

# Interactivist Summer Institute 2009

Simon Fraser University, Vancouver

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Abstracts

## Conceptual issues concerning foundationalism: A framework for transcending the nativist-empiricist debate

Jed Allen

Lehigh University

This talk will provide a critique of, and alternative framework to, the nativist-empiricist debate. In particular, transcending the debate will require: 1.) correctly identifying the problem and 2.) the availability of an alternative to that problem. Nativism and empiricism are two distinct proposals concerning the source of our knowledge; however, their shared limitation is the assumption that knowledge pre-exists (foundationalism). An action-based approach constitutes a positive alternative to the problems inherent in foundationalism.

## From Parmenides to Persons

Mark Bickhard

Lehigh University

Presents an overview of the Interactivist framework, beginning with the Pre-Socratics and ending with a model of the social ontology of persons.

## Some Issues in Metaethics

Mark Bickhard

Lehigh University

Discussions of ethics make presuppositions concerning underlying ontologies of agents and actions, and these presuppositions are often false and misleading. I will outline some metaethical issues that arguably need revision and explore some of those revisions and their consequences.

## The Induction and Control of Central Nervous System Attractor Landscapes: The Emergence of Representational Normativity in the Brain

Mark Bickhard

Lehigh University

The central nervous system has evolved via the exploitation of the enabling potentialities of microgenesis, and has generated the emergence of basic consciousness, learning, emotions, and reflective consciousness. I will outline the macroevolutionary course by which this has occurred.

# Frontiers of Interactivism

Mark Bickhard  
Lehigh University

## A constructivist approach to the “research/application” loop: The example of a numeracy competencies diagnostic software

Sandra Bruno (Université Paris 8)

An important branch of AI today operates within the cooperative paradigm. Researchers there try to design not autonomous cognizing agents but rather agents that help humans to improve their performance. In this context, researchers, engineers and other experts explore solutions as to how their ideas, innovations, solutions, and artefacts affect users’ development, and their new demands, rather than in answering their established needs. In this sense, we would like to explore more deeply the “research/application” loop, as possibly self-organized, and producing creativity. Empirically, we will analyze how a program (“DIANE”) aimed at diagnosing students’ numeracy competency is comprehended by both students and teachers. The analysis so far shows that the output given by the diagnostics program complements teachers’ comments for the same answer of the student.

On the other hand students proceeded pretty much in the same manner regardless whether they were working with the program or simply with pen and paper. The question we wanted to answer here is: should we encourage teachers to accommodate their repertoire of schemas by making them better understand and use the software (not for intrinsic characteristic of being an artificial system but for the additional layer of cognitive knowledge it can offer), or should the designers improve the software? Another possibility would be to allow for both and thus, in this loop, letting the system evolve into unknown, potentially more creative solutions.

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# Rhythm, anticipation and regulation in Piaget sensorimotor schemes; application to computer simulations and robotics

Jean-Christophe Buisson

In this paper, we show that Piaget schemes can be successfully used to implement sensorimotor competences in robotic devices and computer simulations. In order to model such assimilation schemes correctly, we argue that rhythm, anticipation and regulation are all crucial aspects which have to be dealt with necessarily in the computer models. A rhythm recognition computer program is presented, able to assimilate real rhythms played on a keyboard and to accommodate to new rhythms. Each known rhythm is internally represented by an assimilating scheme and such schemes are able to accommodate to new situations by regulating their timing or by spawning modified copies of themselves. This program demonstrates the necessity of anticipating future events, as well as synchronizing and regulating the timing of external events to anticipated ones. A second computer program, able to perform realistic handwriting with a robotic arm, show how such performance can only be achieved with internal rhythm generators, in this case a pair of orthogonal and coupled oscillators. We show how our program replicates timing features found in human handwriting. Finally we present a computer program simulating saccadic eye movements when visually assimilating moving objects. An internal rhythm generator causes eye saccades; regulation and anticipation are used by visual schemes to accommodate and keep following tracked objects.

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## **Jean Ladrière's reading of Kurt Gödel**

### **and its effect on Jean Piaget's theory of construction through interaction**

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An historical archaeology of Jean Piaget's appeals to Kurt Gödel's incompleteness theorem shows a rupture in its use around 1960. Prior to this, Gödel was for Piaget a footnote in the history of mathematics and logic. But afterwards, Gödel's work became the source of "impressive arguments in favor of constructivism" (Piaget, 1967/1971, p. 80). The most likely cause of this rupture can be found in the writings of Jean Ladrière (Burman, 2008b, 2009a).

