Wild Systems Theory as a 21st Century Coherence Framework for Cognitive Science

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The present paper examines the historical choice points the led twentieth-century cognitive science to its current commitment to correspondence approaches to reality and truth. Such a "correspondence"-driven approach to reality and truth stands in contrast to coherence-driven approaches, which were prominent in the 1800s and early 1900s. Coherence approaches refused to begin the conversation regarding reality with the assumption that the important thing about it was its independence of observers because the reality-observer split inherent in correspondence-driven views often led to objective-subjective divides, which, within scientific theorizing, tended to render the latter causally unnecessary and in need of ontological justification. The present paper fleshes out the differences between coherence- and correspondence-driven approaches to reality and truth, proposes an explanation of why cognitive science came to favor correspondence approaches, describes problems that have arisen in cognitive science because of its commitment to correspondence theorizing, and proposes an alternative framework (i.e., Wild Systems Theory—WST) that is inspired by a coherence approach to reality and truth, yet is entirely consistent with science.

Keywords
Affordances | Coherence approach to reality and truth | Energy-transformation system | Epistemic gap | Evolutionary theory | External grounding | External relations | Global groundedness thesis | Internal relations | Intrinsic properties | Modes of experience | Realism | Reality | Relational properties | Representational | Self-sustaining embodiment | Ultra grounding | Wild systems theory

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1 Introduction

Over the course of its history, cognitive science has often assumed that the important question regarding reality was its independence of an observer. Within this framework, epistemology becomes paramount as scientists work to discover the lawful connections between observer-independent reality and observers. Implicit, if not explicit, in this approach to cognitive science is the assumption that "truth" is to be measured in terms of the degree of discrepancy between observer-independent reality and whatever impressions, thoughts, representations, affordances, and other observer-dependent phenomena observers use to overcome this assumed epistemic gap.

In contrast to such correspondence-driven approaches to reality and truth, many coherence-driving philosophers of the late 1800s and early 1900s rejected correspondence as a starting point for ontology because they believed the subject-object divide it engendered ultimately made it difficult to defend the reality of the subjective (Gardner 2007; Hegel 1971; Priest 1991; Tseng 2003). Given their commitment to the reality of phenomena such as consciousness, value, and meaning, coherence theorists refused to accept the ontological risks inherent in correspondence approaches to reality. Instead, they proposed an alterative approach that admits the reality of consciousness, value, and meaning and assesses truth in terms of the degree of coherence (i.e., non-contradiction) (Oakeshott 1933; Tseng 2003).

In what follows, we flesh out the differences between coherence- and correspondence-driven approaches to reality, propose an explanation of why cognitive science came to favor the correspondence approach, describe problems that have arisen in cognitive science because of its commitment to correspondence theorizing, and propose an alternative framework (i.e., Wild Systems Theory—WST) which is inspired by a coherence approach to reality yet is entirely consistent with science.

2 Correspondence and coherence

2.1 A creation myth: The origins of the correspondence view

A professor walks into the first day of his graduate-level Learning and Cognition course. He tells the students the following story:

"A boy is riding his bike and sees a bracelet on the street. He stops his bike, picks up the bracelet, and realizes the bracelet is a snake."

After reading the story, the professor asks the students to describe it using the concept "real." The students share perplexed glances, as if to say, "I signed up for a science course, not a philosophy course." The professor continues to press the issue, and eventually a student speaks.

"He thought the object was a bracelet, but it was really a snake."

This prompts another student to say, "He misperceived the snake as a bracelet."

The professor asks the class if they understand these statements and if they agree with the students' use of the concept "real." The vast majority of the class nods yes.

The professor then asks the following, "Is there anything real about the bracelet?"

Eyes roll and students laugh as the question comes across as being silly more than important. The professor waits patiently and asks the question again.

After some time, a student states, "He really believed he saw a bracelet."

When the professor asks the class if they understand and agree with the statement, only half or less nods yes.

To cut to the chase, the professor asks, "How many of you had a dream in the last week?"

Surprised by the question, few students raise their hand.

Needing to get the class on-board, the professor pushes harder and asks, "Ok. How many of you have had a dream in the past year?"

Now everybody raises their hand.

"Good," says the professor. "And was there anything real about the dream?"

Connecting the questions regarding the reality of the bracelet and the reality of dreams, a student says, "The dream was real in the sense that I had the experience."

"Excellent," states the professor. "Now you understand the type of thinking that lies at the root of our thinking about reality and truth."

Students look back at him, slightly puzzled.

"According to what you just told me," the professor begins, "both the snake and the bracelet are real."

The class continues to stare.

"How many of you think the two are equally real?"

More staring.

"OK. How many of you think the snake is more real than the bracelet?"

Roughly two-thirds of the class raises their hand.

"Why?"

One student raises her hand and states, "The boy really experienced a bracelet, but since the bracelet was an incorrect perception, the snake is more real."

"And when the boy finally had a snake perception," states the professor, "his perception was correct?"

"Yes," responds the student confidently.

"Excellent!" exclaims the professor. "How many agree?"

The students look back and forth to each other, seeking an answer. Eventually, most everyone in the class raises their hand.

"Now we are truly making progress," states the professor, "and for my final question, how do we know the snake is more real than the bracelet?"

The same student answers without hesitation, "Because the snake perception accurately corresponds to the object."

"There it is," exclaims the professor. "We know the object is really a snake because our experiences correspond to it. In short, perceptions are true, or accurate, because they correspond to reality correctly."

He centers himself in front of the class and states, "This way of describing reality is known as the correspondence approach to truth and reality. It has dominated the way we think about truth and reality for at least four hundred years, if not longer. And over the next two weeks I hope to show you that if you believe this approach to truth and reality, you, one, logically deny yourself access to reality, and, two, make it very difficult to defend the reality of phenomena such as love, hate, the sound of music, and the taste of ice cream."

He looks out over the class and sees that he has their attention.

"How many of your really like ice cream?" he asks.

Everyone raises their hand instantly. Some students raise both hands.

"Good then," the professor states. "Let us begin."

2.2 A very brief history of correspondence, reality, and truth

While the story described above may seem rudimentary, the purpose is to give the reader, as well as the hypothetical student, a common entry point into the conversation regarding correspondence and coherence approaches to reality and truth. This is important because coherence approaches have not been proposed all that often over the past one hundred years. Thus, very few contemporary cognitive scientists know of them, let alone make use of them. This century-long waxing and waning of correspondence and coherence approaches, respectively, may have had something to do with the fact that alternatives to correspondence have come to be seen as increasingly irrelevant after a century of naturalism, physicalism, and realism. That is, the increasingly sophisticated view of the physical world that has developed over centuries of scientific practice has led the vast majority of practicing cognitive scientists to assume that the issue of reality and truth has been solved, and by using science, we decrease the degree of discrepancy between objective and subjective reality. From this perspective, science is metaphysical in the sense that science reveals how reality really is, independent of our personal perspective.

While this correspondence-driven, metaphysical take on science is practically implicit in contemporary cognitive science, we propose that the issues addressed in the snake/bracelet story are, in fact, unresolved. Furthermore, we believe that the current zeitgeist of correspondence thinking is due to historical choices regarding our conceptualization of the reality of human experience. In what follows, we briefly review some of these choice points in the hope of clarifying why a commitment to correspondence has seemed to be such an obvious step for cognitive scientists.

a. Spiritual versus mental subjectivity. Questions about whether or not the bracelet is real, or the manner in which it is real in relation to the reality of the snake, are the same kind of questions René Descartes asked himself when he addressed the reality of God and the

material world hundreds of years ago. To be sure, very few if any contemporary cognitive scientists would account for the reality of the snake and the bracelet via Descartes's notion of interacting yet qualitatively distinct physical and spiritual realities (i.e., dualism). However, despite their assumed distinctiveness from dualism, most contemporary cognitive scientists implicitly, if not explicitly, endorse the basic assumption of dualism that the interesting point about reality is the extent to which it is independent of observers. This commitment to correspondence thinking was evident in the writing of one of Descartes' major critics, John Locke (1700). Even after Locke took some of the first formal steps toward developing cognitive science (i.e., a "science of man") and re-described the spiritual side of Descartes' dualism as being "mental," the question for Locke's "science of man" was how it is that our sense impressions are able to accurately correspond to physical reality.

b. Radical skepticism. In response to Locke's non-spiritual correspondence approach to reality and truth, David Hume (2012) asked whether or not such an approach is even logically possible. Specifically, Hume's basic argument was that if one accounts for reality in terms of the "impressions and ideas" it causes within us, then all we can ever really know are the impressions and ideas we have about reality. This is because every test we could ever run to assess the extent to which our impressions and ideas about external reality are accurate would have to be mediated by impressions and thoughts. That is, once we claim that we know external reality through observer-dependent structures such as thoughts and impressions, we have logically doomed all of our knowledge to be trapped within us.

Though Hume's radical skepticism is hundreds of years old, and seems outdated to many contemporary scientists in general—and cognitive scientists, specifically—we believe Hume's radical skepticism constitutes both a historical choice point and an individual choice point for the issue of how we conceptualize the reality of the subjective. On the one hand, there were and are those scholars who took radical skepticism to be diagnostic of a logically flawed approach to reality and truth. On the other, there were and are those who believed and continue to believe that the test for whether or not the correspondence approach to reality and truth is "correct" is empirical. That is, the "correctness" of science will ultimately be decided on correspondence grounds; that is, by whether or not science can eventually represent the entirety of observer-independent reality accurately. In what follows, we examine various historical attempts to sustain the correspondence approach in spite of radical skepticism.

c. Overcoming radical skepticism. What is somewhat ironic about the attempt to overcome skepticism is that although those who did and do so tend to present themselves as being quite different from each other, they nonetheless avoid skepticism in roughly the same way; specifically, by nesting the correspondence relation within an assumed, larger-scale reality that guarantees the veridicality of the correspondence relation. Descartes, for example, after having doubted all but his ability to doubt, then went on to infer that his ability to do so could have only been created by a superior, omnipotent being (i.e., God). Then, to secure the correspondence relationship completely, he assumed that his subjectivity must correspond accurately to reality because God created both and would not have done so incorrectly. Bishop Berkeley made much the same maneuver when he proposed to overcome Hume's radical skepticism by asserting that the correspondence relation holds because we exist within God's mind.

Cognitive scientists, while certainly not dualists, nonetheless rely on evolutionary theory as a means of placing the correspondence relationship within a larger-scale reality as a means of validating the correspondence relationship. There are two dominant varieties of such thinking: indirect-realism and direct-realism. Realism is the assertion that objects exist as they are, with all of their intrinsic properties, independently of observers. Indirect realism asserts that our knowledge of reality is mediated by our sensory systems and knowledge structures. Direct realism asserts that our knowledge struc-

tures are directly in contact with external properties, exactly as they are.

Indirect realism is basically an evolutionarily inspired re-description of Locke's mediated theory of perception in which external events cause the internal formation of impressions and ideas. Though there are many varieties of indirect realism (Fodor 1983; Pinker 1999), common to most is the computationalist, representationalist view of cognition, which assumes that we know what is outside of us because of the representations that external events cause within our brains. Given that our brains co-evolved with the world and were naturally selected, it seems self-evident that our brains give us accurate access to external reality.

While in the early days of cognitive science indirect realists believed that internal, sensory-driven (i.e., bottom-up) representation of external events could be augmented by top-down, cognitive processes such as attention (Broadbent 1958; Cherry 1953), they still nonetheless believed that the bottom-up processes entailed accurate representations of their external causes. Such assumptions derived support from findings such as Hubel & Wiesel's (1962) discovery of neurons in the primary visual cortex (V1), that expressed spatially correspondent receptive fields (i.e., the activity of a neuron in V1 could be maximally stimulated by a visual stimulus emanating from a particular location in the visual field). Later research revealed a massive degree of spatial correspondence between locations in external space and neural space within a host of different modalities (e.g., visual, auditory, and kinesthetic space). Milner & Goodale's (1995) discovery of visual systems used for object identification versus visual systems used for guiding action (i.e., vision for perception versus vision for action) further solidified indirect realism because it seemed to clarify how internal representations of external events were used to accurately guide behaviors back onto external reality.

