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Interactivism: A manifesto

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ABSTRACT

The interactivist model has grown over the last several decades from a narrower initial beginning into an evolving systematic theory and underlying philosophy. It has been induced to do so because the underlying assumptions that framed the beginnings of the model were fundamentally different from those that are dominant throughout psychology, cognitive science, and philosophy. Consequently, the model faced multiple instances of attempting to integrate with literature in neighboring fields, discovering that such integration was not possible because the basic assumptions were not compatible, and having to either give up on the model thus far constructed, or else extend it in a way consistent with those assumptions into those neighboring (and foundational) domains. This manifesto outlines the resultant interactivist framework, presents some of the arguments for its underlying assumptions, and argues that these avoid problems that are fatal for many standard approaches in the literature.

Interactivism is a complex philosophical and theoretical system; its primary focus is on the mind and person, but it also extends beyond those domains. The assumptions underlying and framing this system differ strongly from those that dominate contemporary studies of the mind and person – across philosophy, psychology, cognitive science, neuroscience, and other related disciplines. The point of a manifesto is to outline and argue for such a framework of assumptions. If they are correct, as I and others contend, then much past and present work in these areas is fundamentally misguided. Conversely, what is required is not just a new, better model or theory, but a basic shift in those deeper assumptions. That is what I wish to urge upon the reader.

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Interactivism, however, did not begin with such broad scope, nor did it begin with the aim of overturning such broadly presupposed assumptions. Instead, it has grown through a process of coherence- and consistency-seeking in relationship to the assumptions with which it began. So much of the study of minds and persons is dominated by assumptions that are inconsistent with those that I began with that the choice I kept encountering was either to give up what I had developed, or to diagnose, critique, and replace the existing work that contradicted it. The choice was forced. Models of narrower processes must ultimately interface and integrate with related phenomena. But when the models of those related phenomena that were available in the literature could not be integrated with the model that I had already developed (because of those inconsistent underlying assumptions), then the value of integrating the explanations had to count as an argument against one or the other of the offending theories.

Because I am persuaded that the assumptions framing the interactive model are correct, and I have only become more so over the past several decades, my choice has been to continue extending the model to new phenomena in ways that are consistent with those assumptions.

1. So, what is interactivism?

The interactive model has a number of levels, ranging from the metaphysical to particular theoretical models for particular phenomena. At the broadest level, interactivism involves a commitment to a strict *naturalism*.

By naturalism I mean (roughly) a regulative assumption that reality is integrated. From a naturalistic standpoint, there are no isolable and independent grounds of reality, as would be the case if the world were made of Cartesian thinking substance and extended substance. There is no ultimate barrier to further questioning and potential understanding, as would be the case if the world were ultimately made of Empedoclean earth, air, fire, and water. If earth, air, fire, and water were the ultimate constituents of everything, it would make no sense to ask “Where does earth come from?” or “Why is water stable?” Rather, such basic substances would mark the limits of understanding.

The grounds for naturalism are at least twofold. First, the history of science as it has so far unfolded has turned up no permanent barriers to further understanding: we now have naturalistic explanations of fire, heat, life, magnetism, and so on. Second, assuming any such barriers at this point would be without warrant, and it would put a pointless obstruction in the path of further investigation.

Closely related to this naturalism is a type of process metaphysics: what the world basically is is organizations of process. Again, there are several grounds for adopting a process-based conception (Bickhard, 2000a, 2004b, in press-b, in preparation):

(1) The history of science has so far involved the progressive replacement of substance models with process models. Phlogiston has been replaced with a process model of combustion, caloric has given way to thermal heat, vital fluid has yielded to self-maintaining and self-reproducing organizations of process, and so on.
(2) Our best contemporary science tells us that there are no elementary physical particles, only the processes of quantum fields.
(3) There are serious conceptual flaws with the metaphysical assumption that everything is ultimately made out of particles.
(4) Emergence is possible only if the world consists of processes and organizations of process, and
    (a) Emergence has clearly happened, and
    (b) Only by taking emergence seriously can we account for such emergent phenomena as life and mind (and representation) (Bickhard, 2000a, in press-b, in preparation; R. J. Campbell & Bickhard, in press).

