could be realized by micro-processes x, y, or z, neither x, y, nor z is necessary or sufficient for the outcome. And moreover – this is the new part – whether x, y, or z is the chosen substrate for the pattern depends on whether the background conditions are already in place for x, y, or z to occur. But that in turn might be determined by the system itself. It then occurred to me that, in theories of self-organization like the one proposed by the chemist Stuart Kauffman, the system itself could have the power to use y or z as the substrate for A if x happened to be unavailable.

As John Mackie had shown years earlier, a cause is necessary and sufficient for an effect only if certain background conditions are assumed. What if the living organism has the capacity to rearrange the background conditions that would be needed for the causal efficacy of x, y, or z? We would then have a truly self-organizing system, one that maximizes the odds of pattern A obtaining by rearranging the needed background conditions for causal processes x, y, or z, depending on available circumstances. The classic example is the way the brain can compensate for damage to a certain group of neurons by reorganizing itself so that other neurons play the role of those that had been damaged, as in recovery from a concussion or stroke.

So multiple realizability alone isn't enough to overcome the stimulus-response paradigm. It's also necessary that the multiple realizability occur within a system that is self-organizing in the sense that Francescotti's argument suggests.

Once I realized that genuine self-organization is possible, I then discovered that another philosopher, Natika Newton, had already developed an "action theory of understanding." Her question was: What is the difference between machine knowledge and human consciousness, or what she called "understanding"? In John Searle's "Chinese room" example, a machine could merely exchange Chinese words for English ones without actually speaking or understanding Chinese. Rather than devising

more and more clever systems of machine-like information processing, Newton went directly to the crucial difference between humans and machines: Humans are *motivated to act* relative to our environment; we feel the motivations, and we understand the environment by forming those motivations and corresponding actions. The feeling of the motivation for the action provides the subjective feeling component of consciousness, and the patterns of resistance against the actions provides the representational component. Consciousness has to include both the feeling and the representational component, related to each other in the way that only living creatures can relate them. Newton, although mainly an analytic philosopher, had studied phenomenology extensively, and knew that Edmund Husserl, many years earlier, had already spoken of this way of relating to the environment as the "life world."

Another philosopher, Shaun Gallagher, who knows both phenomenology and neuroscience, has done an excellent job of bridging between the two previously opposed camps. He uses empirical neurology and neuroscience to find the connections between subjective, phenomenal experiences and their empirical correlates. To find consistent connections requires looking at both the empirical data and the subjective consciousness from an enactive perspective. One conference hosted by Gallagher featured an entire session devoted to the neurology of the above-mentioned phenomenon of utilization behavior.

I then began to discover that many neuroscientists had already begun to understand the brain as a self-organizing system. Notably, Jaak Panksepp had shown that the emotional brain initiates motivated processes independently of any externally derived rewards or punishments, and Panksepp minced no words in rejecting the behaviorist stimulus-response paradigm, with its hedonistic reinforcement theory. There are a number of separate emotion systems in the brain, not dependent on hedonistic reinforcement, and those emotion systems provide the impetus to active life processes other than the mere seeking of pleasure or avoidance of punishment. The emotions that motivate action come from within, not as reactions to something external or to a sequence of linear chemical reactions.

Another neuroscientist, Carl Aurell, had shown with imaging studies that when a perceptual object is presented, emotional brain areas are activated earlier in the stream than any processing that occurs in the visual cortex of the occipital lobe. The brain's frontal-limbic connections have already begun to gear us up for possible actions

before the perceptual signal has even reached the parts of the visual cortex that process the appearance of the object. This suggests that we understand the perceptual pattern relative to the possible motivated actions the object affords or blocks. And we use our anterior cingulate to direct our attention accordingly.

Readers of this journal might notice that some of the names I've mentioned here are relatively unknown. That's because new ideas tend to be proposed by new people. The old people, who are better known, then pick them up, but in a somewhat homogenized form, more in line with the older paradigms. I was speaking to a young psychologist recently who was quite delighted to hear that I knew Panksepp. In his view, "Panksepp is rapidly becoming the state of the art."

At the end of this interview, I'll give you a short list of some of the resources I've referred to here.

SM: Which thinkers or disciplines have most strongly resisted this paradigm shift?