# Developmental Psychology of the Whole Person: Transcending False Alternatives

Robert Campbell, John Chambers Christopher, and Mark H. Bickhard

Roughly 120 years of research in developmental psychology have produced a host of impressive empirical findings, but the data sets so generated are not going to assemble themselves into a cohesive understanding of the person, and the ontological conceptions that are usually applied to them will not bring them together. The Cartesian ego, atomistic and disembodied, inherently conscious and deliberating, is not an ontologically adequate view of personhood. Neither is the mechanistic, normless, and basically unconscious actor posited by mainstream naturalism. To transcend this false alternative, developmental psychology needs to be able to explain how norms come into being. An interactivist account of normative implicitness and of the emergence of goals and values can provide such an explanation. We sketch such an account, with special emphasis on participating in social practices and acquiring life skills as a basis for human value acquisition, and on the further unfolding of goals, values, and metavalues through the levels of knowing.

## Forms of Meaning: From Mead's Conversation of Gestures to Significant Gestures

Jeremy Carpendale

Simon Fraser University

Although the nature of meaning is a central problem for philosophers, it is not generally a concern for psychologists, even though theories in psychology are necessarily based on assumptions about meaning. This lack of concern regarding meaning may be because it is felt that an answer is already well accepted and straightforward. However, this view of meaning on which theories in psychology and language development are based is deeply flawed according to criticism from Wittgenstein and others. Wittgenstein argued that meaning cannot be attached to representations of any form that are transmitted between individuals. His therapeutic goal was to make the problems with the picture of how mind and meaning work so evident that we reject them and can clearly see how things work. But his positive contribution is less clear. We get the idea that meaning and understanding is more akin to an ability and that it is based on shared practices that may be derived from or based on early forms of natural reactions. For developmental psychology it is important to fill in more detail regarding how this develops. Canfield (1993, 1995) has done some work in this direction of spelling out how meaning emerges in early proto language games. But there are still many aspects of this process that seem to be glossed over. In attempting to unpack this process I have found that the work of G. H. Mead, from decades before Wittgenstein, to be very helpful. Even with Mead, however, there are parts of the story that need to be filled in because he was not a developmentalist. And, since his work on meaning seems to have been largely

overlooked, perhaps it could do with some translation into a form that is more accessible. Mead introduced an important distinction between conversations of gestures and significant gestures. A non-significant gesture is responded to by a second animal but there is no evidence that the first intended to evoke that response, whereas with significant gestures the first animal is able to react in the way that the second animal would. However, there are still many questions about how development occurs between these two forms of interaction and how it is that humans are adapted to make this transition. In this talk I will explore these questions.

## Redefining empathy through interactivism

Stuart Hammond

Simon Fraser University

Empathy plays two roles in philosophy and psychology. In one role, empathy is a mechanism of understanding the emotion of others. In its other role, empathy is a mechanism of morality; empathy with another leads to help and care for the other. Most theories of empathy argue that empathy occurs when a person experiences the same (or a similar) emotions as another person, an experience that is considered to lead to an understanding of the other. Viewing empathy as emotional concordance, without presenting an account of how a person could verify that what they feel is the same as what another person feels, suggests that empathy is built on an encoding perspective (see Bickhard & Terveen, 1995).

## Group-level Characteristics: Measuring the Emergent Characteristics of Peers in the Classroom Context

Snjezana Huerta

Abstract:

Peer-group characteristics are phenomena of consequence both to researchers interested in the theory and measurement of emergence, and those investigating child development. With regard to the latter, there is evidence suggesting that the quality of intra-group relations is relevant to children's development, both in terms of their moral reasoning and behaviour (cf. Higgins, Power, and Kohlberg, 1984) and children's perspective taking practices (cf. Epley, Caruso, and Bazerman, 2006). Equally, the study and measurement of children's peer contexts proffers an opportunity to adopt an interactivist approach.

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# Agent Causation Reconsidered: The Evolutionary and Developmental Emergence of Self-Determining Persons

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The central argument of this paper is that human agent causation can be disentangled from the clutches of traditional, fixed-substance metaphysics that pits agency against determinism. Such disentangling can be achieved through a combination of conceptual clarification provided by Hacker's (2007) philosophical anthropology, and emergentist theorizing provided by contemporary evolutionary and developmental science. Agent causation is nothing more than the non-mysterious self-determining capability of persons, understood as embodied, emergent ontological entities whose nature is not fixed due to their uniquely evolved and developed capabilities of language use, cultural construction, self-consciousness and self-understanding, and moral concern. Relevant arguments of Dennett (2003) and Searle (2001, 2007) are adapted to fit within the author's own emergentist, developmental theorizing in order to explain how the self-determining capability of persons is determined by relevant biophysical and sociocultural constituents, yet is not fixed by those determinants.