In light of this accumulating neural evidence as well as a host of perceptual-cognitive research that revealed our apparent ability to represent invariant properties of biologically relevant external events, Roger Shepard (2001) stated the following in the opening line of the abstract to his seminal paper, *Perceptual-cognitive Universals as Reflections of the World*: "The universality, invariance, and elegance of principles governing the universe may be reflected in principles of the minds that evolved in that universe" (p. 581). Clearly, from this indirect-realist perspective, our connection to the world around us is mediated by internal representations that are phylogenetically derived stand-ins for what the world around us is like.

Critiques of indirect realism within cognitive science basically recapitulated Hume's critique of Locke's mediated theory of perception. That is, cognitive scientists dating back as far as the Six Realists (Holt et al. 1910) criticized the representational approach to cognition because they believed it logically denied one access to external reality. Interestingly enough, instead of challenging the correspondence view of reality and truth that lay at the heart of indirect realism, and which constituted Hume's biggest concern with Locke's approach, cognitive scientists who labeled themselves direct-realists argued that the connections between the internal and the external were not constituted of mediating representations of the external but, rather, of natural relations between the organism and the environment. Though this idea dates back at least as far as William James as well as the Gestalt psychologist Kurt Koffka (Ash 1998), perhaps its most influential expression was provided by J. J. Gibson (1979), who argued that we perceive the world in terms of behavioral possibilities, what he referred to as affordances.

Since Gibson (1979), many cognitive scientists have effectively investigated affordances. Given that most ecological psychologists who investigate affordances are simultaneously direct realists, it is important to their realism that affordances be real, and that we have direct access to affordances via our sensory systems. Instead of constructing representations, however, our sensory systems are described as having the task of picking up or detecting information (i.e., affordances).

The direct-realist appeal to the reality of directly perceivable affordances defends the

validity of the correspondence relation by arguing that organisms veridically perceive affordances because they evolved to do so. That is, just as was the case with Descartes, Berkeley, and indirect realism, the assertion of the correspondence relation is validated by placing it within an *assumed*, larger-scale reality. In the case of direct realism, that assumed, larger-scale reality is the evolved physical world.

By calling the *evolved, physical world* an assumed, larger-scale reality, we are not proposing that the theory of evolution is untrue, or that the phenomena referred to via the concept of the physical world do not exist. In fact, we believe the phenomena referred to via the concept of the physical world do exist, and we further believe that the theory of evolution is "true." We just believe they exist and are true respectively, in a manner that is not couched in the correspondence framework espoused by realists. (We will describe how we believe they exist and are true at a later point in this paper.) Rather, what we are trying to accomplish by referring to the evolved physical world as an assumed, larger-scale reality is to point out the common strategy shared by correspondence theorists across the centuries. Specifically, if one espouses a correspondence account of reality, in which knowledge and/or perceptual structures are meant to correspond to reality, either via perceptually generated representations or via evolutionarily tailored relations, then, by definition, all we have contact with are knowledge and perceptual structures, and any statement about external reality is an *assumption*. This, in fact, was the gist of Hume's critique of Locke's mediated theory of perception. Radical skepticism does not argue that objects do not exist. Rather, it is simply a critique of a *particular* account of reality (i.e., the correspondence account), and the critique refers to the *logical coherence* of the account. If one espouses a correspondence framework for reality and truth, one has logically denied oneself access to external reality, and neither empirical data nor an assumed larger-scale reality is capable of overcoming this logical flaw. On logical grounds alone, one cannot use realism and its attendant correspondence arguments to overcome radical skepticism.

To be sure, direct realists might respond that their brand of realism overcomes radical skepticism because direct realism does not rely on internal representations to connect the internal to the external. Rather, the connections, as stated above, are conceptualized in terms of relations between organisms and environments that co-evolved in such a way that organisms are able to directly perceive these relations (i.e., affordances).

While at first glance the anti-representational slant of these arguments does seem to skirt the issue of radical skepticism, it's appeal to relations or relational properties between relata (e.g., organisms and environments) still commits to the correspondence notion that truth is determined by the degree of correspondence between the system (i.e., the organism) and something external to the system (i.e., affordances). Again, this commitment to the correspondence relation stems from the centuries-old belief that the important thing about reality is its independence of observers. Armed with such an approach to reality and truth, science is believed to be metaphysical in that it reveals observer-independent properties of external reality. To be sure, the direct realist will argue that evolution has solved all of this. However, as was stated above, it is their commitment to realism that logically denies the correspondence scholar access to external reality. In short, it is the logically incoherent notion of correspondence that denies the realist access to external reality, not reality itself.

2.3 The coherence approach to reality and truth

In order to overcome the representationalism inherent in indirect realism, direct realists reframed the connection between organisms and environments in terms of evolutionarily derived relations as opposed to internal representations. Doing so, however, begs the issue of the nature of the things that stand in relation to each other (i.e., the relata). Are the relata themselves constituted of relational properties? If so, just how far down is reality constituted of relations?

While questions regarding the relational nature of reality might seem silly to contemporary cognitive scientists, it was actually of paramount importance to the maintenance and perpetuation of the correspondence approach roughly a century ago. Bertrand Russell (1911), for example, went to great lengths to counter the notion of internal relations that was prominent in idealist philosophy in the 1800s and early 1900s. As described by Russell, the notion of internal relations is the idea that the relations between entity A and B are actually constituents of A and B. In other words, part of what constitutes A is its relationship with B. This idea was problematic for Russell because idealist philosophers often used it as a means of overcoming radical skepticism. Specifically, these philosophers proposed that the objectivity of supposed external reality was actually observer dependent, in that a subject (i.e., an observer) was internally related to its objects. That is, the objects do not have an existence independent of the subject, and vice versa (Hegel 1971; Oakeshott 1933; Priest 1991). Different idealist philosophers held different motivations for espousing this view. Many did so in order to maintain the reality of God. Others did so in order to maintain the reality of phenomena that Descartes had relegated to the subjective (e.g., values, meaning, and aesthetics).

Regardless of their motivations, the idealist notion of internal relations was problematic for Russell because he wanted to describe reality in terms of the objects of science and logic. In short, Russell wanted metaphysics to be empirical. In order to do so, he felt he needed to establish the logical independence of external reality. That is, he had to show that objects are not internally related to subjects. As a result, he argued that not all relations are internal, and that some are external. By external relations, Russell meant that a relationship between entity A and entity B is not constitutive of entities A and B. An example of an external relation would be the relative height of two people, say Mary and Sam. While it is logically coherent to state that Mary is taller than Sam, the "taller" relation is not constitutive of either Mary or Sam. That is, the "taller" relation depends, of course, upon Mary and Sam, but it exists externally from Mary and Sam in the sense that it plays no role in the properties that constitute Mary or Sam. Russell uses this notion of external relations to propose a correspondence approach to reality and truth in which entities share relations and via those relations constitute components of complexes. Having assumed that he had logically negated the notion of internal relations, Russell then proposed that we get on with the empirical, metaphysical business of scientifically describing reality "as it is," independent of observers.

The use of the notion of externally related entities as a means of sustaining the correspondence approach to reality and truth is also evident in the work of direct realists such as Holt et al. (1910) and Gibson (1979). By utilizing this relation-driven form of realism, all three were implicitly asserting the belief that the issue of reality was to be solved via epistemology. That is, they were continuing the centuries-old argument that the important thing about reality is its independence from observers.

a. The relational nature of reality. As stated above, the direct-realist assumption that we have contact with external reality via relations begs the issue of the nature of the things that stand in relation to each other (i.e., the relata). In other words, if we claim that two relata share a relation, we imply that there is a difference between relata and relations. This leads to another choice point that historically influenced the manner in which we describe the reality of the subjective: Are the relata themselves constituted of relational properties, or are they constituted of non-relational properties, what one might refer to as *intrinsic* properties? The answer to this question is important, for if one argues for a difference between intrinsic and relational properties, then realism seems the obvious choice; the purpose of science is to uncover the intrinsic properties of reality. If, however, one assumes that relata are themselves constituted of relational properties, we have a much different problem. For if all relata are constituted of relations, then there can be no intrinsic properties. This is because the constitution of all properties, by definition, would be re-

lational. In short, reality would constitute a unity in which all things were constituted of all things.

The notion that all things are about all things sounds much like the idealist notion of internal relations. And while the idea might seem outdated in contemporary cognitive science, it has recently gained traction in the philosophy of science as a possible explanation of properties. For example, mass is often considered an intrinsic property in that the mass of an object is considered to be independent of its context, while weight is considered to be an extrinsic property because the object's weight is determined by how its mass interacts with its context. Jammer (2000), however, proposes that all particles receive their inertial mass via their interactions with the Higgs field, "a scalar field that 'permeates all of space' and 'endows particles with mass'" (p. 162). Bauer (2011) argues that the dependence of mass on the Higgs field renders mass *externally grounded*. This means that the mass of the particle is not independent of its context. As a result, the object's mass is a *relational, non-intrinsic* property.

Bauer's notion of external grounding should not be confused with Russell's (1911) notion of external relations. Bauer uses the notion of external grounding to make the case that a property (i.e., mass) that was assumed to be intrinsic (in order to distinguish it from the property of weight, which was assumed to be contextually relative) was actually contextually relative. "External" in this sense was used to flesh out the relative nature of a previously assumed to be non-relative (i.e., intrinsic) property (i.e., mass). Russell, on the other hand, used the concept "external" in the opposite way. That is, he wanted to demonstrate that certain properties were independent (i.e., were not entailed in the constitution) of other properties. In short, Russell used the notion "external" to create independent properties in a reality the idealists had described as an internally related unity, while Bauer, roughly a century later, uses the concept "external" to re-contextualize properties that post-Russellian realists had conceptually isolated from reality by describing them as *intrinsic*.

While one could see Russell's (1911) and Bauer's (2011) uses of the concept "external" as contradictory and leave it at that, one might also argue that their different uses of the same concept are diagnostic of the success of Russell's efforts. Specifically, Russell used the concept external to de-contextualize certain parts of reality (i.e., make them intrinsic), while Bauer, one hundred years later, uses the same concept to re-contextualize what Russell had worked so hard to de-contextualize. In short, one might argue that while Russell represented a first conceptual step away from holism, contemporary works such as Bauer's represent initial conceptual steps back toward holism. Further evidence of a tendency to conceptually move the philosophy of science away from the notion of intrinsic properties can be found in the work of Harré (1986), who proposes the notion of *ultra-grounding*, the idea that a property may be grounded by a property, or properties, of reality as a whole.

Such an anti-intrinsic take on the nature of properties is also proposed by both Schaffer (2003) and Dehmelt (1989). These authors assert that there may be no fundamental level to reality at all (i.e., no final, non-relational, intrinsic property that forms "relations" into "complexes"). Rather, they propose that reality may be constituted of infinite levels of microstructure. Consistent with the notion of external grounding, Prior et al. (1982) propose the Global Groundedness Thesis. This thesis asserts that all dispositions (i.e., properties) are grounded (i.e., externally grounded) rather than ungrounded (i.e., intrinsically grounded). Ladyman et al. (2007) implicitly, if not explicitly, express a similar critique of the notion of intrinsic properties when they assert that contemporary analytic metaphysics needs to abandon the idea that reality is constituted of self-subsistent individual objects.

b. Truth in a relational reality. The idea that reality is infinitely relational is inconsistent with the correspondence approach to reality and truth because a relational reality can never be subdivided into final, intrinsic, "in-and-of-themselves"-type properties. In an infinitely relational reality, all objects

and subjects are composed of relations (i.e., they are contextually grounded), and all intrinsic properties are inherently relational. This implies that dialectic counterparts such as objective versus subjective, or relational versus intrinsic, come to be introduced into one's description of reality, not because they reflect accurate, final, ontological subdivisions of reality, but for the same reason one describes the snake in the snake-bracelet story as being more real than the bracelet—specifically, because one accepts the subjective-objective divide inherent in the correspondence view and tries to defend the assumed greater reality of the snake by asserting its independence of oneself. It is this assumption that the important thing about reality is its assumed observer-independent nature that drives the correspondence approach and leads one to further believe that the goal of science is to overcome subjectivity and reveal the objective truth about reality. Once such independence is no longer assumed, then truth can no longer be measured by assessing the degree of difference between reality and an impression, idea, or representation we have of it, or by investigating an assumed relation we share with it. There exists nothing "as it is" to which anything else can accurately correspond. The final, ontological description of what something *is* must include reality as a whole. In short, truth must be assessed in a non-correspondence fashion.