Strictly speaking, *interactivism* is a name for the model of representation that developed within this framework. Roughly, representation emerges in the presuppositions of anticipatory interactive processes in natural or artificial agents. It was Rita Vuyk (1981) who called the model "Radical Interactivism," and I decided that the term captured its spirit well.

The general interactivist model also includes treatments of virtually all other mental as well as some social phenomena: learning, emotions, consciousness, language, perception, memory, motivation, neural realizations of mental phenomena, the nature and emergence of social reality, the nature and emergence of human sociality and the social ontology of the person, development, personality and psychopathology, rationality, and so on. It further addresses phenomena such as normative biological functionality; the rationality of realism, truth, progressiveness, and "induction" in science; the emergent evolution of the biosphere, and so on. (See Bickhard, 1978, 1980b, 1992c, 1992d, 1993, 1995, 1996, 1999, 2000b, 2000c, 2001, 2002a, 2003b, 2004a, in press-a, in press-b, in preparation; Bickhard & R. L. Campbell, 1996; Bickhard & Christopher, 1994; Bickhard & Terveen, 1995; R. L. Campbell & Bickhard, 1992b; R. L. Campbell, Christopher, & Bickhard, 2002; Christensen & Bickhard, 2002; Levine & Bickhard, 1999.)

This architecture of metaphysical commitments and theoretical models is not a deductive system; you cannot begin with the metaphysical principles and deduce the models. It is a nested hierarchy or lattice of *constraints*, beginning with the metaphysical and reaching deep into the theoretical, within which ever more specific modeling and constraint discovery can take place. Explorations into the social or biological proceed by adopting the broadest possible set of constraints that apply, and exploring for their implications and for any further constraints that might be found. For instance, the interactive account of language does not supply strong constraints for exploring what a biological species is, but the broader model of emergence does. The general approach, then, can be extended horizontally (e.g., into the biological or social) as well as vertically (e.g., deeper into the mental).

2. What are the relationships between interactivism and other theories?

Interactivism shares with Jean Piaget's genetic epistemology (Piaget, 1970, 1971, 1977) a pragmatic commitment to process and action as the proper framework for modeling mental phenomena. Like genetic epistemology, interactivism notes how action-based knowledge entails constructivism. The only way that action systems can be created is by construction; they cannot be created by passive processes such as transduction or induction. But interactivism differs strongly from Piaget in giving central (though far from exclusive) importance to processes of constructing new variations and selecting among them. Interactivism borrows freely from Piaget for some of its particular models; e.g., of manipulable objects (Piaget, 1954).

The interactive model diverges from Piaget in a number of particular and general ways. Interactivism is broader than Piaget's genetic epistemology, addressing, for example, emotions, language, normative function in biology, and a number of other phenomena that Piaget did not undertake to model in detail. Interactivism rejects Piaget's notion of "figurative" knowledge, which he thought was characteristic of perception, language, and mental imagery. Figurative knowledge, from an interactive standpoint, is a vestige of the older views that Piaget was trying to replace: figurative knowledge continues to be based on static correspondences (Bickhard, 1992a; Bickhard & R. L. Campbell, 1989; R. L. Campbell & Bickhard, 1986). The interactive model of representation is, for this and other reasons, different from Piaget's, as are the interactive accounts of logical and mathematical necessity, and so on.

The developmental model within interactivism has been called neo-neo-Piagetian or revisionist Piagetian. Although this is accurate in some respects, it does not convey the breadth of the model or the divergences from Piaget's work. It also suggests that the interactive model historically emerged out of genetic epistemology; in fact, Piaget's late studies of developmental processes were going on roughly in parallel with the earliest work on interactivism, and many of the affinities did not become clear, on either side, until after Piaget's death.

