Publication Review

Recent Books and Articles Related to Constructivist Approaches

> Upshot • This section lists publications related to constructivist approaches – constructivism, second-order cybernetics, enaction, non-dualism, biology of cognition, neurophenomenology etc. – that recently have been published elsewhere, and which the reader of the journal might find interesting. The entries are ordered alphabetically and clustered according to their respective primary disciplinary backgrounds or application. The increasingly extending bibliography and the Constructivist E-Print Archive (CEPA) can be consulted at http://cepa.info

Artificial Intelligence

> Georgeon O. L., Marshall J. B. & Manzotti R. (2013) ECA: An enactivist cognitive architecture based on sensorimotor modeling. Biologically Inspired Cognitive Architectures 6: 46–57.

>> A novel way to model an agent interacting with an environment is introduced, called an Enactive Markov Decision Process (EMDP). An EMDP keeps perception and action embedded within sensorimotor schemes rather than dissociated, in compliance with theories of embodied cognition. Rather than seeking a goal associated with a reward, as in reinforcement learning, an EMDP agent learns to master the sensorimotor contingencies offered by its coupling with the environment. In doing so, the agent exhibits a form of intrinsic motivation related to the autotelic principle (Steels), and a value system attached to interactions called "interactional motivation." This modeling approach allows the design of agents capable of autonomous self-programming, which provides rudimentary constitutive autonomy – a property that theoreticians of enaction consider necessary for autonomous sense-making (e.g., Froese & Ziemke). A cognitive architecture is presented that allows the agent to discover, memorize, and exploit spatio-sequential regularities of interaction, called Enactive Cognitive Architecture (ECA). In our experiments, behavioral analysis shows that ECA agents develop active perception and begin to construct their own ontological perspective on the environment. **Relevance:** This publication relates to constructivism by the fact that the agent learns from input data that does not convey ontological information about the environment. That is, the agent learns by actively experiencing its environment through interaction, as opposed to learning by registering observations directly characterizing the environment. This publication also relates to enactivism by the fact that the agent engages in self-programming through its experience from interacting with the environment, rather than executing preprogrammed behaviors.
http://cepa.info/1009

Biology

> Sharov A. A. (2009) Role of utility and inference in the evolution of functional information. Biosemiotics 2: 101–115.

>> Functional information means an encoded network of functions in living organisms, which is represented by two components: code and an interpretation system, which together form a self-sustaining semantic closure. The interpretation system consists of inference rules that control the correspondence between the code and the function. The utility factor operates at multiple time scales: short-term selection drives evolution towards higher survival and reproduction rates within a given fitness landscape, and long-term selection favors those inference rules that support adaptability and lead to evolutionary expansion of certain lineages. Inference rules make short-term selection possible by shaping the fitness landscape and defining possible directions of evolution, but they are under the control of the long-term selection of lineages. Communication normally occurs within a set of agents with compatible interpretation systems, which I call a "communication system" (e.g., a biological species is a genetic communication system). This view of the relation between utility and inference can resolve the conflict between realism/positivism and pragmatism. Realism overemphasizes the role of inference in evolution of human knowledge because it assumes that logic is embedded in reality. Pragmatism substitutes usefulness for truth and therefore ignores the advantage of inference. The proposed concept of evolutionary pragmatism rejects the idea that logic is embedded in reality; instead, inference rules are constructed within each communication system to represent reality, and they evolve towards higher adaptability on a long time-scale. **Relevance:** This paper applies pragmatism and ineractivism (Bickhard) to biological evolution. It suggests that biosemiotics rests on evolutionary pragmatism.
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2759718/ or http://cepa.info/1005

> Sharov A. A. (2011) Functional information: Towards synthesis of biosemiotics and cybernetics. Entropy 12: 1050–1070.

>> Biosemiotics and cybernetics are closely related, yet they are separated by the boundary between life and non-life: biosemiotics is focused on living organisms, whereas cybernetics is applied mostly to non-living artificial devices. However, both classes of systems are agents that perform functions necessary for reaching their goals. I propose to shift the focus of biosemiotics from living organisms to agents in general, which all belong to a pragmasphere or functional universe. Agents should be considered in the context of their hierarchy and origin because their semiosis can be inherited or induced by higher-level agents. To preserve and disseminate their functions, agents use

functional information – a set of signs that encode and control their functions. It includes stable memory signs, transient messengers, and natural signs. The origin and evolution of functional information is discussed in terms of transitions between vegetative, animal, and social levels of semiosis, defined by Kull. Vegetative semiosis differs substantially from higher levels of semiosis, because signs are recognized and interpreted via direct code-based matching and are not associated with ideal representations of objects. Thus, I consider a separate classification of signs at the vegetative level that includes proto-icons, proto-indexes, and proto-symbols. Animal and social semiosis are based on classification and modeling of objects, which represent the knowledge of agents about their body (Innenwelt) and environment (Umwelt). **Relevance:** The paper suggests an agency-based approach to biosemiotics. This approach is related to the interactivism of Mark Bickhard.
http://www.mdpi.com/1099-4300/12/5/1050/pdf or http://cepa.info/1006

Cognitive Science

> Colombetti G. (2013) The feeling body. Affective science meets the enactive mind. MIT Press, Cambridge MA.