RE: I don't see the new and old paradigms as an us versus them. A new paradigm can't just write off the insights of the past. We have understood for years or even centuries that there are regular and predictable causal processes, and we can't just pretend that those no longer exist. Any new paradigm has to be able to incorporate them. Einstein's theory had to include all the insights of the Newtonian theory, but framed within a larger context. We still need to respect the micro-processes of causation in the brain, even as we incorporate them into a system that allows for neural plasticity and self-reorganization. All kinds of medical and pharmaceutical facts depend on the micro processes as well as the ones that suggest neural plasticity.

The clearest example of a theorist who completely rejects the self-organizational theory is John Bickle, who brands himself as a radical reductionist. I have tremendous respect for Bickle's work on the micro-circuits of the brain. I even co-authored an article with him about the correlations between phenomenal experience and brain processes. The challenge of the new paradigm is to incorporate all that was known about linear causal processes into the self-organizational approach. My disagreement with Bickle is that I think such a synthesis is possible, whereas he maintains serious doubts on this score.

I mentioned earlier Daniel Wegner's *ad hoc* hypothesis that "conscious choice is an illusion," which was hastily endorsed by Daniel Dennett. This is a straightforward example of an attempt to just preserve the old epiphenomenalist paradigm regardless

of how many *ad hoc* hypotheses are needed to do so. In the realm of neuroscience, it remains a common parlance to couch discussions in terms of linear stimulus-response causality and behaviorist reinforcement theory, as in the writing of the well-known neuroscientist Edmund Rolls and many others. It may be that people are so accustomed to speaking the hedonistic-reinforcement and stimulus-response languages that whatever they say tends to be expressed in terms of them.

SM: How does the enactivist approach influence our everyday self-understanding? In other words, how do these developments in mind research shape our worldviews?

RE: I think it can be very damaging to our real-life philosophical grounding if we think of all human value as reducible to a hedonistic reward-seeking machine. My last several books have addressed this problem. I think a lot of the anxiety driving the current tendencies toward fascism around the world, just as Hannah Arendt observed in her own time, results in large part from a general cynicism about moral values – or to be more precise, cynicism about the very idea that there can be any truth about ethical issues. If everyone is just an egoistic hedonist at bottom, as the behaviorist approach tends to suggest, then how can we take seriously any collective caring about human well-being in a universalized sense?

The enactive approach to mind and consciousness can reconnect us to the most important existential and moral issues. Panksepp's endogenous emotion systems have evolved around inevitable conditions for our existence. Adopting the convention of using ALL CAPS for the endogenous (not learned) emotion systems in the brain, Panksepp especially emphasizes a SEEKING system,[1] which grounds the endogenous exploratory drive (somewhat similar to David Hume's "love of truth"); and an equally basic PANIC (or SEPARATION DISTRESS) system, which reflects the necessary fact that our existence is relational. Our existence requires being in relation to other creatures, and the basic emotion systems embody this fact.

When we combine the love of truth with the caring for others grounded in the NURTURING and SEPARATION DISTRESS systems, we end up understanding that

1) See for example Antonio Alcaro, Stefano Carta, and Jaak Panksepp, "The Affective Core of the Self: A Neuro-Archetypical Perspective on the Foundations of Human (and Animal) Subjectivity," Frontiers in Psychology 8:1424 (2017). https://doi.org/10.3389/fpsyg.2017.01424.

our concern for others has to be universalized. If the intrinsic value that we attribute to others is by virtue of their being valuing creatures, the same property attaches to all valuing creatures. If we value someone for any other reason – for instance that they are good musicians or scientists or that they make us happy – we are recognizing their instrumental value relative to other aims, not the intrinsic value that we take them to have for their own sake. When we lose the feeling that valuing creatures themselves can have intrinsic value, we lose the most basic building block for the sense that life can have meaning. But if the value of others isn't universalized, then their value becomes only instrumental relative to other aims, and we lack a sense that there are intrinsic values for the sake of which the instrumental ones can be instrumental. Panksepp's emotion systems re-open these possibilities in a way that seemed distant within the stimulus-response paradigm with its behaviorist, hedonistic and stimulus-response implications.

SM: To what extent has the advancement of brain imaging technology been crucial for the embodied/enactivist understanding of experience?