More broadly, the interactive model has multiple convergences with pragmatism. It shares with pragmatism its process and action framework, its criticisms of encodingism (i.e., of spectator models of knowledge, as the pragmatists sometimes called them), and its focus on consequences in action and interaction. It differs in its explicit model of representation, among other places. Peirce's model of representation[1] more closely resembles external representation than mental representation, in this view; the interactive model of representation is more akin to Peirce's model of *meaning* (Rosenthal, 1983). Dewey's discussions of language sometimes sound very much like the interactive model of language, but he provided no real details, and interactivism would certainly not join with Dewey in rendering truth as warranted assertability (Tiles, 1990). The interactive model of perception is much like a later offshoot of the pragmatist tradition, James Gibson's theory (Gibson, 1966, 1977, 1979) – but only after some careful work separating Gibson's theory from his metatheory, and even then some differences remain (Bickhard & Richie, 1983). Many models of language have focused on its pragmatic aspects, including its manifold context-dependencies, but they all retain an encoding model of representation, usually of propositions (Bickhard, 1980a, 1987; Bickhard & R. L. Campbell, 1992; R. L. Campbell & Bickhard, 1992a). And so on: alongside the partial convergences and even the ideas directly imported from existing literature into the interactive model, fundamental differences remain.

3. How does interactivism connect with data?

The broader commitments of interactivism are, by and large, metaphysical, so the reasons for accepting them are not based on any direct appeal to empirical data. Rather, these positions are worth accepting and working within because they make possible models and understandings that other frameworks rule out as impossible. Correlatively, they enable us to avoid fatal problems that other frameworks cannot escape. For instance, representation has been modeled in terms of encoding relationships for several thousand years, and the problems of encodingism are fatal; if the interactivist critique is correct, these problems have never before been solved – or dissolved.

Interactivism, nonetheless, yields some straightforward empirical explanations and predictions. For instance, the interactivist model of perception predicts that people will have no problem estimating relative temporal durations or accelerations, something that is impossible on standard models according to which perception consists of a series of static snapshots. Piaget (1969) was among the few who realized that this was a problem, implicating his own model of duration as constructed from rate and work accomplished. But if perception is an ongoing temporal process, rather than a file full of snapshots, then such estimations pose no problem at all, and that is in fact what we find (Ramalho, 1990; Richie & Bickhard, 1988). With regard to perception, the interactive model is much closer to Gibson than to Piaget.

The interactivist model of human development predicts that there will be an initial domain-general stage shift that is relatively synchronous with age: this has been located empirically between ages $3^1/_2$ and 4. The "age 4" shift is then followed by non-domain-general and non-synchronous transitions into further stages. Only the interactive model has made such a prediction; it made it as far back as the early 1970s; and it appears so far to be what we find (in spite of the contemporary general refusal to consider domain-general developmental changes) (Bickhard, 1980b, 1992b).

The interactive model of rationality and the treatment of philosophy of science that goes with it (Bickhard, 2002a) explain a number of phenomena, such as the progressivity of science, the rational role of truth and realism in science, and the rationality of what looks like induction, that are seriously problematic on standard approaches. In brief, interactivism, as mentioned above, yields a constructivism; constructivism, in turn, generates internal processes of constructive variations tested against internal criteria of selection – an internal evolutionary epistemology (D. T. Campbell, 1974); and the inherent tendency to learn more about what selection criteria are relevant and about what sorts of constructions can satisfy them constitutes an inherent developmental trend toward rationality. This is in strong contrast to standard foundationalist approaches, and yields some quite different consequences both for rationality in a broad sense and as constituting the framework for the rationality of science. The rationality model also makes predictions about what sorts of educational and curriculum designs should work best, a prediction confirmed in at least one study (Wu, 1993).

[1] That is, his semiotic model of icon, index, and symbol related via the triadic sign relations of sign, object, and interpretant (e.g., http://plato.stanford.edu/entries/peirce/).

The model explains the developmental sequence of enactive, semantic, episodic, and autobiographical memory (Bickhard, 1992b), to modify Tulving slightly (Nelson, 1994; Tulving, 1983, 1985, 1987) — a sequence that makes no sense at all from standard encoding perspectives: in standard conceptions of memory as encoded snapshots, episodic memory as sequences of such snapshots should be foundational, not a late development (Bickhard & Christopher, 1994). And so on. In general, the model makes contact with data in many places, though only a few have been tested so far.[2]

4. What's wrong with dominant assumptions?

The study of the mind has become the last holdout against the historical abandonment of substance models in favor of process models. Phlogiston for fire, caloric for heat, magnetic effluvium for magnetism, vital fluid for life have long since been recognized as not merely false models of their respective phenomena, but the wrong kind of models altogether. Neither fire nor heat nor magnetism nor life are substances. Instead, each is a kind of process.