>> This book takes ideas from the enactive approach developed over the last twenty years in cognitive science and philosophy of mind and applies them for the first time to affective science – the study of emotions, moods, and feelings. Colombetti argues that enactivism entails a view of cognition as not just embodied but also intrinsically affective, and she elaborates on the implications of this claim for the study of emotion in psychology and neuroscience. In the course of her discussion, the author focuses on long-debated issues in affective science, including the notion of basic emotions, the nature of appraisal and its relationship to bodily arousal, the place of bodily feelings in emotion experience, the neurophysiological study of emotion experience, and the bodily nature of our encounters with others. **Relevance:** The author draws on enactivist tools such as dynamical systems theory, the notion of the lived body, neurophenomenology, and phenomenological accounts of empathy.

> Froese T. Iizuka H. & Ikegami T. (2014) Embodied social interaction constitutes social cognition in pairs of humans: A minimalist virtual reality experiment. Scientific Reports 4: 3672.

>> Scientists have traditionally limited the mechanisms of social cognition to one brain, but recent approaches claim that interaction also realizes cognitive work. Experiments under constrained virtual settings revealed that interaction dynamics implicitly guide social cognition. Here we show that embodied social interaction can be constitutive of agency detection and of experiencing another's presence. Pairs of participants moved their "avatars" along an invisible virtual line and could make haptic contact with three identical objects, two of which embodied the other's motions, but only one, the other's avatar, also embodied the other's contact sensor and thereby enabled responsive interaction. Co-regulated interactions were significantly correlated with identifications of the other's avatar and reports of the clearest awareness of the other's presence. These results challenge folk psychological notions about the boundaries of mind, but make sense from evolutionary and developmental perspectives: an extendible mind can offload cognitive work into its environment. **Relevance:** This paper builds on an enactivist approach to cognition (Varela et al.).
http://www.nature.com/srep/2014/140114/srep03672/full/srep03672.html or http://cepa.info/1012

Cybernetics

> Foerster H. von, Mueller A. & Mueller K. H. (2013) The beginning of heaven and earth has no name. Fordham University Press, New York NY.

>> Heinz von Foerster was the inventor of second-order cybernetics, which recognizes the investigator as part of the system he is investigating. The Beginning of Heaven and Earth Has No Name provides an accessible, nonmathematical, and comprehensive overview of von Foerster's cybernetic ideas and of the philosophy latent within them. It distills concepts scattered across the lifework of this scientific polymath and influential interdisciplinarian. At the same time, as a book-length interview, it does justice to von Foerster's élan as a speaker and improviser, his skill as a raconteur. Developed from a week-long conversation between the editors and von Foerster near the end of his life, this work playfully engages von Foerster in developing the difference his notion of second-order cybernetics makes for topics ranging from emergence, life, order, and thermodynamics to observation, recursion, cognition, perception, memory, and communication. The book gives an English-speaking audience a new ease of access to the rich thought and generous spirit of this remarkable and protean thinker. **Relevance:** It presents the most comprehensive interview with Heinz von Foerster available in English.

Educational Research

> Affifi R. R. (2011) What Weston's spider and my shorebirds might mean for bateson's mind: Some educational wanderings in interspecies curricula. Canadian Journal of Environmental Education 16: 46–58.

>> Education has institutionalized a process that reifies cultures, ecological communities, and ultimately evolution itself. This enclosure has lessened our sensitivity to the pedagogical (eteragogical) nature of our lived relations with other people and with other living beings. By acknowledging that learning and teaching go on between species, humans can regain an eteragogical sense of the interspecies curricula within which they exist. This article explores interspecies lived curricula through a selection of ideas from ecopragmatist Anthony Weston, and cybernetician Gregory Bateson, and through lived experiences with shorebirds of Lake Ontario. Some gulls and a tern teach the author to enrich and diversify, rather than constrict, the potentiality of life. In so doing, being ecological and being educative become unified concepts. **Relevance:** The publication is concerned with the relational implications between humans and other species of Bateson's cybernetic theory of learning.
http://cjee.lakeheadu.ca/index.php/cjee/article/view/949

> Hackenberg A. J. (2013) The fractional knowledge and algebraic reasoning of students with the first multiplicative concept. Journal of Mathematical Behavior 33: 1.