One way to measure truth without asserting a correspondence relationship is to do so on the basis of coherence. By coherence we mean lack of contradiction. In contemporary philosophy, lack of contradiction (i.e., coherence) is most often used to refer to the means by which a belief is justified (Kvanvig 1995; Lycan 2012). Specifically, a subset of contemporary epistemologists, who might be loosely referred to as "coherentists" (Lycan 2012; Quine & Ullian 1978; Thagard 1978), propose a view akin to the following:

> […]what justifies […] the formation of any new belief—is that the doxastic move in question improves the subject's explanatory position overall and/or increases the explanatory coherence of the subject's global set of beliefs. (Lycan 2012, p. 6)

While the coherentist approach to propositions clearly relies on the notion of "lack of contradiction" to measure the justifiability of beliefs, it does not make use of "lack of contradiction" as a measure of the truth inherent in experience. As a result, it is logically possible for one to be a coherentist about beliefs while simultaneously holding an implicit or explicit correspondence view that conceptualizes beliefs as subjective propositions that refer to external, objective reality. It is not clear where Lycan (2012) stands on this issue.

> At any given moment, we find ourselves involuntarily holding any number of beliefs, at least those produced by perception and by memory; however, […] I do not make any primary appeal to those faculties as justifying. Call such unconsidered beliefs "spontaneous beliefs"; they are primarily about our immediate environment, past events, sometimes our own mental states, and more. (p. 6)

Although Lycan (2012) makes no claims regarding the metaphysical status of *perception*, or where he stands on the issue of reality and experience, his use of the word *perception* allows him to interject other phrases such as "primarily about our immediate environment," that then implicitly connect beliefs to external reality via a correspondence relation. Regardless of whether or not this was Lycan's intent, it is clear that coherentism is about the justifiability of beliefs and not about reality, per se. As a result, it may not have much to offer in our attempt to develop a coherence approach to reality and experience.

One possible way to apply the coherence approach to the issue of reality and experience is the very same test entailed in the snake-bracelet problem. If one assumes that reality constitutes an internally related unity that defies that logic of correspondence tests of truth, then statements regarding the truth of the

snake and the bracelet should be stated in terms of contradiction. That is, the statement "the boy saw a bracelet while riding his bike" is true in the sense that the boy had a persistent flow of "bracelet" experience. The notion of persistent flow is important here because it calls attention to the fact that from moment to moment during the bracelet phenomenon, the phenomenon did not contradict itself; that is, the "bracelet" phenomenon at one moment was not followed by a different "non-bracelet" phenomenon the next. Jordan & Vandervert (1999) propose that it is this coherent flow of phenomena, what they refer to as "within-instance" coherence, that underlies our propositions regarding the reality of phenomena. To be sure, later on in the story, when the boy picked up the "bracelet," he suddenly did have a contradiction in the flow of the bracelet phenomenon; specifically, the bracelet phenomenon was contradicted by a "snake" phenomenon. Given that the snake phenomenon persisted in a more coherent fashion than the bracelet phenomenon (i.e., no matter what he did, the boy could not convert the snake phenomenon into another type of phenomenon), one then asserts that the snake phenomenon is more real than the bracelet phenomenon. From the coherence perspective, what this means is that the snake phenomenon was more coherent (i.e., more persistent, or less contradictory) than the bracelet phenomenon.

Such a coherence approach to the reality and truth of phenomena is rather similar to the approach advocated by Michael Oakeshott. In perhaps his most famous book, *Experience and its Modes*, Oakeshott (1933) described reality in a manner that is consistent with the idea that reality constitutes an internally related unity. He did not say it this way, however. Rather, as was consistent with both his idealist background and the philosophical context of his time, he described reality in terms of experience and stated, "[…]experience is a single whole, within which modification may be distinguished, but which admits of no final or absolute division" (Oakeshott 1933, p. 27). Also,

> [s]ubject and object are not independent elements or portions of experience; they are aspects of experience which, when separated from one another, degenerate into abstractions. Every experience [...] is the unity of these, a unity which may be analysed into these two sides but which can never be reduced to a mere relation between them. (Oakeshott 1933, p. 60)

To be sure, the manner in which Oakeshott uses the concept of experience makes it difficult for those who have already made correspondence-driven commitments to the meaning of "experience" to follow his arguments. For correspondence theorists, "experience" refers to the subjective side of Descartes dualism. But given that Oakeshott did not define experience in terms of the mental, spiritual, transcendental, or absolute, it seems reasonable to assume that when he described reality as a world of experience, he was using the concept differently than it had been used by Locke, Kant, or Hegel. This is important, for when most contemporary cognitive scientists refer to idealism, they tend to mention Locke and Berkeley (Charles 2011). Locke and Berkeley both accepted the correspondence relation. Locke accepted it without reservation. Berkeley accepted it and then placed it within the assumed larger-scale reality of God's mind in order to avoid skepticism. Oakeshott, on the other hand, denied the correspondence relation (as did most all the German idealist philosophers). Thus, for Oakeshott, the terms "reality" and "experience" were synonymous, not because he believed reality was ultimately subjective, but because he believed reality constituted an internally related unity that defied any ontological, final division into dialectic categories such as subjective and objective, or reality versus experience.

c. Coherence, truth, and modes. Oakeshott proposed his coherence approach to reality and truth because he believed that the correspondence approach was, first, logically incoherent, and second, improperly applied in contexts in which it was not relevant. Specifically, Oakeshott argued that within the confines of the correspondence approach, it was easy to believe that the task of science was to uncover the intrinsic, observer-independent properties of

reality. In addition, given its supposed ability to accumulate a stockpile of context-independent, universal knowledge, it became easy to believe that its criterion for truth (i.e., correspondence) should have dominion over all arenas in which truth was at stake.

Agreeing with his idealist predecessors about the logical incoherence of correspondence thinking, Oakeshott argued that endeavors such as "science" constituted modes of experience. What he meant by "mode" is that science constitutes a distinct means of generating abstractions about the internally related unity in which we are embedded. It is an abstraction in the sense that it is constitutive of reality (i.e., it is "within" the reality it is attempting to describe) and can therefore never be "outside" of reality, looking "at" reality. As a result, it should be conceptualized as a recursion on reality—an abstraction about that from which it emerged and within which it is entailed.

Oakeshott described at least four different modes: science, daily practice (i.e., politics), history, and poetry. What distinguishes these modes, in addition to the content they are about, is the means by which truth is determined within each. In the mode of science, truth is determined by the degree of quantitative coherence that can be achieved in the description of a phenomenon, both individually and collectively. Given that quantitative coherence within and between individuals is paramount, factors such as personal opinion are irrelevant to the truth criteria of the mode of science. In the mode of daily practice (i.e., politics), however, opinion and desire (i.e., how people want to live their lives) constitute the issue at hand. Truth, therefore, could not be measured in terms of the degree of quantitative coherence within and between individuals. Rather, it was reflected in the degree to which members of a group treated each other in accordance with a normatively determined system of expectations. As a result, the truth criteria of the modes of science and politics (i.e., daily practice) were similar in that they were both measured in terms of coherence but were fundamentally different in terms of the phenomena whose coherence was being assessed (i.e., quantification of a phenomenon versus normatively determined expectations).

Because of this qualitative difference in the relata of science and politics, Oakeshott argued that the truth criteria of one could not coherently be used to measure the truth of the other. That is, just as personal opinion and desire were to play no role in the truth status of scientific statements, quantitative coherence in both individual and collective descriptions should not play a role in determining the truth status of political statements (i.e., statements of how people should live their lives).

Oakeshott went to such great lengths to distinguish science as a mode of experience because he felt he needed to provide an alternative to the correspondence approach. By appealing to the notions of *coherence* and *internally related unity* that were common to idealist philosophers, without making appeals to the mental, spiritual, transcendental, or absolute, Oakeshott presented a coherence approach that was capable of addressing the physicalist, naturalist forms of correspondence thinking that were emerging during his time. The difference between Oakeshott's coherence approach and the correspondence-driven naturalism of his time was not that the former did not believe in the reality of objects or that the former was created to maintain a place for God in metaphysics, as had been the case for Berkeley and Kant. Rather, the difference was that the former recognized the logical incoherence of the latter and worked to develop an approach to reality that avoided the logical pitfalls historically encountered by the latter. Given that direct realists such as Holt et al. (1910) and Gibson (1979), who were, to some extent, contemporaries of Oakeshott, had probably developed fairly robust associations between coherence, idealism, and the religious agendas of Berkeley and Kant, they probably had no reason to assume that an idealist-inspired philosophy had anything to offer.

Regardless of who did or did not read Oakeshott's work while he was alive, his lack of appeal to mental, spiritual, transcendental, or absolutist themes, coupled with his persistent attacks on the correspondence approach, collectively support the idea that when he referred to

reality as a world of experience, he was using it more as a placeholder in his arguments with the correspondence approach as a way to slowly transform the reader's meaning of the word experience from the subjective-mental denotation it had acquired in the midst of the correspondence approach to the holist-driven, internally related unity of all phenomena it was meant to imply in the coherence framework.

d. Coherence and science. To correspondence ears, the description of the coherence approach given above might be interpreted as antiscientific. That is, since we take seriously the logical incoherence of the correspondence approach and assert that it does not inform us about context-independent, intrinsic properties of reality, one might assume we are proposing that science does not reveal truth. This is a common reaction of those who implicitly hold a correspondence view. They assume that those who acknowledge the strength of Hume's insight are actually denying the existence of "things." This is simply not the case. As stated above, radical skepticism is a critique of the internal logic of the correspondence approach to reality and truth, not a critique of the existence of "things." Oakeshott's coherence approach constitutes a means of addressing reality and truth in a way that does not beg incoherent correspondence assumptions. In order to further demonstrate the compatibility of science and the coherence approach, we present WST as a case in point. As we present WST we will also point out how various choice points in the theory's construction were guided by the notion of coherence.

3 Wild systems theory

WST is a recently developed theory of cognitive systems (Jordan 2008, 2013; Jordan & Ghin 2006, 2007; Jordan & Heidenreich 2010; Jordan & Vinson 2012) that conceptualizes organisms in a different light than technological metaphors such as switchboards and computers, or dynamical metaphors such as Watt Governors and convection rolls. Rather, WST follows the lead of physicists (Schrödinger 1992), theoretical biologists (Kauffman 1995) and ecologists (Odum 1988), and conceptualizes organisms as multi-scale, self-sustaining energy-transformation systems. What is meant by *self-sustaining* is that the *work* of the system (i.e., the energy exchanges that actually constitute the system, such as the chemical work that constitutes biological systems) gives rise to products (e.g., other chemicals) that serve as a catalyst for the reaction that produces the product or some other reaction in the system. When a self-catalyzing system of work emerges, it is able to *sustain* itself as long as the proper fuel source remains available.

What is meant by *multi-scale* is that an organism can be coherently conceptualized as being constituted of different scales of self-sustaining work. Jordan & Vinson (2012) describe the notion of multi-scale, self-sustaining work in the following manner:

> At the chemical level, self-sustaining work has been referred to as autocatalysis (Kauffman 1995), the idea being that a self-sustaining chemical system is one in which reactions produce either their own catalysts or catalysts for some other reaction in the system. At the biological level, self-sustaining work has been referred to as autopoiesis (Maturana &Varela 1980), again, the idea being that a single cell constitutes a multi-scale system of work in which lower-scale chemical processes give rise to the larger biological whole of the cell which, in turn, provides a context in which the lower-scale work sustains itself and the whole it gives rise to (Jordan & Ghin 2006). Hebb (1949) referred to the self-sustaining nature of neural networks as the 'cell assembly', the idea being that neurons that fire together wire together. Jordan & Heidenreich (2010) recently cast this idea in terms of self-sustaining work by examining data that indicate the generation of action potentials increases nuclear transcription processes in neurons which, in turn, fosters synapse formation. At the behavioural level, Skinner (1976) referred to the self-sustaining nature of behaviour as operant conditioning, the idea being

> that behaviours sustain themselves in one's behavioural repertoire as a function of the consequences they generate. Streeck & Jordan (2009) recently described communication as a dynamical self-sustaining system in which multi-scale events such as postural alignment, gesture, gaze, and speech produce outcomes that sustain an ongoing interaction. And finally, Odum (1988) and Vandervert (1995) used the notion of self-sustaining work to refer to ecologies in general. (p. 235)

3.1 Wild systems theory and coherence

Conceptualizing organisms as being composed of multi-scale, self-sustaining work is consistent with coherentism (Lycan 2012). That is, the notion of self-sustaining work increases the coherence of our conceptualization of organisms (i.e., beliefs about organisms) because it reveals the dynamic homologies that transcend both the phyla and the nesting of multi-scale, energy-transformation systems that constitute a single organism. From plants, to neurons, to behavior, to persons, to human societies, increasingly complex systems of work (i.e., energy transformation) have evolved precisely because the work of which they are constituted is self-sustaining in that the work produces catalysts for either the work itself or some other level of work in the multi-scale system.