Furthermore, our best contemporary science tells us that there are no substances. Fundamental physics models all of reality not in terms of old-fashioned substances – nor in terms of particles – but in terms of quantum fields (Aitchison, 1985; Bickhard, 2000, 2003a; Brown & Harré, 1988; Cao, 1999; Davies, 1984; Halvorson & Clifton, 2002; Kaku, 1993; Nakahara, 1990; Ryder, 1985; Saunders & Brown, 1991; Weinberg, 1977, 1995, 1996, 2000). Particle models yield a partial fit because the field processes are quantized, but that quantization is akin to the integer number of vibrational waves in a guitar string, and no one thinks there are guitar sound particles. Lacking any grounding in physics, a substance approach to understanding mental phenomena can at best be heuristic, and is conceptually dangerous even then.

For example, substances, and structures made out of substances, are assumed to be inherently stable. They change only if something makes them change. Thus, if we are attempting to model psychopathology, and are using a substance–structure framework, we will take it for granted that pathological phenomena are stable. Unlearning or changing psychopathological structures will require specific intervention. But, if mind is process, intrinsically self-organizing, then what becomes problematic about psychopathology is why it remains stable. Why don't we all "just" unlearn such pathologies? A substance framework, even when applied heuristically, puts the most basic questions of stability and change beyond examination: stability, being presupposed, needs no explanation (Bickhard, 2003c).

A substance metaphysics makes emergence of new substances impossible. For instance, Empedocles' earth, air, fire, and water could not support the emergence of a new kind of substance, or even of new earth, air, fire, or water. But virtually everything in the universe has emerged since the Big Bang. A substance metaphysics specifically makes *normative* emergence impossible: substances are not themselves inherently normative, and Hume's argument concludes that norms cannot be derived from, or emergent from, facts such as about substances.

But hardly anything about mind or the person can be understood without taking normativity into account. Representation is normative: it can be true or false. Learning is normative: it can succeed or fail. Rationality, psychopathology, social interaction, forms of language, are all normative. The normativity of ethics is just one among many. Substance frameworks have no way to address the central normative aspects of any of these phenomena, and thus can say remarkably little about the mind or person.

Process and emergence, in particular the emergence of normativity, must be addressed and understood in order to adequately model the mind and person. So long as we continue within a metaphysical framework of substance presuppositions, we will be in the same position as chemists attempting to explain fire with a better substance-based model than phlogiston theory. It is not just the particular phlogiston-based model that must be rejected and overcome, it is the entire substance framework that led to the phlogiston theory in the first place. Put representation, cognition, language, psychopathology, emotions, memory, development, and sociality in the place of phlogiston, and you have the present state of studies of the mind and person.

[2] For a test of a different hypothesis that initiated a family of research, see Wedemeyer, Bickhard, and Cooper (1989).

Representation. Consider these points as they pertain to representation, one of the foundational issues for interactivism. Paradigmatic of a substance model of representation is Aristotle's (1908) analogy between perception and the impression made by a signet ring in soft wax. The wax, it is claimed, receives the form of the ring but not the material of which the ring is made. The normativity of representation is a salient problem for this analogy. There are a number of relationships between the form in the wax and the form of the ring, several of which have been – and still are – taken to constitute the crucial representational relationship.

Suppose, for instance, that the causal relationship between the pressing of the ring and the impression left in the wax is what is taken to constitute representation. Here are some of the problems that emerge.