>> To understand relationships between students' quantitative reasoning with fractions and their algebraic reasoning, a clinical interview study was conducted with 18 middle and high school students. Six students, with each of three different multiplicative concepts, participated. This paper reports on the fractional knowledge and algebraic reasoning of six students with the most basic multiplicative concept. The fractional knowledge of these students was found to be consistent with prior research, in that the students had constructed partitioning and iteration operations but not disembedding operations, and that the students conceived of fractions as parts within wholes. The students' iterating operations facilitated their work on algebra problems, but the lack of disembedding operations was a significant constraint in writing algebraic equations and expressions, as well as in generalizing relationships. Implications for teaching these students are discussed. **Relevance:** In this paper the author uses second-order models of students' multiplicative concepts and fractional knowledge built from radical constructivism to explore relationships between students' fractional knowledge and algebraic reasoning. The paper is therefore one contribution to the construction of second-order models of students' algebraic reasoning, which is sorely needed by the field of mathematics education, particularly for students who struggle to learn algebra.
http://cepa.info/992

Ethics

> Kenniff T.-B. & Sweeting B. (2014) There is no alibi in designing: Responsibility and dialogue in the design process. Opticon 1826(16): 1.

>> This paper explores a potential relation between architecture and ethics intrinsic to design processes when understood in terms of dialogue or conversation. We draw on separate but related research interests: one focused on the design process, especially the significance of drawing, and the other on the ethics of designing for the public realm, with reference to Bakhtinian dialogism. Our investigation concentrates on two aspects of the design process, both of which can be thought of in terms of conversation – first, the relation between architect and Other, and second, the act of drawing. Through this, we support the idea that in design the ethical and the aesthetic cannot be meaningfully separated from one another. Instead, their relation must be understood as a dialogue in and of itself, as well as part of the dialogue between all participants in the design process. **Relevance:** This article develops a cybernetic understanding of the design process, based on the analogy between conversation and sketching (and the work of Glanville and Pask), in relation to the dialogues that designers hold with those they design for; in so doing it suggests a connection between a cybernetic understanding of epistemology and ethical questions.
http://dx.doi.org/10.5334/opt.bj

Interdisciplinary

> Parmentier Cajaiba A. & Avenier M. J. (2013) Recherches collaboratives et constructivisme pragmatique: Eclairages pratiques. Recherches Qualitatives 32(2): 201–226.

>> This paper offers practical guidance for collaboratively developing academic knowledge in interaction with professional practitioners in various fields such as management, education, communication, social work, etc., and rigorously justifying it in the epistemological framework of "pragmatic constructivism." The knowledge elaborated has the further property of being considered by practitioners as relevant for the professional practice considered. The guidance offered in the paper holds more specifically for research done in the so-called "dialogical model" of doing collaborative research. This model of engaged scholarship comprises five broad activities: specifying a research question, elaborating local knowledge, developing conceptual knowledge, communicating knowledge, and activating knowledge. The paper finely explains how to carry out these activities in practice and provides numerous illustrations of examples stemming from a completed research project. **Relevance:** It offers practical guidance on ways to rigorously conduct a collaborative research project (with practitioners) and justify the research process carried out and the results obtained, in the epistemological framework of radical constructivism.
http://revue.recherche-qualitative.qc.ca/edition_reguliere/numero-32-2/32-2-parmentier-avenier.pdf or http://cepa.info/991

Philosophy

> Brier S. & Joslyn C. (2013) What does it take to produce interpretation? informational, peircean, and code-semiotic views on biosemiotics. Biosemiotics 6(1): 143–159.

>> This paper presents a critical analysis of code-semiotics, which we see as the latest attempt to create paradigmatic foundation for solving the question of the emergence of life and consciousness. We view code semiotics as an attempt to revise the empirical scientific Darwinian paradigm, and to go beyond the complex systems, emergence, self-organization, and informational paradigms, and also the selfish gene theory of Dawkins and the Peircean pragmaticist semiotic theory built on the simultaneous types of evolution. As such, it is a new and bold attempt to use semiotics to solve the problems created by the evolutionary paradigm's commitment to produce a theory of how to connect the two sides of the Cartesian dualistic view of physical reality and consciousness in a consistent way. **Relevance:** This paper relates to cybersemiotics and Maturana and Varela's theory.
http://cepa.info/1013

> Podnieks K. (2014) The dappled world perspective refined. The Reasoner 8(1): 3–4.