When we conceptualize organisms with technical metaphors such as switchboards and computers, we leave out these homologous, multi-scale, energy-transformation dynamics that living systems do not have in common with technological systems. This use of technological metaphors then forces us to generate explanations of the means by which our technologically inspired model of the organism is "connected" to the external context. To be sure, the issue is not unique to science. Descartes ran into the same problem when he divided humans into physical and spiritual substrates, and most scholars who have taken Descartes's correspondence problem seriously have had to do something similar. Locke proposed causal connections between external events and internal impressions and ideas. Kant proposed a priori conceptions of space and time. Indirect realism proposed evolutionarily derived representations, and direct realism proposed evolutionarily derived "relations."

Given its focus on multi-scale, self-sustaining homologies, WST is able to focus on that which is common across the internal and external contexts of an organism; namely, energy transformation. As a result, WST's focus on internal/external homologies renders it consistent with the coherence approach to reality and truth. Specifically, its focus on internal/external homologies prevents WST from internal/external conceptualizations that lead to the connection problems experienced by correspondence-driven approaches. Within contemporary correspondence frameworks (e.g., indirect and direct realism), the external context tends to be conceptualized as physical. Historically, the concept physical has garnered its meaning from its dialectic relationship with concepts such as "mental" and "spiritual." As a result, its usage implicitly intimates a correspondence relation and leaves us having to determine whether or not the internal context is likewise physical, mental, or something altogether different, as well as how it is that the internal context is connected to the external context.

Within WST, the internal and external contexts of an organism are both conceptualized in terms of energy transformation. Specifically, the external context is conceptualized as a self-organizing, energy-transformation hierarchy (Odum 1988; Vandervert 1995), while brains and organisms are conceptualized as multi-scale, self-sustaining energy transformation systems that are able to sustain themselves in the larger-scale energy transformation hierarchy because the work of which they are constituted produces its own catalysts. Inspired by this idea, Jordan & Ghin (2006) proposed that *the fuel source dictates the consumer*. This means that any system that sustains itself on a certain fuel source (e.g., plants on sunlight, herbivores on plants, or carnivores on herbivores) must be constituted such that it is able to address the constraints involved in capturing that fuel source.

Conceptualizing organisms as self-sustaining embodiments of the contextual constraints entailed within an energy-transformation hierarchy renders WST consistent with a coherence approach to reality and truth because an embodiment of context is necessarily "about" that context. By "necessarily" we mean that the system's internal dynamics are phylogenetically and ontogenetically emergent from the energy-transformation hierarchy in which it sustains itself; it is an embodiment of the reality (i.e., context) within which it emerged. In short, it is reality within reality. The idea that organisms constitute embodiments of context is consistent with Friston's (2011) assertion that organisms constitute an embodiment of an optimal model of their environment. Interestingly enough, Friston is led to this assertion for much the same reason WST is led to its notion of organisms as embodied contexts; specifically, because both begin with the idea of the organism as an energy-transformation system. As a result,

> there is no epistemic gap between an organism and its environment. Organisms do not need to be 'informed' by environments in order to be about environments because they are necessarily 'about' the contexts they embody. Rather, what self-sustaining systems need do is sustain relationships with the contexts in which they are embedded in ways that lead them to sustainment. According to WST, meaning is constitutive of embodied context (i.e., bodies). As a result, living systems are necessarily meaningful (Jordan, 2000a), not because a body is alive or dead, because it is physical, or because it is biological. Living is meaning because it is sustained, embodied context. (Jordan & Vinson 2012, p. 9)

Given this lack of an epistemic gap between embodiments of context and the contexts in which they sustain themselves, WST dissolves the subjective-objective epistemic barrier created by the correspondence approach. Embodiments of context are naturally and necessarily "about" their context and, as a result, are inherently meaningful.

Our use of the word *meaningful* is not meant to imply that the evolutionary emergence of living systems simultaneously constituted the emergence of meaning into a reality that had been, up until then, *meaningless*. Rather, our equating the notion of *embodied context* with *meaningfulness* is meant to demonstrate the serious metaphysical consequences that emerge from our earlier description of reality as an internally related unity. If all phenomena are, in the end, contextually dependent, then part of what constitutes them is their relation with the rest of reality. In short, as was stated previously, self-sustaining systems are reality within reality. It is this irreducible, inherent relationality that we are conceptualizing as *meaning*.

Within contemporary philosophy of mind, it might seem as though we are asserting that embodied contexts (i.e., self-sustaining bodies) *instantiate* phenomenal properties. While this assertion is not incorrect, our concern with such an interpretation is the implicit, correspondence-driven assumption that phenomenal properties are subjective while other properties of the system are objective. Our take on this issue is that embodied contexts do not represent the emergence of phenemonology into reality as much as they represent the emergence self-sustaining relationality into reality. And it is this self-sustaining relationality that phylogenetically scales up to the phenomenon we refer to via terms such as consciousness and phenomenology.

Defining meaning in this way allows for meaning (i.e., embodied context) to be constitutive of what organisms are. As a result, phenomena traditionally referred to via concepts such as phenomenology, consciousness, meaning, and value, which tended to be relegated to the subjective/internal side of correspondence frameworks and had to be described as being emergent from, identical with, or fundamentally different from "physical" properties (Chalmers 1996), are considered phylogenetically scaled-up versions of the embodied meaning inherent in all embodied contexts. Jordan & Vinson (2012) describe why it is that self-sustaining embodiments of context entail meaning:

> In a single-cell organism, the internal dynamics (i.e., the micro scale) and the organism as a whole (the macro scale) are coupled in such a way that changes in the micro-scale (e.g., low energy levels) give rise to changes at the macro-scale (e.g., behaviors such as swimming and tumbling) that recursively influence the micro-scale (i.e., give rise to energy intake) and, in the end, foster the sustainment of both levels of scale. In short, the micro-macro coupling is self-sustaining. In the case of a rock, the micro-macro coupling is not recursively self-sustaining. The coupling generates no dynamics that serve to sustain a particular aspect of either the macro or micro organization. (Jordan & Vinson 2012, pp. 11-12)

Jordan & Ghin (2006) refer to the embodied aboutness of a single-cell organism as *proto-consciousness*. They do so for the following reasons: (1) to acknowledge the meaning (i.e., embodied context) inherent in a single-cell (i.e., a small-scale, self-sustaining embodiment of context), and (2) to set the groundwork for an explanation of how the proto-consciousness of a single-cell system could possibly scale up to the full-blown self-awareness entailed in humans. As regards this scaling up, Jordan & Vinson (2012) say the following:

> It was possible for self-sustaining systems to scale-up from the level of single-cell organisms to the level of human beings because their status as energy-transformation systems simultaneously rendered them a potential fuel source for any system that embodied the constraints necessary to sustain itself on such embodied energy. As an example, the emergence of herbivores gave rise to a context that afforded the emergence of carnivores. A significant constraint of being a carnivore, however, was the need to capture a moving fuel source. Doing so required, and still requires, anticipatory structures regarding the future location of the moving target. Jordan and Ghin (2006) assert that the embodiment of anticipatory dynamics in the neuromuscular architecture of organisms capable of propelling themselves as a whole toward anticipated locations constituted the phylogenetic emergence of anticipatory aboutness. That is, the self-sustaining dynamics of one system came to be 'about' the future dynamics of another system. WST equates such anticipatory aboutness with the traditional notion of mind, and proposes that phenomena that have received labels such as memory, thought, phenomenology, and self-awareness constitute evolutionary recursions (i.e., scale-ups) of the anticipatory dynamics embodied in self-sustaining systems. Given that all self-sustaining systems constitute embodiments of context and are, therefore, necessarily 'about' context, their anticipatory dynamics likewise entail 'aboutness.' Thus, as self-sustaining systems evolved and became increasingly abstract (i.e., about increasingly abstract events such as tomorrow, next week, and/or next year), meaning, too, became increasingly abstract. (Jordan & Vinson 2012, p. 12)

WST's conceptualization of meaning as embodied context is consistent with Oakeshott's (1933) coherence approach to reality and truth in that it does not assume that subjects and objects are independent and in need of connection. Rather, subjects (i.e., organisms) are considered embodiments of their context and are, therefore, internally related to their context. The contexts in which they are and have been embedded are constitutive of what they are. Said in a more familiar way, a thoroughgoing (i.e., maximally coherent), ontologically minded explanation of what an organism *is* must include all aspects of the organism as well as the contexts it embodies.

To be sure, WST is not the only approach to propose that (1) organisms constitute embodiments of their contexts, and (2) such systems necessarily entail anticipatory dynamics. As was stated previously, Friston (2011) makes a similar claim when he asserts that (1) organisms constitute optimal models of their environ-

ments, and (2) they utilize anticipatory coding as a means of optimally maintaining homeostasis. (See Andy Clark's, Jakob Hohwy's, and Anil Seth's contributions to this collection for other approaches to cognition that posit a reliance on anticipatory coding.). A potential difference between WST and Friston's position is the degree of metaphysical commitment WST makes to the assertion that reality constitutes an internally related unity. That is, while Friston's view is consistent with the notion of embodied contexts, it is not clear he also agrees with the coherence approach to reality. As a matter of his fact, much of his explanation of how it is that organisms generate and maintain minimum free energy is couched in the epistemic language of external stimuli and internal representations. Though the use of these terms does not, in and of itself, indicate a commitment to direct or indirect realism, it does reveal, at the very least, a minimal, implicit commitment to a correspondence approach to reality and truth.

This comment on Friston's position should not be construed as a critique of his framework, as much as it should be taken to constitute a means by which the unique metaphysical commitments of WST can be thrown into sharp relief. Friston's goal is to provide a maximally coherent account of the causality underlying cognition. The goal of WST is to provide a scientifically informed approach to reality and truth that does not rely on the correspondence relation. The difference in these missions fairly thoroughly accounts for the differences between WST and Friston's free energy approach, and the jury can still be out as to whether or not the free-energy principle constitutes a correspondence approach to reality and truth.

3.2 Wild systems theory and truth

As was stated previously, a coherence approach to reality and truth assesses the degree of truth in experience and beliefs via the degree of coherence entailed in and across both. As was also previously stated, this coherence approach to truth differs from coherentism (Lycan 2012) in that the latter applies the criterion of coherence (i.e., lack of contradiction) to beliefs, while the former applies it to both experience (i.e., moment-to-moment contradictions in experience) and beliefs.