- If the causal relationship exists, then the representation exists, and it is correct; if the causal relationship does not exist, then the representation does not exist at all. These are the only two possibilities; they leave no way to account for the case in which "a representation exists but is false about what it is representing." The model affords two possibilities when three distinct conditions must be modeled: the representation exists and is correct, the representation exists and is incorrect, and the representation does not exist.
- There are myriads of causal relationships throughout the universe – they encompass every instance of causally paired events – and almost none of them is representational. What is special about those that allegedly are representational?
- Causality is transitive: if X causes Y, and Y causes Z, then X causes Z. So if there is a causal relationship between the impression in the wax and the ring as it is now, there are also causal relationships with: the quantum activities in the ring, with whatever is pressing the ring, with the ring a second ago, with the ring a year ago, with the materials out of which the ring is constructed, with the stellar processes that constructed those materials, and so on. In the case of vision, relationships with the light similarly proliferate – to include relationships with the table from which it reflects, the table an hour ago, the trees from which the table is constructed, the sunlight from which the trees grew, and so on. Which of these is to be the crucial representational relationship? How does the perceiver "know" what that special relationship is (supposed to be) with? This last question is the representational question all over again: so the entire account is fundamentally circular.

All of these problems recur regardless of which kind of relationship between the ring and the wax is selected as the constitutive one: it could be causal, nomological, informational, isomorphic, homomorphic. They recur, too, if we substitute the latest technological analogy for signet rings and wax: instead of "impression," we may refer to the "transduction" of light in the retina or to "induction" as the basis for learning. None of the relationships between the ring and the wax can capture the normativity of representational content.

As far as content is concerned, we find arguments that, because we have no model of the origin of representation in learning, it must all be innate (Fodor, 1975, 1981).[3] But, within these frameworks, evolution cannot solve the normativity problem any more than learning or development can. Contrariwise, if evolution can somehow can solve this problem, then there is no argument against learning and development availing themselves of whatever kinds of processes evolution uses to solve the problem.

Piaget (1970) pointed out one manifestation of this issue: if our representation of the world were in some sense a copy of it, then we would have to know the world already in order to construct our copy. Once again, content remains unaccounted for. Any presumption that it *is* explained is circular, because there is simply no way to model the origin of normative representational content within a substance framework. Substances are factual, not normative; substances do not permit emergence of any kind, let alone normative emergence.

[3] But see Fodor: "the argument has to be wrong, … *a nativism pushed to that point becomes unsupportable,* … *something important must have been left aside*. What I think it shows is really not so much an a priori argument for nativism as that *there must be some notion of learning that is so incredibly different from the one we have imagined* that we don't even know what it would be like as things now stand" (Piattelli-Palmarini, 1980, p. 269).

The *circularity* of models of normative content within a substance-and-structure framework is often unpacked into a presupposed or alleged *regress*: the circular dependence of content on content is split into one representational agent providing content to some other alleged representational agent. This is sometimes implicit, as when a hidden homunculus (a miniature full-fledged cognitive agent) or multiple homunculi both provide and translate representations. Other times it is explicit: representation may be claimed to exist only from the perspective of some observer of the overall situation who becomes an external source of judgment that a "representation" is correct or incorrect. Neither is acceptable. Representation needs to be understood as emerging within cognitive systems themselves, just as it presumably emerged during the course of evolution.

Problems with content can be further understood by focusing on a correspondence relationship that really is a representational relationship: genuine encodings. "…" encodes "S" in Morse Code, for example, or neutrino counts "encode" properties of fusion processes in the sun. These are unproblematic relationships in themselves. However, encoding cannot be a foundational form of representation because in all genuine cases, both ends of the encoding relationship must be known in advance. To be able to use Morse Code, for instance, an agent has to know "…" *and* "S" *and* the correspondence between them, or there is no encoding relationship. Encodings make use of preexisting representation, changing its form: "…" can be sent over telegraph wires while "S" cannot. Encodings do not generate new representations, nor could they constitute basic representations.

Rather, encodings are derivative, borrowing their content from other representations just as "…" gets its content from "S." The neutrino counts get their content from previously represented models and parameters concerning fusion in the sun. An encoding can be defined in terms of other encodings, and those may perhaps be defined in terms of still others, but after some finite number of steps a base must be reached: a foundation out of which all other "encoding" representations can be defined. It is this base that Fodor argues must be innate because we have no models of how any such foundational representation could emerge. But consider any element of such a basic set: how does *it* receive its representational content? If it is defined in terms of other representations, then it is not foundational and does not belong in the basic set. If it is not defined in terms of other representations, then that very element, "X," say, must be the source of its own representational content. But ""X" represents X" provides no content, so cannot constitute "X" as a representation. Whether implicit or explicit, encoding*ism* – the view that all representation takes the form of encodings – turns out to be fundamentally incoherent.