The key point is that in addition to whatever other causal elements (external, internal, efficient, material, biophysical, sociocultural) might enter into the determination of the choices and actions of persons, the self-conscious self-determination of persons in the form of purposeful, intentional activity also may contribute significantly to the total causal mix active at any particular moment in the life activity of persons. What this means is that persons, although themselves emergent within a determined biophysical and sociocultural world, and always subject to biophysical, sociocultural, and occasionally random, and unconscious psychological and neurological processes that they do not control, nonetheless are capable of self-determining their actions (at least in part and on occasion) through their own purposeful activity, activity that is fueled by deliberation that is both reasoned and morally concerned. Persons are emergent biophysical and sociocultural beings with social, rational, moral, and psychological capabilities that allow them to exercise some degree of self-determination in their lives that goes beyond the effects of other external and internal causes and determinants. The self-determining capability of persons requires explanation not only in terms of efficient causal explanations appropriate to our evolved biophysical nature, but also in terms of final purposive explanations appropriate to our emergence as culture-capable, self-reflective agents, and formal explanations consistent with our evolved and developed nature as particular bio-cultural hybrids.

# Decision Capacity Increases Intelligence, Wellbeing, and Survival, But Challenges to Decision Correctness Persist

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*Abstract:* Decision capacity is identified as the primary cause of increased intelligence, wellbeing, and survival as species evolve into greater complexity, as humans develop from infancy to adult, and as groups become larger. Two models of decision capacity are compared to explain these trends. The first model of decision capacity is based on the encoding model of representation. The second, based on interactivism, is designated the *invariance gyre* model, incorporating six processes effecting a system's making of decisions to attain and maintain invariances. A key recognition of this study is that decision making and corresponding actions are always involved whenever invariances are attained or maintained using negative feedback loop control. The invariance gyre functions provide insight into what increases or decreases decision capacity. A synchronized network of invariance gyres, designated a *synchronet*, is proposed to instantiate a system's decision space. An organization of invariance gyres within a synchronet defines a heuristic model of decision capacity. Some challenges to making correct decisions are viewed in a new light as being due to improper (from a species or group survival viewpoint) interactions between invariance gyre component processes.

# A Constructivist Anticipatory Learning Mechanism For Coupled Agent-Environment Systems

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Abstract

This paper presents CALM (Constructivist Anticipatory Learning Mechanism), an agent learning mechanism based on a constructivist approach. It is designed to deal dynamically and interactively with environments which are at the same time partially deterministic and partially observable. CALM can discover its environment regularities through the construction of more abstract or high-level representational concepts. The created world model is then used to define an action policy, improving the agent performance.

We also present CAES (*Coupled Agent Environment System*) meta-architecture, to define our conception of autonomous agent, situated into the environment, embodied and intrinsically motivated.

# Getting Beyond Rich and Lean Views of Early Social Cognition

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Part of the reason for the current interest in embodiment, distributed and/or situated cognition and systems approaches is that a growing number of researchers in psychology, neuroscience, philosophy and AI are becoming increasingly skeptical about explanations of behavior that rely on centralized control and overly mentalistic and/or gene-centered explanations of purposeful activity. The worry is that when a highly cognitive or adaptationist approach is applied to the wrong sort of phenomenon, it may provide researchers with a distorted image of what they are trying to understand. Accordingly, in recent years a growing number of researchers are conceiving of mental processes as something far less in-the-head that has often been theorized (Bickhard, 2001; Fogel, 1993; Johnson, 2001; Kaye, 1982). Similarly, population-genetic level accounts of psychological phenomena have been criticized by developmental evolutionary psychological approaches (evo-devo), the latter of which are wary of genocentric explanations (Gottlieb, 2002; Griffiths & Stotz, 2000; Lickliter, 2008; Oyama, 1985). In this paper, we argue that when these not-just-in-the-head and not-just-in-the-gene approaches are applied to early social and communicative development, they may help to resolve a particular theoretical impasse that has been reached in the comparative and developmental psychology of pointing, a behavior that is widely held to be the least ambiguous indicator of an early grasp of mind.