Given this notion of the organism as a self-sustaining prediction, WST is able to apply the coherence criterion to both experience and beliefs because it conceptualizes organisms as embodiments of context and avoids the correspondence relation. As a result, truth is not measured in terms of the degree of correspondence between the subjective and the objective. Rather, it is measured in terms of the degree of non-contradiction entailed within one's moment-to-moment embodied context (i.e., phenomenology) and across the beliefs one derives from the moment-to-moment flows of embodied context. In Friston's (2011) language, the degree of coherence in an embodied context might be taken to refer to the degree of prediction error minimization that has been achieved by the organism's current model of reality. To make this work however, and to avoid the implicit epistemic gap implied by the notion of a "model of reality," the meaning of the word *model* would have to be stretched to such a point that the organism itself constitutes a model of reality. To be sure, Friston intimates as much when he describes organisms as optimal models of their environments. To make this use of the word *model* simultaneously imply that the organism-as-model *constitutes* anticipation, the organism itself would have to be seen as constituting a prediction. While this use of the concept prediction seems strange, it is actually consistent with how Friston uses the term when describing the cheomotaxic behaviors exhibited by *E. coli*:

> …by selective modulation of tumbling frequency, these bacteria show chemotaxis. This is a nice example of an itinerant policy based on the prior expectation (endowed by natural selection) that the organism will only change its motion through state-space when it encounters unexpected (costly) generalized states (here, a decrease in the concentration of attractants). (2011, p. 114)

What is at issue here is the degree of ontological commitment entailed in Friston's assertion that natural selection endows organisms with prior expectations. Is he claiming that organisms are constituted of phylogenetically derived prior expectations, or is he simply presenting prior expectations as a productive way to model organisms? While his assertion that organisms constitute optimal models of their environments seems to favor the former interpretation, his later use of terms such as sensations and representations seems to favor the latter. Whatever the case, if Friston's notion of minimizing prediction error is to be used as a description of what it means for there to be a contradiction in the flow of contingent context, then the concept *prediction* has to be used in a way that does not engender an epistemic gap. In short, the organism has to be conceptualized as a self-sustaining prediction.

In order to better clarify this admittedly abstract means of talking about truth, we offer certain arguments presented in the present paper as a case in point. As was mentioned previously, indirect- and direct-realist approaches to reality and experience rely on evolutionary theory as a means of connecting the subjective and the objective. In our critique of these views, we argued that they validated the correspondence relation by conceptually placing it within the assumed, larger-scale reality of the evolved physical world. WST, however, also makes use of an assumed, larger-scale reality, specifically, the self-organizing, energy-transformation hierarchy (Odum 1988). The difference between the two uses of evolutionary theory lies in what the two approaches are believed to reveal about evolution. To realists, be they direct or indirect realists, evolutionary theory is believed to reveal reality as it is, independent of observers. Within WST, evolutionary theory is definitely seen as being "true," but in the coherence sense that it is the most coherent account of the existence of species yet given.

When describing the "truth" of evolutionary theory in coherence terms, it is important to remember that WST is not radically skeptical about whether or not the phenomena referred to via the realist notion of an *evolved physical world* (e.g., organisms, rocks, and plants) exist. To the contrary, it would be incoherent to deny our belief that such phenomena exist and do so outside of our skin. What is at stake is the issue of *how* something exists beyond our skin. In a correspondence framework, what is important about something existing on the other side of our skin is that it be observer-independent. Given this conceptualization, one has to explain how observer-independent and observer-dependent phenomena are connected. In the coherence framework, the existence of objects beyond the skin, as well as the idea that they exist as such without the presence of an observer, is conceded. However, defining their reality status in terms of their observer-independence is seen as being insufficient, for even though they may exist independently of the presence of an *observer*, such observer-independence in no way implies such objects exist independently of all context. No phenomenon, no matter how universal, exists as it does independently of all other phenomena. In short, all phenomena are context-dependent.

WST's notion of embodied context implies that we should measure the truth status of claims made in cognitive science in terms of their degree of coherence, both within experience and across beliefs. Given that most contemporary cognitive scientists are direct or indirect realists, either explicitly or implicitly, they tend to assume the correspondence relationship (again, either explicitly or implicitly), which, in turn, makes it difficult for them to coherently address the reality of "subjective" phenomena such as phenomenology, meaning, and value. To be sure, by aligning itself with a coherence approach to truth, WST logically denies itself access to objective, intrinsic reality. But given that WST conceptualizes the notion of objective, intrinsic reality as an incoherent assumption derived from the coherence of moment-to-moment experience, WST, simply given its commitment to coherence, could not accept such a notion in the first place.

3.3 Wild systems theory and cognitive science

Given that WST is not designed to reveal intrinsic properties of objective reality, its beliefs about science are inconsistent with the correspondence notion that science is metaphysical.

Let us recall that the slogan "science is metaphysical", which was briefly mentioned at the beginning of the present paper, is just shorthand for the philosophical thesis that the goal of science is to overcome the objective-subjective divide and reveal the "real," observer-independent, intrinsic properties of reality. By asserting that all properties are contextually grounded and cannot therefore be intrinsic, WST posits that science cannot reveal intrinsic properties. As a result, there is no final, thing-as-it-is essence to which any "experience" or "theory" can correspond. As a further result, there can be no correspondence test of reality. Science, therefore, cannot be metaphysical. This lack of belief in the metaphysical nature of science, however, is in no way anti-scientific. On the contrary, it is wholly consistent with Oakeshott's (1933) contention that the practice of science constitutes a mode of experience. That is, if reality is an internally related unity, then theories are constitutive of that reality and can never "point to" reality as if to do so outside of it. They are, by definition, "in it" just as we are. Thus, they are, by definition, incomplete, what Oakeshott referred to as an arrestment of the whole (i.e., a mode of experience). As an example, WST's scientifically inspired conceptualization of organisms as self-sustaining embodiments of context does assume a "larger-scale reality" within which organisms are nested, just as direct and indirect realism do. The different reasons for doing so are important. In WST, a larger-scale reality is assumed because it would be incoherent not to do so. That is, we would be contradicting both our experiences and our beliefs about those experiences if we claimed we did not exist within something larger than ourselves. From the correspondence perspective, a larger-scale reality is assumed, and it is believed to comprise observer-independent, intrinsic properties that science will ultimately reveal.

An immediate implication of coherence- versus correspondence-driven approaches to science is that while the latter conceptualizes science as inherently metaphysical (i.e., it reliably reveals intrinsic, observer-independent properties of objective reality), the former conceptualizes science as a method by which we are able to increase the coherence of our statements about that within which we are embedded (i.e., coherentism; Lycan 2012). Such coherentism is valuable because it affords us more influence over our context; that is, it affords us the ability to more effectively sustain ourselves.

To be sure, the idea that the value of science is pragmatic, as opposed to metaphysical, is not new. Dewey (1929) proposed much the same:

> But the search does not signify a quest for reality in contrast with experience of the unreal and phenomenal. It signifies a search for those relations upon which the occurrence of real qualities and values depends, by means of which we can regulate their occurrence. To call existences as they are directly and qualitatively experienced 'phenomena' is not to assign to them a metaphysical status. It is to indicate that they set the problem of ascertaining the relations of interaction upon which their occurrence depends. (Dewey 1929, pp. 103–104)

Interestingly enough, Dewey espoused his pragmatic approach to science for much the same reason Oakeshott proposed his coherence approach to reality and truth—specifically, because they both believed that the realist, physicalist naturalism of their time was inspired by a logically incoherent correspondence framework that had been historically derived from dualism's assumed split between spiritual and material reality. Dewey states,

> The notion that the findings of science are a disclosure of the inherent properties of the ultimate real, of existence at large, is a survival of the older metaphysics. It is because of injection of an irrelevant philosophy into interpretation of the conclusions of science that the latter are thought to eliminate qualities and values from nature. This created the standing problem of modern philosophy:— the relation of science to the things we prize and love and

> which have authority in the direction of conduct. (1929, p. 102)

As regards cognitive science specifically, WST's coherence approach to the meaning of science provides a way for cognitive scientists to experience their theories and models as pragmatic tools versus metaphysical tests. In addition, WST's reliance on the concept of embodied context provides a means for cognitive scientists to discuss those phenomena traditionally associated with the subjective side of correspondence theorizing (e.g., phenomenology, value, and meaning) without relying on the subjective-objective correspondence relation. This is important, for as was mentioned in the latter half of the preceding quote by Dewey, by conceptualizing the practice of science as a means of overcoming the correspondence relationship, realist philosophers ultimately put the reality of the "subjective" at risk as more and more naturalists came to conceptualize the subjective in terms of inherently meaningless, physical properties (Gardner 2007). As was stated previously, by conceptualizing organisms as self-sustaining embodiments of context, WST renders properties that had been historically associated with the subjective, such as phenomenology, value, and meaning (see Jordan & Vinson 2012, for a thorough review of this issue), constitutive of what organisms are. As a result, cognitive scientists can avoid distracting arguments about such correspondence-driven issues as the grounding problem (i.e., how do concepts and symbols garner their meaning; Harnad 1990), or the relationship between the physical brain and consciousness. These issues are only experienced as important, hard problems within the conceptual confines of correspondence theory and the belief that the answer will be found via cognitive science.

4 Conclusions

To be sure, there were twentieth-century philosophers other than Dewey and Oakeshott whose approach to reality and truth was very consistent with the coherence approach. Heidegger and Marleau-Ponty are two examples. Perhaps these relationships will be fleshed out to a greater extent in future papers. For the present paper, the purpose was to (1) illustrate for the reader that there is another, historically relevant, robust approach to reality and truth other than the correspondence approach, and (2) illustrate that this other approach is completely consistent with science.

Maybe it was the fact that many idealist philosophers used their anti-correspondence frameworks as a means of defending the reality of God that led so many scientifically minded philosophers to avoid it to the point that now, after more than one hundred years of neglect, it is rarely if ever mentioned or utilized in cognitive science. This is precisely why we began this paper with the snake-bracelet story. Coherence approaches have been out of fashion for so long that we felt it necessary for the reader to experience, first hand, the type of thinking that has always fostered questions about reality. Our assumption was that by experiencing the tension between what it means to describe the snake as real and what it means to describe the bracelet as real, the readers would be in a better position to understand that although the coherence approach was ignored during the past century, Oakeshott's presentation of a non-spiritual, non-absolute, non-transcendental coherence framework leaves the coherence and correspondence frameworks on similar, logical ground. Given the advent of concepts such as external grounding, ultra grounding, and *global groundness* in contemporary philosophy of science, it seems the coherence approach to reality and truth is, at the very least, once more being discussed.

Wild Systems Theory is only one possible theory of "what people are" that could emerge from a coherence-driven perspective, and we suspect there will be others. But given WST's description of phenomenology as an evolutionarily, scaled-up form of self-sustaining embodied context, phenomena such as the taste of ice cream are rendered just as "real" as the cream and sugar that constitute the ice cream. We believe this is an important achievement. And when one considers WST's compatibility with science, it seems reasonable to propose WST as a twenty-first-century coherence framework for cognitive science.

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Thickening Descriptions with Views from Pragmatism and Anthropology

A Commentary on J. Scott Jordan & Brian Day

Saskia K. Nagel

How can we as biological systems that are self-organizing and constantly adapting make sense of our surroundings? How can the rich connections between organisms and environment lead to our particular lifeworlds, lifeworlds that allow individual experiences and that are themselves constantly changing in reaction to them? This commentary suggests, extending the framework provided by Scott Jordan and Brian Day, an integration of recent neuroscientific evidence with perspectives from pragmatism, anthropology, and phenomenological thought. Much experimental evidence demonstrates that human beings are systems comprised of a brain as part of a body and an environment, which is constantly regulating and adapting. This evidence resonates with reasoning from pragmatism and anthropology that describe the continuous, dynamic interaction of mind, body, and world. Employing those various perspectives leads to a dense description of human experience and cognition that specifies details and patterns, which considers contextual factors that allow us to enrich human self-understanding, and which aids attempts to answer the questions raised at the beginning of this paper.

Keywords
Anthropology | Circular causalities | Enactivism | Mind-body-world-relationship | Pragmatism | Systems approach

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> *Mind as background is formed out of modifications of the self that have occurred in the process of prior interactions with environment. Its animus is toward further interactions. Since it is formed out of commerce with the world and is set toward that world nothing can be further from the truth than the idea which treats it as something self-contained and self-enclosed.* (Dewey 1934, p. 269)

> *Knowing does not lie in the establishment of a correspondence between the world and its representation, but is rather immanent in the life and consciousness of the knower as it unfolds within the field of practice set up through his or her presence as a being-*

> *in-the-world […]. Like life itself, the unfolding does not begin here or end there, but is continually going on. It is equivalent to the very movement—the processing—of the whole person, indivisibly body and mind, through the lifeworld.* (Ingold 2001, p. 159)

1 Introduction

Philosophers and scientists alike have long been interested in the question of how our being-in-the-world allows us to experience in a plethora of ways and to behave meaningfully. In extending the framework suggested by Scott Jordan and Brian Day, this commentary suggests integrating recent neuroscientific evidence with perspectives from pragmatism, anthropology, and phenomenological thought. The commentary shall be programmatic in the sense that it prepares the way for further argument and discussion by making available new perspectives that invite the reader to look beyond the "classical" argument and thus benefit from various disciplines. The driving questions are: How can we as biological systems that are self-organizing and constantly adapting make sense of our surroundings? How can we grasp our world via perception? How can we skillfully engage with the world? How can the rich connections between organisms and environment lead to our particular lifeworlds; lifeworlds that allow individual experiences and that are themselves constantly changing in reaction to them?