RE: Brain images usually need to be taken with a few more grains of salt than is typically done. For one thing, as with so much of psychology, correlations between brain image patterns and mental or emotional processes – especially if the images are of normal brains – are quite weak correlations, often barely enough to be statistically significant (which is a low bar). Also, controlling for intervening or contaminating variables is difficult. Some of the patterns revealed by the imaging are reliable – for example, that sociopaths lack modulation of the amygdala by the orbitofrontal area of the prefrontal cortex. But other patterns involve such weak correlations and are contaminated with so many co-varying brain processes that any inferences from them are can often be very speculative.

For example, a subject watching emotion-eliciting images on a screen exhibits heightened anterior cingulate activity, which might seem to say something impressive about an anterior cingulate role in emotion, until we remember that paying attention to *anything* involves the anterior cingulate. For the same reason, the "grandmother cell" theory – that activation of a certain cell in the brain correlates with a certain thought or idea – forgets that activation of that particular cell is only part of a larger pattern of widely-distributed brain activity.

Also, when it comes to enactive processes, the *timing* of the brain processes is more important than the precise location of activation. But the currently most popular type of imaging, the fMRI, is very imprecise when it comes to the timing of the activations, which would need to be accounted for in terms of milliseconds. The Aurell study that I mentioned earlier, where the timing of the activations showed that the emotional and action-initiating brain regions are activated prior to the perceptual areas, used Event Related Potentials (ERP) rather than fMRI. ERP electrodes attached to the surface of the head can discern activity down to the millisecond; but on the other hand, the ERP technology doesn't localize the activation as precisely as the fMRI.

Another factor too often ignored is that fMRI relies on changes in blood flow. But cortical activity involves more noticeable changes in blood flow than does emotional and motivational activity in the subcortex and limbic system. As a result, fMRI studies tend to be cortico-centric, seeming to overemphasize *cortical* correlates to mental processes, when in fact the emotional, motivational, and thus action-initiating brain areas may often be at least as important. Those motivational processes work by means of changes in neurotransmitter balances more than by changes in blood flow, and thus aren't picked up very much by the fMRI. On the other hand, with ERPs, it's hard to know exactly which area of the brain the electrode is picking up on. The ERP is measured simply by strapping electrodes to the surface of the head. With enactive processes, the timing is more crucial than the precision of the location, so on the whole it seems to me that ERP studies are often more useful for enactive understanding of how the brain works to generate motivation, emotion, and action – with one caveat: fMRI can be very revealing when it identifies brain areas that have been damaged *on a long term basis* and which, over time, correlate with changes in behavior, emotion, or cognitive skills.

For that same reason, when it comes to enactive processes, I believe more reliable inferences can be made from good old-fashioned neurology. When we know that a certain brain area is damaged on a long-term basis – which often can be seen with scans – we can observe what kinds of mental processes are impaired. That gives us a more dependable correlation than we can get from images of normal brains.

Antonio Damasio, who is a neurologist by profession, showed in his 1999 book, *The Feeling of What Happens,* that when cortical brain areas are damaged or destroyed, certain cognitive skills are lost, while consciousness *per se* can remain; but when

subcortical areas are destroyed, where the emotion and motivation are initiated, there is no consciousness. The lower in the brain the damage occurs, the more likely it is that consciousness can't be regained. As the damage descends to lower and lower brain areas, the cognitive processes that we associate with consciousness, such as perception, memory and understanding, are increasingly lost. Yet consciousness itself remains possible as long as the subcortex is intact. That too is consistent with the enactive approach, since endogenously generated action intentions have to be motivated, and the impetus to action begins with neurotransmitters released by activity of the emotional deep subcortex.

Damasio's point also implies that the human mental skills that seem at least superficially somewhat analogous to what computers do – the higher cortical ones – are the *least* important contributors to whether we are conscious or not. This again suggests that the way we process information is just the reverse of the way computers do it; rather than first receiving and then processing information, on the contrary, we first initiate actions, then use the cortical processes to check on the way the environment is resisting certain actions or could facilitate others. As Merleau-Ponty once observed, a football player perceives the shape of the field in terms of which passes could or couldn't be completed.

On the enactive view, the human organism isn't just an inferior model of the more sophisticated calculating machines. We aren't merely the Big John trying to compete against more efficient wood-chopping technology with his old-fashioned axe and saw. What we are trying to do is completely different from what the computers are doing. We are trying to use the environment to execute actions that have value and meaning. Non-living computers are incapable of providing value or meaning for any action. They therefore don't need to process the information the way we do.

Useful Resources on Enactivism, Self-organization, and Neural Plasticity:

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