# Is the Concept ‘Concept’ a Useful Concept?

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In the most authoritative psychological text of its time, William James (1890) asserted that, "*The function by which we thus identify a numerically distinct and permanent subject of discourse is called CONCEPTION; but the thoughts which are its vehicles are called concepts. But the word ‘concept’ is often used as if it stood for the object of discourse itself; and this looseness feeds such evasiveness that I shall avoid the use of the expression concept altogether, and speak of ‘conceiving states of mind’, or something similar instead*" (p. 461, emphasis original). Although James did in fact use the concept ‘concept’ in several other places later in this highly influential work, the century that has passed since the publication of *The Principles of Psychology* has witnessed a proliferation of such ‘concept’ concepts, some of a familiar somewhat garden-variety sort like James’ and some more technical and tied to psychological areas of specialization that have emerged in the past fifty years or so.

Within psychological science generally, and cognitive neuroscience in particular, the ‘concept’ concept has gained a fair degree of purchase over the past several decades. Of course, the expression, the origins of which lie in the Latin term *conceptum*—something conceived, has a history that significantly predates its employment in psychological science. And, certainly, more ordinary usages of the term (e.g., which denote a general idea or notion, a linguistic class, etc.) appear throughout psychological literature. However, although some are tied in very particular ways to the ordinary use, there appear to be a number of seemingly distinct homonyms which also appear throughout scientific psychological discourse. For instance, the *Oxford Dictionary of Psychology* (Colman, 2001) defines the “traditional psychological definition [of ‘concept’ as] a category that divides some domain into positive and negative instances” (p. 157). This definition might conceivably be applied to the activities of a scientist who is *investigating* a particular concept and an agent who might be said to *possess* a concept because the agent displays an ability to classify instances of some domain.

There are also the ‘concept’ concepts discussed in cognitive science that are born out of the various theories of concept formation which have been proposed, such as that of componential theory which defined ‘concept’ in terms of necessary and sufficient defining properties, and Rosch’s (1973) prototype theory, according to which concepts

are defined by their resemblance to a prototype. In her case, Rosch claimed to find inspiration for her theory in Wittgenstein's (1958) notion of family resemblance among category members. It is perhaps ironic that this is the same Wittgenstein (1976) who noted that "the word 'concept' is too vague by far" (§42) and even that "concept is a vague concept" (§45). Thus, an issue here is how these 'concepts' are related, if at all, to the currently popular notion within representational theories of mind, wherein 'concept' is typically defined as a "mental category", or "mental representation" that is causally related to the activities being described. In such cases, concepts are offered up as causes of manifest behaviour and are therefore offered as explanations of how it is that agents are able to do what they do, for example, to classify. Wittgenstein would, no doubt, not be pleased by such a supposition.

Piaget introduced to developmental psychologists what has been variously interpreted as a causal and also a formal notion of concept which Piaget employed in his illustrations of the normativity in the child's interactions with the physical world. From Piaget's point of view, a child has a particular concept when she has come to understand that such and such had to be the case, which demonstrated to Piaget what he considered to be forms of necessary knowledge. Piaget used such ideas to criticize empiricist theories of knowledge because an understanding of necessity was not in his view possible if concepts were taken to be entirely empirical. However, although contemporary critics of Piaget have argued that he is correct that concepts cannot be empirically derived, they claim that he was mistaken that they are constructed through the child's own activity and suggest instead that children come equipped with *innate concepts* that are said to explain how it is that infants and some animals show relatively rapid development in particular domains (i.e., folk psychology, folk biology, folk physics, folk mathematics).

Some of these folk so-called 'core knowledge' concept domains are argued to exist in many other animals. For example, some bird and mammal species are argued to have basic numerical and physical concepts. And humans are argued to share some of their psychological concepts with nonhuman primates, dolphins, dogs and even domesticated goats. The reason that the core knowledge approach has been able to claim that such capacities are common across species is that their research paradigm of choice is the habituation study, a methodology that can be applied to many nonhuman animals. But the motivation for employing such a method and the attendant assumption of its unproblematic nature raise the issue of the extent to which it makes sense to attribute a concept to a non-language using agent be they a human infant or a nonhuman animal. And related to this are the necessary presumptions of an underlying ontology and epistemology within which it makes sense to do so. These considerations apply equally to claims made by comparative psychologists who argue that particular animals (e.g., grey parrots, great apes) make use of conceptual representations when they navigate their social and physical world.

Then there is the seemingly quite distinct "theoretical concept" whose relevance has been made explicit within the philosophy of science (although with different camps therein telling sometimes quite different versions of the story). Today, these "hypothetical constructs" (or just "constructs") are generally taken variously as either *denoting* psychological attributes processes, mechanisms (sometimes causal in nature, sometimes not) which are manifest in observed behaviour or as *being* those attributes,

processes, and mechanisms about which the psychological scientist would like to accumulate knowledge.