One dominant approach to reality and truth has been the correspondence approach of computational cognitive sciences that assumes that reality can be revealed by science, independently of the personal perspective of an observer. The task of correspondence theories is to understand the relation between observer and observer-independent reality; a task that assumes dichotomies between inner and outer, between objective and subjective. Facing the limits of those approaches, Scott Jordan & Brian Day (this collection) suggest bridging the riff between the inner and the outer by acknowledging that there is in fact no gap between the organism and its environment. If one wants to avoid the dualistic trap that asks how something inside the "mind"—such as thoughts or ideas—can represent the outside world, one challenges the seemingly essential dependence of cognitive science on representations.

Much neuroscientific, psychological, anthropological, and philosophical work, both old and new, suggests that we understand cognition as arising from the actions of embodied agents that engage skillfully in a meaningful world (Beauchamp & Martin 2007; Brooks 1991; Clark 1997; Graziano et al. 1994; Lakoff & Johnson 1999; Noë 2004; O'Regan & Noë 2001; Thompson 2010; Varela et al. 1991; Wilson & Knoblich 2005). This understanding can ultimately help us avoid the correspondence theorists' notorious problem, how the external is connected to the internal. Organisms that are embedded and situated do not need to represent the external environment as they are always already about the contexts in which they live. Moreover, for the situated organism, "the situation is organized from the start in terms of human needs and propensities which give the facts meaning, make the facts what they are, so that there is never a question of storing and sorting through an enormous list of meaningless, isolated data" (Dreyfus 1992, p. 262). Understanding organisms as always already existing in meaningful interaction[1] with their environment and thereby constantly adapting and changing is relevant not just for topics in philosophy of mind but also for epistemology and metaphysics. The metaphysical question of how mind, body, and world are related is tightly linked to epistemological questions about how we can experience the external world. The central tenet is how experience can happen at all, i.e., how the experiencing organism can relate meaningfully to the world.

This commentary furthers the line of thought described by Scott Jordan & Brian Day

1 Due to lack of a better concept, the term "interaction" will be used throughout this article even though it entails clearly separable entities that have previously been independent—an assumption that is contested by the approach suggested here. Moreover, due to limited space, this commentary cannot take into account the aspect of intersubjectivity. The relevance of others with whom interaction takes place is inherent in the concept of mind and its interdependence with the environment (see e.g., De Jaegher & di Paolo 2007).

(this collection) by suggesting further perspectives from neuroscience, pragmatism, and anthropology for approaching cognitive systems as experiencing, bodily systems that are in constant, value-laden interaction with the world; rather than as systems that primarily mirror an external reality from a position separated from the world. Here, I will combine arguments from John Dewey, in particular his work on experience, and anthropologist Timothy Ingold, with recent neuroscientific approaches that support a view that challenges classical correspondence approaches. This will allow a thicker description, i.e., a dense description specifying details and patterns and considering contextual factors, of human experience and cognition.

2 Pragmatism and anthropology meet the neurosciences

In line with much neuroscientific work today, Dewey describes how life is about constantly striving for greater adaptation and for a balance of energies. He beautifully elaborates:

> Life itself consists of phases in which the organism falls out of step with the march of surrounding things and then recovers unison with it—either through effort or by some happy chance. And, in a growing life, the recovery is never mere return to a prior state, for it is enriched by the state of disparity and resistance through which it has successfully passed. If the gap between organism and environment is too wide, the creature dies. If its activity is not enhanced by the temporary alienation, it merely subsists. Life grows when a temporary falling out is a transition to a more extensive balance of the energies of the organism with those of the conditions under which it lives. (Dewey 1934, p. 535).

This view resonates with Wild Systems theory, as suggested by Jordan & Day (this collection), which explains an organism not as a computational input–output system but as an open energy-transforming system that must absorb, transform, and use energy to sustain itself. This does not forestall computation, of course, but it describes the computational process in a different context.

The description of this context can be developed further to challenge correspondence theories: correspondence theories suggest that we understand cognition when we understand how humans represent the external world internally, and when we understand how they process this representation. The focus on a potentially disembodied input–output machine that passively receives information about an observer-independent reality and that has an isolated computational system processing representations cannot tell us how the internal relates to the external—the notorious problem of traditional cognitivism—or how the internal can be enacted in real-world situations that are often vague and constantly changing. As Andy Clark explicates:

> Real embodied intelligence [...] is fundamentally a means of engaging with the world—of using active strategies that leave much of the information out in the world, and cannily using iterated, real-time sequences of body-world interactions to solve problems in a robust and flexible way. The image here is of two coupled complex systems (the agent and the environment) whose joint activity solves the problem. In such cases, it may make little sense to speak of one system's representing the other. (Clark 1997, p. 98)

Cognition and experience arise from ongoing interaction with an unstable, changing environment. The entanglement of the brain, the rest of the body, and its particular environment—which includes other organisms—is essential for experience and reason. This is not the trivial claim that the brain cannot exist without a body; even though the bodily context is often neglected in research studying brain processes.[2]

2 The importance of the body was put forward by Maurice Merleau-Ponty in the *Phenomenology of perception:* "[t]he body", he wrote," is the vehicle of being in the world, and having a body is, for a living creature, to be involved in a definite environment, to identify oneself with certain projects and be" "continually committed to them"' (1962, p. 82), and further: "[o]ur bodily experience of movement is not a particular case of knowledge; it provides us *with a way of access to the world* and the object, with a 'praktognosia', which has to be recognized as original and

The message is that reason, cognition, mind arise from this very entanglement. How the body relates to the environment structures experiences; there is an immediate coupling between perception and action. Cognition is not a transcendent aspect detached from "matter" (the brain and the rest of the body in particular) but is constantly shaped, fostered, and constrained by the environment and the body's peculiarities.

Anthropologist Timothy Ingold consequently questions whether it makes sense:

> to attribute that quality of the operation of a cognitive device [...] which is somehow inside the animal and which, from its privileged site, processes the data of perception and pulls the strings of action. Indeed it makes no more sense to speak of cognition as the functioning of such a device than it does to speak of locomotion as the product of an internal motor mechanism analogous to the engine of a car. Like locomotion, cognition is the accomplishment of the whole animal, it is not accomplished by a mechanism interior to the animal and for which it serves as a vehicle. (Ingold 1993, p. 431)

It is thus the interaction of the different systems that is the most fascinating research topic in cognitive science—a topic that requires a holistic approach. Such reasoning that considers circular causalities can be traced back to earlier thinkers such as Bateson 1973, Kelso 1995, Maturana & Varela 1980, Thompson 2010, Varela 1996 or von Uexküll 1940. This idea of circular causality as a property of living, self-organizing systems refers to the connection of perception and movement that underlies the ongoing co-constitution of organism and environment. There is continuous top-down-bottom-up interaction that captures the interrelations between several levels in a hierarchy. The general underlying idea is that individual small-scale parts enable the existence of order parameters that in turn determine the behavior of the individual parts. Thomas Fuchs (2012) refers to physicist Hermann Haken's 2004's work on synergetics, the science of self-organization, to further illustrate the mutually-constraining relation between the microscopic and macroscopic elements of a complex system. Dynamic system modeling in various fields relies on multi-level causal processes in which higher-order processes are mutually entrained with lower-order processes, without one taking precedence over the other (Engel et al. 2001; Freeman 1995; Lewis 2005; Thelen & Smith 1994).

While a purely cognitivist approach that fosters "The Myth of the Inner; The Myth of the Hidden; and The Myth of the Single" (Torrance 2009, p. 112) is still fairly mainstream, in recent years we have seen a growing interest on the part of cognitive scientists and neuroscientists in particular in the relevance of the complex interplay of brain, body, and world. Today, this interplay is finally considered in the empirical study of cognition, which resonates in the growing body of work in cognitive science.[3] The importance of embodiment is widely appreciated in cognitive science today. There is a large body of evidence from the neurosciences on how an ongoing organism–environment interaction is essential for cognition (Beauchamp & Martin 2007; Brooks 1991; Chiel & Beer 1997; Engel et al. 2001, 2013). While we still see attempts to describe what has been termed the "'filing cabinet' view of mind: the image of the mind as a storehouse of passive language-like symbols waiting to be retrieved and manipulated by a kind of neural central processing unit" (Clark 1997, p. 67)—there is growing consensus that cognition can best be studied and understood in dynamic, interactionist terms, as bound to bodily organisms that are confronted with particular problems in specific environments.

perhaps as primary. My body has its world, without having to make use of 'symbolic' or 'objectifying function'" (1962, p. 140–141; emphasis mine). This has been elaborated and enriched in the last years with views on recent empirical work by Shaun Gallagher (2005), who offers an account of the body that emphasizes the role of embodied action in perception and cognition.

3 Curiously, there is little direct reference to the pragmatists and in particular to John Dewey's work. Notable exceptions are Mark Johnson (e.g., 2007) and Jay Schulkin (2009), who offer nuanced and explicit pragmatist views on neuroscientific research. Philip Kitcher (2012) offers a wide and detailed demonstration of the importance of pragmatism for philosophy.

Dewey once again can serve as an inspiring reference point:

> To see the organism in nature, the nervous system in the organism, the brain in the nervous system, the cortex in the brain is the answer to the problems which haunt philosophy. And when thus seen they will be seen to be in, not as marbles are in a box but as events are in a history, in a moving, growing never finished process. (Dewey 1991, p. 224)

With this focus on the context and the ongoing interaction of the organism and its surroundings, one can avoid assumptions of ontological separations. Going one step further and elaborating on the moral dimensions that Dewey expresses, neo-pragmatist Robert Brandom, in his account of intentionality, explicates the very idea of pragmatism in a way that links it to the enactivist approach to cognition: "[a] founding idea of pragmatism is that the most fundamental kind of intentionality (in the sense of directedness towards objects) is the practical involvement with objects exhibited by a sentient creature dealing skillfully with its world" (Brandom 2008, p. 178). This skillful engagement with the world is crucial for challenging prevailing paradigms surrounding correspondence theories.

The respective holistic approach envisioned by Dewey that he powerfully elaborates with his conception of *continuity* (Dewey 1934), and which is furthered by some neo-pragmatists, is reinforced by research in the neurosciences that questions the understanding of cognition as a centralized mirroring process that uses perceptual input to generate the appropriate behavioral output. Brains are studied and described as embodied, situated, and embedded.[4]

3 Challenging the "myth of the inner" from within the Neurosciences

In the following, approaches in the empirical sciences that seek to consider the dynamic, interactionist nature of cognition will be introduced in order to enrich the view of the complexities of adaptive behaviour in self-organizing systems.

Computational cognitive neuroscientist Olaf Sporns provides a state-of-the-art synthesis of the sciences of complex networks in the brain and suggests a view beyond neurocentrism. He introduces his work as follows:

> To understand these systems, we require not only knowledge of elementary systems components but also knowledge of the ways in which these components interact and the emergent properties of their interactions [...]. We cannot fully understand brain function unless we approach the brain on multiple scales, by identifying the networks that bind cells into coherent populations, organize cell groups into functional brain regions, integrate regions into systems, and link brain and body in a complete organism. (Sporns 2011, pp. 1–3)

While he does not (yet) consider the further complexities that come into play when one includes the environment of the organism, his description can be seen as a relevant, though timid first step away from a purely neurocentric view. The next step will be to recognize the relevance of environmentally attuned actions, i.e. to investigate how actions can be understood, rather than as isolated from the environment, as being in constant dynamic relation with it, adapting to requirements from the environment and in turn shaping it.