A metaphysical framework reliant on substances forces representation to be modeled as a factual relationship – one that somehow represents whatever is to be represented by encoding it. But encoding is a normative concept, and substance models will never make good on it. The assumption that all representation is some form of encoding cannot work, and must finally be abandoned (Bickhard, 1993, 2002b, 2004b, 2004c, in press-a, in press-b, in preparation; Bickhard & Terveen, 1995).

Before outlining a model of representation that overcomes these difficulties, I would like to point out that every one of them turns on the inability of substance metaphysics to handle emergence, especially normative emergence. So versions of these problems will rear up again for every normative phenomenon that we might wish to address. Since our concern is to understand mind and the person, that includes just about every phenomenon of any relevance. Substance metaphysics, then, renders minds and persons impossible to model and impossible to understand. Substance and structure assumptions need to be rooted out wherever they are found – far from an easy task, because such assumptions are not necessarily obvious, nor are the problems that they produce.

4.1. The interactive model of representation

Normativity involves an asymmetric distinction between good and bad. For representation, this asymmetry is between true and false. Making distinctions is easy in the factual world – any differential response will accomplish that. Accounting for the normative asymmetry of the distinction is much tougher. This is particularly so since most of the laws of physics, though not all, are inherently symmetric. I propose to derive normative asymmetry from an asymmetry in thermodynamics. In particular, a system that is at thermodynamic equilibrium will stay at equilibrium without any additional intervention. By contrast, a system that is far from equilibrium needs ongoing interactions and exchanges with its environment in order to stay far from equilibrium. A far from equilibrium system isolated from its environment will quickly cease to exist as it goes to equilibrium. This is the basic generative asymmetry out of which normative asymmetry emerges.

Most far from equilibrium systems are maintained in their condition by external processes. A set of pumps may bring chemicals from various reservoirs into a chemical bath, maintaining the bath at a far from equilibrium condition. Such systems can exhibit many important properties, including self-organization. More to the point, however, are far from equilibrium systems that make their own contributions to maintaining their far from equilibrium condition. A candle flame is a canonical example. It keeps its temperature above the threshold for combustion, vaporizes wax into fuel, and, under standard gravitational and atmospheric conditions, induces convection, which brings in fresh oxygen and gets rid of waste products. I call such systems *self-maintenant*.

A *recursively* self-maintenant system, in turn, is one that can maintain its ability to maintain itself in response to various changes in environmental conditions. A candle flame cannot adopt any new methods to maintain itself when it is running out of candle. A bacterium, however, may be able to swim so long as it is swimming up a sugar gradient, but tumble for a moment if it finds itself swimming down a sugar gradient (D. T. Campbell, 1974, 1990). Swimming is self-maintenant if pointed toward higher concentrations of sugar, but dysfunctional if pointed toward lower sugar concentrations.[4] Similarly, tumbling contributes to maintaining far from equilibrium conditions when the bacterium is pointed toward lower sugar concentrations, but not when it is pointed in the opposite direction. Recursive self-maintenance, then, requires sensitivity to the environment, and appropriate switching among available interactions with that environment in order to select one that maintains the condition of being self-maintenant in the face of differing conditions (Bickhard, 1993, 2002b, 2004b, in press-a, in press-b, in preparation).

The key property here for current purposes is that selecting interactions involve *dynamic presuppositions* about the environment. Swimming is appropriate only in certain kinds of environmental conditions and relations, and is inappropriate otherwise. In that sense, swimming presupposes that ***this*** environment is one of those environments in which swimming is appropriate. But such presuppositions can be *wrong*; they can be *false*. The bacterium may swim up a saccharin gradient as well as a sugar gradient, and that does not contribute to maintaining its far from equilibrium condition. Here, I claim, is the fundamental emergence of representational normativity.