>> In this article I show how the Dappled World Perspective can be refined in the model-based model of cognition. The very idea of modeling as replacing implies severe limitations. And this implies the Dappled World perspective at the level of models: neither humans nor robots can hope to create a single model for extensive parts of their environment. At the model level, we will always have only a patchwork of models, each

very restricted in its application scope. Thus, to manage what happens in the world, we need to generate a variety of different models. Could this be done by means of a single "theory of everything" (or, at least, by means of a limited system of theories), i.e., without any ad hoc assumptions? **Relevance:** This model-based model of cognition is a radical version of non-dualism.
http://www.kent.ac.uk/secl/philosophy/jw/TheReasoner/vol8/TheReasoner-8(1).pdf or http://cepa.info/993

Psychology

> Efran J. S., McNamee S., Warren B. & Raskin J. D. (2014) Personal construct psychology, radical constructivism, and social constructionism: A dialogue. Journal of Constructivist Psychology 27: 1–13.

>> This article presents a dialogue about personal construct psychology, radical constructivism, and social constructionism. The dialogue is based on a symposium conducted in July 2011 at the 19th International Congress on Personal Construct Psychology. Jay Efran, Sheila McNamee, and Bill Warren were the participants, with Jonathan Raskin as moderator. The dialogue addresses points of contact and divergence across these three theories, how these theories deal with the issue of relativism, and how theorists from these three perspectives might best "go on" together. **Relevance:** The paper covers the relationship between radical constructivism and personal construct psychology and social constructionism.

Visual Arts

> Bexte P. (2005) Heinz von Foerster in the art department: A collide-oscope in four parts. Kybernetes 34(3/4): 485–489.

>> Purpose: To provide illumination of how systems tend to produce an output nobody expected. It is in these moments that observers may learn something about their own expectations. Design/methodology/approach – The paper discusses two cases in the history of art: faked Vermeer paintings and a test Heinz von Foerster did in the art department at the University of Illinois. Findings: McLuhan's notion of the "collide-oscope" is applied to the way Heinz von Foerster (ab)uses images in his own texts; furthermore it is applied to the way the BCL was organized. The formal structure of the "collide-oscope" offers a model of perception. Originality/value – Provides a discussion of a fundamental message of cybernetics – that we cannot escape collisions and disturbances. They are its essence. **Relevance:** This paper relates to the second-order cybernetics of Heinz von Foerster.
http://cepa.info/1011

> Filippone Christine (2013) Ecological systems thinking in the work of Linda Stein. Woman's Art Journal 34: 1.

>> Scholars have described the sculptures of Linda Stein, limbless, classicizing, thick-waisted female forms that are often wearable, in the context of gender performativity and/or embodied subjectivity, informed by the sumptuousness of her materials, which invite a haptic or touch-centered response. To encompass the performative nature of her wearable sculpture used as a component of her political activism and her developing concept of the interrelationship between individual, society and environment, I propose a reading through the lens of systems theory, particularly the concept of open systems. Associated with life, growth, and change, open systems took on political and social resonance for artists like Stein maturing in the late 1960s and early 1970s. Historically coincident with the American women's movement, the theorization of open systems in relation to society, biology and the environment was deployed by women artists in the early 1970s as an alternative means of conceiving social and environmental relationships. **Relevance:** I discuss the artist's work through the theory of Gregory Bateson. In 1972, the anthropologist and cyberneticist argued that individuals, societies and ecosystems must be conceived integrally, as a complex, interrelated system. The notion of a self-sufficient, independent self is a fallacy in this model. According to Bateson, Mind itself expands to become "immanent in the larger system [of] man plus environment."
http://cepa.info/994

> Sweeting B. (2011) Conversing with drawings and buildings: From abstract to actual in architecture. Kybernetes 40(7/8): 1159–1165.

>> Purpose: The purpose of this paper is to describe the various movements from abstraction to actuality in the context of design, with particular reference to architecture, first in terms of the design process and second in terms of the interpretation of architecture by observers. Design/methodology/approach – The paper focuses on the designers' use of forms of representation, such as drawings, with reference to the cybernetic understanding of conversation. This account is then used to discuss the representational properties of architecture itself and to relate this back to the design process. Findings: It is argued that the forms of representation used by designers, such as drawings and physical models, have both abstract and actual properties and that this combination is important for their representational function. The ambiguity in the interpretation of drawings and models is not only useful in generating ideas but also appropriate given the ambiguity in the interpretation of the architecture they represent. Originality/value – The division between the abstract (understood in terms of representation) and the actual is challenged. A connection is proposed between architecture itself as a form of representation and the representation used in its design. **Relevance:** This article extends and reflects on the analogy between cybernetic conversation and design in relation by understanding our experience of architecture as also a form of conversational exploration.
http://cepa.info/1002