There is no doubt that the developmental perspective is crucial for understanding the dynamic interplay between social and biological processes and thus the role of the environment for experiences in developing cognition. From

4 For reasons of space, I cannot discuss the rich debate around the concepts of embodiment, embeddedness, and enactivism let alone their relation to the extended mind hypothesis (for parts of the discussion see: Adams & Aizawa 2008; Clark 1997, 2001; Clark & Chalmers 1998; Rupert 2009; Shapiro 2011; Sprevak 2009; Thompson 2010; Varela et al. 1991; Ward & Stapleton 2012; Wheeler 2011). These approaches vastly differ regarding their views on representations and their general approach to cognition and action. However, each of them can offer a way of moving beyond the traditional mind-body dichotomy. Specifically, enactivism focuses on the precise coupling of brain, body, and environment and might therefore be particularly promising for action-oriented approaches.

early childhood onwards, the brain is shaped by constant interaction with the world. Experiences impact on brain structure and function, as demonstrated by abundant evidence on the brain's plasticity (for classical studies, see: Buonomano & Merzenich 1998, Pascual-Leone et al. 2005). Susan Oyama, in her account of developmental systems theory, argues that the mind–world dichotomy inherent in descriptions that follow dualistic accounts claiming strong gaps between the biological realm and sociocultural realm cannot do justice to evolving systems. Oyama invites us to focus on change, rather than constancy. She points to the conglomerate of heterogeneous influences that allows development. A developmental system is "a heterogeneous and causally complex mix of interacting entities and influences that produces the life cycle of an organism" (Oyama 2000, p. 1). This multi-scale, interaction-driven dynamics requires an approach that does justice to context-dependency, since it is a particular context that leads to the emergence of a specific phenotype. Neglecting the context would thus necessarily lead to a failure to understand the developmental system.

Complementary to this view, Tim Ingold describes how the specificities of an environment and an organism's history with it matter for its very existence:

> What goes for the relations between internal parts of the whole organism also goes for the relations between the organism and its environment. Organic forms come into being and are maintained because of a perpetual interchange with their environments not in spite of it [...]. But since an 'environment' can only be recognized in relation to an organism whose environment it is—since, in other words, it is the figure that constitutes the ground—the process of formation of the organism is the process of formation of its environment [...]. Moreover, the interface between them is not one of external contact between separate and mutually exclusive domains, for enfolded within the organism itself is the entire history of its environmental conditions. (Ingold 1990, p. 216).

Consequently, rather than speaking of distinct organisms, Ingold suggests that we would be better served by speaking of the "whole-organism-in-its-environment" (Ingold 2001). In a similar way, Richard Menary suggests cognitive integration as a dynamical account of how the bodily processes of an organism in its environment lead to cognition (Menary 2007), and elaborates how manipulation of the organism's specific environment, development in that environment, and the resulting transformation of cognitive capacities in this cognitive niche matter for actual cognitive processes and our explanatory models thereof (Menary 2010).

In line with such descriptions, Andreas Engel et al. (2013) recently noted what they saw as a "pragmatic turn" in cognitive science, a turn that leaves aside frameworks focusing on computation over mental representation to instead study cognition as being essentially action-oriented. Building on reasoning from Clark (1997) and Varela et al. (1991), Engel and colleagues focus on the relevance of action for cognition. They discuss evidence of perception as not being neutral with respect to action but rather as part of sensorimotor couplings that are always specific for the organism, given its previous learning, experiences, and expectations. This focus implies embodiment and situatedness just as the context-sensitivity of processing. The "pragmatic turn" is based on much experimental evidence from studies on sensorimotor integration and neuronal plasticity that highlight how cognition is, in a fundamental way, grounded in action.

Taken together with many more research lines in the experimental field, these approaches can further our understanding of the essential value of what beforehand was seen to be "merely" subjective, and not necessarily real. Experience and skillful engagement with the world have a relevant, even an essential role for cognition. This insight opens the way for a more encompassing view of human experience and thus enriches Jordan and Day's account with phenomenological, anthropological, and pragmatist perspectives.

4 Why a systems approach matters

While Wild System Theory primarily seems to offer new possibilities for how to study human experiences and engagement with the world, it actually does more: it helps to develop a "theory 'of what people are'" (Jordan & Day this collection, p. 20) by shifting our understanding of the relationships between brain, mind, body, and world. These possibilities challenge dichotomies that have for a long time dominated classical philosophical views of what human beings are and how they reason and experience. John Dewey argued against a series of dichotomies that were abundant in philosophy, such as those of mind versus body, fact versus value, internal versus external, and experience versus nature by explicating the role of continuities, e.g., between mind and body, and the importance of action for experience. A better understanding of circular causalities is necessary in order for us to be able to see humans as continually changing bodily organisms that incorporate their histories of past interactions with their environments, successful adaptations, and learning processes—each shaped their particular way of being in the world.[5] Such a systems perspective does not seek to understand the brain in isolation, but a person in his or her idiosyncratic context.

Crucially, the approaches fostered already by John Dewey, which have today been rediscovered by philosophers and neuroscientists alike, are in fine accordance with phenomenological descriptions of what it is like to experience. How those perspectives converge into a science of mind is still to be elaborated and might receive inspiration from neurophenomenology, with its call to take seriously introspective phenomenological reports (Lutz & Thompson 2003; Varela 1996). In particular, it can be worthwhile to take this view to psychiatry, as a clinical field deeply dependent on a sensitive understanding of the relation between mind, brain, the rest of the body, and the environment. In psychiatry it becomes particularly evident that dealing with persons is not the same as dealing with brains. For example, explaining depression as a mere chemical imbalance based on a lack of serotonine (a popular statement that does not by any means hold universally, even if one follows a strong reductionist account) does not do justice to the complex causal relationships leading to the pathology. Thomas Fuchs compellingly suggests giving up the classic physical–mental dichotomy that is present in biomedical reductionism, to develop a proper understanding of the circular causality between an organism and its environment (Fuchs 2009, 2011). Fuchs explains how an ecological concept of mental illness does justice to findings about how disorders are a product of the complex interaction of subjective, neuronal, social, and environmental influences. This does not only matter for our understanding of mental illnesses, but also importantly impacts on how we approach treatments at various levels. The essential relevance of recognizing circular causalities in the brain–body–world interaction can also be seen in neurological treatment and in the psychological reactions of patients to treatments. Beliefs about the relationship between brain and mind and how they relate to one's personality and psychological well-being might influence reactions to neurological or neurosurgical interventions. In particular, for treatment with deep brain stimulation it has been argued that a framework that is neither dualistic nor brain-centric, but which offers a perspective that recognizes the manifold interaction between mind, body, and world can have beneficial effects on patients and their surrounding (Mecacci & Haselager 2014; Keyser & Nagel 2014). Thus, the quality of therapeutic approaches might benefit from examining more holistic approaches to psychiatric disorders and therapies. Ultimately, these theoretical considerations can be crucially relevant for life in all its facets.

5 Outlook

Abundant experimental evidence demonstrates that human beings are systems comprised of the

5 *The implied essentialisation of biology as a constant of human being, and of culture as its variable and interactive compliment, is not just clumsily imprecise. It is the single major stumbling block that up to now has prevented us from moving towards an understanding of our human selves, and of our place in the living world, that does not endlessly recycle the polarities, paradoxes and prejudices of western thought* (Ingold 2004, p. 217).

brain as part of a body and the environment in a constant regulatory, adaptive process. Consequently, we suggest a systems view that considers such complex feedback loops in terms of circular causality (Crafa & Nagel forthcoming). As there are manifold fluctuating organismic levels that create feedback loops for continuous adaptation, studying those feedback loops will in all likelihood improve our understanding of how our experience is action-oriented and based on skillful engagement with the world. Notably, this approach does not in itself forestall by definition the assumption of representations (see e.g., Dennett 2000). I suggest that a computational view of cognition might not be opposed to the dynamic, embodied view. It is likely that we need both approaches in order to understand how self-organizing dynamic systems constantly adapting to their environment are able to reason, solve abstract problems, use language, etc (c.f., for another synthesizing suggestion, Grush 2004). Computational explanations of how the body and the environment interact can be useful tools here, possibly benefiting from ideas such as predictive coding or deep learning in Artificial Intelligence.[6] Such a step includes blurring the boundaries between cognitive and sensory-motor processes. So-called low-level and high-level processes cannot be understood independently, since they constantly interact and influence one another. While symbolic abstraction is necessary for reasoning, problem solving, or language, those are strongly coupled to lower-level processes, such as perception, object manipulation, or movement. Much conceptual and empirical work must be undertaken, for which a mixed methods approach considering multiple dimensions seems to be necessary and most promising. Such an approach —or better, combination of approaches—can help to integrate multiple levels of analysis. It might combine neurobiological concepts (and these on different levels as well, reaching from molecular studies up to studying systems and interacting systems) with psychological, anthropological, and philosophical studies. For the laboratory, a systems approach would ask for frameworks that allow us to study 'active' subjects using a variety of methods. Mobile technologies for physiological measurements are an important step towards this goal, as are set-ups that combine different physiological measurements. This is an ambitious task, which demands technological and computational innovation and effort. And, not least, studying mental capacities can be massively enriched by combining phenomenological accounts of experience with cognitive science approaches as suggested from the field of neurophenomenology (Varela 1996).

It is likely that a more holistic view on human cognition and experience will help us focus on topics that truly matter to people and that do justice to their experience. One practical consequence of a different understanding of the relationship between mind, body, and world is its potential effect on human self-understanding, which in turn can have significant psychological effects (e.g., Vohs & Schooler 2008). As Gregory Bateson frames it: "[t]he living man is thus bound within a net of epistemological and ontological premises which—regardless of ultimate truth or falsity—become partially self-validating for him" (Bateson 1973, p. 314). Thus, theoretical considerations in the field of philosophy of mind, together with the pragmatists' understanding of experience and neuroscientific findings on the relevance of the interdependence of the brain, the rest of the body, and the environment shall lead to thicker descriptions of the multifaceted human condition.

6 Predictive coding is a framework for understanding the reduction of redundancy and efficient coding in the nervous system. It is suggested that highly redundant natural signals are processed by removing the predictable components of the input, thereby transmitting only what is not predictable. Hierarchical predictive coding can explain response selectivities in networks (Clark 2001; Hohwy et al. 2008, Friston et al. 2010; Friston & Stephan 2007; Rao & Ballard 1999). Inspired by neural network processing, deep learning methods in machine learning aim to produce learning of features at multiple levels of abstraction, thus allowing learning of complex functions (e.g., Arel et al. 2010; Bengio 2009; Hinton et al. 2006).

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After Naturalism: Wild Systems Theory and the Turn To Holism

A Reply to Saskia K. Nagel

J. Scott Jordan & Brian Day

We agree with Dr. Nagel's assertion that explanations within cognitive science can be *thickened* by an infusion of pragmatism and anthropology. We further propose that because of its direct challenge of the correspondence thinking that tends to underlie contemporary indirect- and direct realism, Wild Systems Theory provides a *coherence* framework that conceptualizes reality as inherently context dependent and, therefore, inherently *meaning-full*. As a result, pragmatists can appeal to the reality of lived experience, anthropologists can appeal to the meaningful, multi-scale influences that shape an individual, and both can do so without having to justify the reality status of meaning in relation to the meaning-less view of reality we have been led to via the indirect- and direct-realism inherent in contemporary naturalism.

Keywords
Coherence theory of truth | Correspondence theory of truth | Direct realism | Embodiment | Epistemic gap | Indirect realism | Intrinsic properties | Modes of experience | Multi-scale self-sustaining systems | Reality | Wild systems theory

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"We are caught up in an inescapable network of mutuality..."
Dr. Martin Luther King, Jr., 1964

1 Introduction

In her commentary on our paper, Dr. Saskia Nagel calls for a thickening of the descriptions we give in cognitive science. By *thickening* she means, ...a dense description specifying details and patterns and considering contextual factors, of human experience and cognition. (Nagel this collection, p. 3). Dr. Nagel further asserts that one way to achieve such a thickening is to infuse cognitive science with the views of pragmatism (i.e., John Dewey) and anthropology (i.e., Timothy Ingold). We couldn't agree more, and we applaud Dr. Nagel's appeal to Dewey and

Ingold as a means of allowing multi-scale contextual factors to play a much larger role in our accounts of cognition and consciousness.

Given our agreement on the important contributions that pragmatism and anthropology can make to cognitive science, we also feel the need to express our belief that WST (Wild Systems Theory) and its conceptualization of organisms as *self-sustaining embodiments of context* (versus physical-mental, or mind-body systems) actually creates a conceptual framework within which the views of Dewey and Ingold can move beyond the conceptual constraints of contemporary pragmatism and anthropology.