Given these multifarious uses of ‘concept’ in psychological scientific discourse, it seems fair to inquire as to their particular meanings and any potential interrelationships that might exist among those meanings: Do they refer differentially, or are they suborder senses to a higher order ‘concept’ concept? Are some uses embedded in others? What is the relationship between ordinary and potentially technical senses of ‘concept’ as used in psychological science? And, how do any of the seemingly technical senses relate to the ordinary, linguistic sense, according to which a ‘concept’ is that which is denoted by a word (or set of words), e.g., “dog”, “chien”, and “inu”, which refer to dog in English, French, and Japanese, respectively?

The primary aim of the current paper is therefore to provide a comprehensive survey of the various senses of the ‘concept’ concept in psychological and related sciences. To this end, we attempt to trace the origins of the various senses of ‘concept’, and explicate well their current uses. Second, we sketch out the relationships, where they exist, between differing senses of ‘concept’, and identify whether and how these senses overlap with a more general ‘concept’ concept. Finally, in order to play out seemingly distinct usages of ‘concept’ in psychological scientific discourse, we describe two distinct formulations of concept formation, viz., that generally received in contemporary cognitive neuroscience, according to which concepts are mental categories, and a linguistic construal wherein concept possession may be understood in terms of mastery of linguistic expressions.

### **Artificial Scientist: Why are we not there yet?**

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#### **Abstract**

In recent years a considerable body of interdisciplinary research relating cognitive development and scientific inquiry has emerged [1], [2], [3]. At approximately the same period numerous attempts to construct so called automated discovery systems in artificial intelligence and cognitive robotics were reported [4], [5]. In my talk I will present several examples these systems, meant to autonomously come up with new scientific insights (or new knowledge). I will then present my critique which applies to virtually all of these systems and is based on:

- a) their implicit naïve realism assumptions;
- b) limitations stemming from the overall construal of perception and knowledge representation processes;
- c) limited heuristics and learning algorithms used.

Based on research in the cognitive aspects of scientific activity, and the frameworks of interactivism, and radical constructivism, I will then put forward a sketch of the minimal requirements to be met if we are ever to build an AI system that will exhibit autonomous learning. These systems cannot be mostly data driven (as it was the case in the most

systems so far), will have to exhibit perpetual endogenous activity, as well as, what I refer to “generative perception”.

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## Mead’s Emergent Reality of Perspectives

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The thesis I present originates in the work of the early 20<sup>th</sup> century theorist George Herbert Mead (1925, 1926, 1932, 1934, 1938) on agentive perspectival. My central claim follows directly from (and is greatly indebted to) substantial recent extensions to that work by Professor Jack Martin (Martin, 2006, 2007). I have integrated this body of thought into non-linear dynamic theories of emergence (e.g., Bickhard, 2002; Bickhard & Campbell, 2003), hence removing Mead’s (1925, 1932) reliance on relativity as the foundation for emergent theories.

The thesis presented herein is as follows: A moment of human agency is a moment of perspectival engagement with the life and social processes that constitute the world. An individual’s perspective is a determining influence on his or her own conduct and also the conduct of others (Martin, 2006, 2007; Mead, 1926). Moreover, the perspectives of others are a determining influence on each individual. According to Mead (1932), the world is a world of events that issue from the perspectives of living agents. Moreover, living agents engage with events from within the perspective of living agents. Events are real and perspectives are a real determining influence on events. The position presented herein, then, is an argument for an emergent reality of perspectives.

# Constitutive Interactivity and the Ontology of Psychological Kinds

Jeff Sugarman

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Ian Hacking's attempts to distinguish among concepts with which human beings furnish the world (i.e., natural versus human kinds) are well known. His project has been advanced largely on the idea that human kinds, unlike natural kinds, are subject to an interactivity he terms, "the looping effect," that points to the capacity of persons to react to the ways in which they are classified and conceptualized. More recently, while preserving the ontological force of interactivity, Hacking has retreated from the claim that interactivity can be employed to make a clean divide between kinds that are natural and kinds that are human. Hacking now claims that neither natural nor human kinds can be defined with sufficient clarity to form a distinctive class. Hacking's recent arguments bear implications not only for his own project, but moreover, for whether or not psychological kinds warrant a distinctive domain of disciplinary inquiry. In this paper, the thesis of constitutive interactivity will be explored in relation to the possibility of a unique ontology of psychological kinds made possible by a distinctive human agency with an appropriately evolved brain and body, but that also requires social and cultural embeddedness for its developmental constitution.