Much more needs to be elaborated for this to address issues of representation across multiple levels of kind and complexity. How could such a model handle representations of objects? How could it address representations of abstractions, such as of electrons or numbers? How could it model *detection by the system* of its own representational error, as in error guided behavior and learning?[5] What about memory, perception, learning, imagery, concepts, language, and so on and on? All these are addressed elsewhere, and I will not recap the specialized models here (Bickhard, 1980a, 1992c, 1992d, 1993, 1995, 1998a, 1998b, 1999, 2000b, 2001, 2004a, 2004b, 2004c, in press-a, in press-b, in preparation; Bickhard & R. L. Campbell, 1992, 1996; Bickhard & Christopher, 1994; Bickhard & Richie, 1983; Bickhard & Terveen, 1995; R. L. Campbell & Bickhard, 1986, 1992b; R. L. Campbell et al., 2002; Christensen & Bickhard, 2002). Suffice it for current purposes to have offered an account of the *emergence* of *representational normative content*, however much elaboration it will need, within a *process* rather than a substance framework. The snags, catches, and dead ends of substance frameworks can at last be left behind.

5. Conclusion

Phenomena of mind and person are *emergent normative* phenomena. But substance metaphysics not only incorrectly characterize the physical, chemical, and biological worlds – they make genuine

[4] I account for normative function in these terms, but will not develop that model here (Bickhard, 1993, 1998b, 2000c, 2004b, 2004c, in press-b, in preparation; Christensen & Bickhard, 2002).

[5] This is actually easy for the interactive model (Bickhard, 1999, 2000b, 2004b, 2004c, in press-b, in preparation; Levine & Bickhard, 1999), but is impossible for any other model in the literature. It is not even addressed by any other model in the literature.

emergence impossible. They are hopeless in dealing with normative phenomena because substances are not themselves normative, yet they block any path to modeling the emergence of normativity.

Substance metaphysics have been abandoned in physics, chemistry, and mostly in biology. They retain a dominance in studies of minds and persons. This is likely at least in part due to the particular difficulties that substance frameworks impose on any attempt to address normative phenomena: substance frameworks preclude emergence, yet they make emergence the only naturalistic option for normativity because substances themselves are not normative. The full range of these complexities and perplexities occurs only in studies of the mind: Normativity is not a focal issue in physics or chemistry. In biology, normative troubles are localized in problematic notions of biological function. Only in psychology and the other sciences of mind is normativity to be found everywhere. It is long past time to transcend these perplexities, to abandon the frameworks and assumptions that have led to them. It is time to shift to a process metaphysical framework.

A process metaphysical naturalism for mind and person is possible, has been developing for some decades, and extends in multiple directions. Because it originated as an interactive model of representation, the entire conception has been dubbed *interactivism*. Interactivism not only offers particular models for many phenomena of mind and person, it also demonstrates that a "process naturalistic emergence" approach can be worked out, with fruitful results. That is, interactivism offers particular models for particular phenomena, *and* a demonstration of possibility along with particular guidance for further theoretical and empirical development within such a process framework.

All theories are ultimately found wanting. An argument for the detailed truth of the interactive model would not be consistent with the points that I have already made – not when the interactive model actually forces epistemological fallibilism. But progress in science proceeds as much by the discovery of new errors to be avoided, and of new ways to avoid them, as it does by the accumulation of timeless truths: Aristotle's physics involved laws that changed from one place to another; Newton introduced a criterion of place invariance, and that rejected Aristotle; Special Relativity introduced a criterion of velocity invariance, and that rejected Newton; General Relativity introduced a criterion of acceleration invariance, and that forced a shift from Minkowski space-time to Riemannian geometry (Friedman, 1983; Longair, 1984; Lucas & Hodgson, 1990). Many old errors stemming from substance approaches have already been corrected by turning to process approaches. I have argued here that the errors that have been uncovered in substance approaches to mind and person may likewise be corrected by turning to process approaches. Interactivism maintains that what has enabled progress for fire, heat, and life will also work for minds and persons.

False assumptions doom science to ultimate failure, even to irrelevance: witness the fates of phlogiston theories of fire, caloric theories of heat, associationistic theories of learning, and two-layer Perceptron theories of pattern recognition. Interactivism offers the prospect of transcending false assumptions about minds and persons, opening up to exploration what thoroughgoing process-oriented naturalism can bring to these normative phenomena.

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