2 Pragmatism and Wild Systems Theory

In a recent paper regarding WST, Jordan & Vinson (2012) propose that Dewey's brand of pragmatism represented a rather unique combination of an idealist approach to metaphysics and an epistemic (i.e., pragmatic) approach to science. Specifically, Dewey's early training as an idealist philosopher led him to reject the objective-subjective, correspondence-driven approach to reality and truth that was prominent in the *indirect-* and *direct-realist* versions of naturalism that were emerging during his time. Instead, Dewey believed, as did his idealist, *coherentist* mentors, that meaning and value were *constitutive* of reality. In addition, given his *coherence-* (versus *correspondence-*) driven metaphysics, Dewey believed that science was a practice that afforded us the opportunity to reveal patterns of contingency within the contexts in which we are embedded. He repeatedly emphasized this epistemic, pragmatic approach to science as a way to challenge the more ontologically minded, metaphysical approach to science that was being espoused by indirect- and direct-realist forms of naturalism:

> The search for 'efficient causes' instead of for final causes, for extrinsic relations instead of intrinsic forms, constitutes the aim of science. But the search does not signify a quest for reality in contrast with experience of the unreal and phenomenal. It signifies a search for those relations upon which the *occurrence* of real qualities and values depends, by means of which we can regulate their occurrence. To call existences as they are directly and qualitatively experienced 'phenomena' is not to assign to them a metaphysical status. It is to indicate that they set the problem of ascertaining the relations of interaction upon which their occurrence depends. (Dewey 1929, pp. 103-104)

Despite Dewey's concerns, his unique combination of idealist ontology and scientific pragmatism eventually gave way to what Gardner (2007) refers to as the *Hard Naturalism* of our time, in which meaning and value are seen as completely unnecessary in a scientific, causal description of reality:

> By the time we get to Freud … let alone Quine, naturalism is conceived as resting exclusively on theoretical reason and as immune to non-theoretical attack—it is assumed that nothing could be shown regarding the axiological implications of naturalism that would give us reason to reconsider our commitment to it: we have ceased to think that naturalism is essential for the realization of our interest in value, and do not believe that it would be an option for us to reject naturalism even if it were to prove thoroughly inimical to our value-interests. (p. 24)

Within the contemporary context of Hard Naturalism, pragmatic philosophers such as Richard Shusterman (2008) tend to downplay and even eschew ontology. Specifically, Shusterman asserts that 20th century ontological approaches to the mind and body that were espoused by the likes of William James and Merleau-Ponty actually led us to devalue bodily sensations in the name of developing our rational capacities.

> Merleau-Ponty's commitment to a fixed, universal phenomenological ontology based on primordial perception thus provides further reason for dismissing the value of

> explicit somatic consciousness. Being more concerned with individual differences and contingencies, with future-looking change and reconstruction, with pluralities of practice that can be used by individuals and groups for improving on primary experience, pragmatism is more receptive to reflective somatic consciousness and its disciplinary uses for philosophy. (Shusterman 2008, p. 66)

Clearly, there are important continuities between the pragmatic philosophies of Dewey and Shusterman (Jordan 2010). Specifically, Shusterman's focus on *practice* overlaps with Dewey's conceptualization of science as a practice as opposed to a tool for metaphysics. In addition, Shusterman's emphasis on *primary experience* is consistent with Dewey's idealist commitment to the reality of experience. The major difference between the two seems to be Shusterman's lack of interest in, or perhaps outright disdain for metaphysics.

One possible reason for Shusterman's (2008) lack of interest in metaphysics may be our contemporary commitment to Hard Naturalism. As was stated in the quotation by Gardner (2007), Hard Naturalism seems so implicitly accepted these days, it seems difficult, if even possible, to propose a metaphysics in which value, meaning, and experience are constitutive of reality. Because of its commitment to the reality of experience however, as well as its clear questioning of the indirect- and direct-realism that lie at the core of Hard Naturalism, WST seems perfectly situated to take-up Dewey's anti-correspondence arguments and place them within a 21st century coherentist framework. Instead of remaining within the centuries-old conceptual framework of *mind* and *body* however, as Dewey did, WST takes the philosophical risk of creating a new concept: specifically, *embodied context*. We say *philosophical risk* because the notion of embodied context conceptualizes meaning in the exact opposite fashion as Hard Naturalism. Specifically, it renders meaning ubiquitous throughout reality. Given the century of philosophical work that has ultimately led to the Hard Naturalist belief that reality is inherently meaningless, we suspect some might see it as simply silly or heretical to assert that reality is inherently meaningful, through and through. This is why we consider the concept of *embodied context* risky. Regardless of the risks however, we see WST as a means of getting meaning back into reality. It does so by following the lead of the idealists, particularly Oakeshott (1933), who did not appeal to the a priori, the transcendental, or the absolute, and refused to describe reality in terms of the observer-independent intrinsic properties that ultimately make it difficult, if not logically impossible, for meaning to be constitutive of reality. Within WST's coherentist perspective, Dewey's pragmatism is restored as a 21st century framework, and pragmatism, in general, can commit itself to the reality of lived experience in an ontological fashion that does not require justification in relation to Hard Naturalism.

To be sure, there have been those scholars who have attempted to introduce meaning back into Hard Naturalism by referring to it via terms such as *emergent* and *irreducible*. Gardner (2007) however, refers to such attempts as *Soft Naturalism* and states the following:

> If, then, it is demonstrated successfully by the soft naturalist that such-and-such a phenomenon is not reducible to the natural facts austerely conceived, this conclusion is not an end of enquiry, but rather a reaffirmation of an explanandum, i.e., a restatement that the phenomenon stands in need of metaphysical explanation. Irreducibility arguments, if successful, yield data that do not interpret or explain themselves, but call for interpretation: the soft naturalist needs to say something on the subject of why there should be, in general, phenomena that have substantial reality, but do not owe it to the hard natural facts. (p. 30)

WST avoids collapsing into Soft Naturalism because it directly challenges the Hard Naturalist assumption of intrinsic, context-independent properties. It does so by asserting that all properties are necessarily context-dependent and

thus, inherently meaning-full. In short, meaning is constitutive of reality.

3 Anthropology and Wild Systems Theory

In addition to providing a contemporary framework for pragmatism, WST also provides a straightforward means of integrating cognitive science and anthropology. For example, in her comment on our paper Dr. Nagel points to the work of Timothy Ingold as a contemporary example of an anthropologist whose work can *thicken* our understanding of cognition and experience.

> Knowing does not lie in the establishment of a correspondence between the world and its representation, but is rather immanent in the life and consciousness of the knower as it unfolds within the field of practice set up through his or her presence as a being-in-the-world. (2011, p. 159)

While WST couldn't agree more with Ingold's (2011) critique of correspondence approaches to the nature of knowledge, WST's conceptualization of living systems as multi-scale, self-sustaining embodiments of the phylogenetic, cultural, social, and ontogenetic contexts within which they emerged and within which they sustain themselves provides a straight forward explanation of why *knowing* is, "...immanent in the life and consciousness of the knower..." (Ingold 2011, p. 159). Specifically, knowing is immanent in *being-in-the-world* because organisms, as embodiments of context, *are* knowledge (Jordan 2000). In short, they are *world in world*. Thus, as implied by Ingold, to *be* is to *mean*.

A potential advantage of WST's approach to this issue is that it directly addresses the Hard Naturalism that underlies the correspondence-driven thinking Ingold (2011) critiques. That is, by problematizing the realist assumption of context-independent, intrinsic properties, WST asserts it is logically impossible for meaningless *things* to exist. That is, it is logically impossible to *be* and *not mean*. By engaging in this ontological spadework, WST does not suffer the risk of collapsing into Soft Naturalism, as does Ingold's position, or any position for that matter, that attempts to establish the reality of experience without addressing Hard Naturalism's assertion that meaning is not constitutive of reality.

In addition to addressing Ingold's (2011) *being-in-the-world* approach to meaning, WST also addresses Dr. Nagel's assertion that anthropology can *thicken* cognitive science by leading us to consider the continuous, un-ending influence that multiple scales of context (e.g., phylogenetic, cultural, social, and ontogenetic) have on the nature of bodies and meaning. She develops this point by referring to Susan Oyama's (1985) assertion that in addition to inheriting genes, infants also inherent a heterogeneous collection of multi-scale contexts, including other persons, that continuously shape, and are shaped by, the developing individual. Oyama refers to this collection of contexts as a *developmental system*. While describing Oyama's work, Dr. Nagel states:

> This multi-scale, interaction-driven dynamics requires an approach that does justice to context-dependency, since it is a particular context that leads to the emergence of a specific phenotype. Neglecting the context would thus necessarily lead to a failure to understand the developmental system. (this collection, p. 6)

Again, we couldn't agree more with Drs. Nagel and Oyama. What WST potentially adds to the notion of a developmental system is the idea that self-sustaining systems constitute embodiments of their developmental contexts. The advantage here is the same advantage we encountered when addressing WST's relationship to Ingold's (2011) *being-in-the-world* approach to meaning. By providing a coherentist ontology that renders reality inherently meaningful, WST constitutes a meaningful alternative to Hard Naturalism's correspondence-driven assertion that reality is inherently meaningless. As a result, WST allows one to utilize Oyama's (1985) notion of *developmental contexts* in a way that prevents one from having to explain how it is that developmental contexts

render an inherently meaningless reality meaningful. Specifically, developmental contexts don't have to render meaningless reality meaningful because, according to WST, all phenomena are context dependent and, therefore, inherently meaningful.

4 Conclusions

In the end, we agree with Dr. Nagel's assertion that pragmatism and anthropology provide a means of *thickening* our descriptions of bodies and meaning. We further propose that WST helps achieve such a *thickening* because it asserts that bodies (i.e., embodied contexts) *are* meaning. From this perspective, anthropology and cognitive science both involve the study of meaning, and differ only in that they focus their descriptions on different levels of nested context, or, to say it another way, different levels of nested meaning.

In addition to providing a means of integrating cognitive science and anthropology, WST's focus on a coherence approach to truth, as opposed to a correspondence approach to truth, puts it in a position to provide an integrative framework for scholarship in general (Jordan & Vandervert 1999; Jordan & Vinson 2012). In short, all disciplines study some scale of reality, and any scale being measured, because of its inescapable context dependence, is inherently meaningful. This observation leads to yet another point at which we are in agreement with Dr. Nagel. Specifically, we very much appreciate her assertion that WST helps to develop a different approach to *what people are*. By modeling all of reality as context-dependent, and self-sustaining systems as embodiments of context, WST conceptualizes each and every one of us as *world in world* instead of as meaningless physical systems. As a result, we are all inescapably meaningful and efficacious. Everything we do alters the contexts within which we sustain ourselves. Everything we do matters.

Given WST's ability to provide a means of bypassing the meaningless view of reality we have been led to via Hard Naturalism, it is not clear to what extent philosophy is so much experiencing a *pragmatic* turn (Engel et al. 2013) as it is experiencing a *holist* turn (Jordan 2013). If it proves to be the latter, sustaining such a turn will be difficult, for it will force us to experience our scientific concepts (e.g., physical, chemical, biological) as epistemic tools we must necessarily utilize if we are to get on with the cooperative, social practice of science. As was stated by Oakeshott (1933) however, science as a mode of experience is inherently an abstraction, an arrestment from the whole. This means that while the practice of science necessitates that we generate conceptual abstractions regarding that within which we are nested, we must always remember that our abstractions can never satisfy a correspondence-driven definition of truth. In short, while me must necessarily represent, we must simultaneously commit to uncertainty. Perhaps it was the potential pathos of this conundrum that W. G. Sebald was referring to in his poem After Nature*:*

> For it is hard to discover
> the winged vertebrates of prehistory
> embedded in tablets of slate.
> But if I see before me
> the nervature of past life
> in one image, I always think
> that this has something to do
> with truth. Our brains, after all,
> are always at work on some quivers
> of self-organization, however faint,
> and it is from this that an order
> arises, in places beautiful
> and comforting, though more cruel, too,
> than the previous state of ignorance
> (2003, p. 2)

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