



# Designing cybersystemically for symviability

Designing for  
symviability

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## Abstract

**Purpose** – The purpose of this paper is to encourage professional designers of many kinds, and especially those of the entertainment media, to understand themselves as actually being partners in a common educative enterprise, which is through artistry, predictive knowledge, non-dominative legitimative discourse and technology, helping people everywhere to learn to desire to, and to be able to, survive reasonably pleasantly on Earth for a very long time to come.

**Design/methodology/approach** – This paper puts forward three theses: collapse of civilisation is immanent unless people can be educated to live symbiotically with one another and Gaia; all designs have educative and mis-educative importance; designers need to learn to use higher level cybersystemic approaches to be beneficial. Then it argues for the plausibility of these theses from philosophical educational to practical perspectives. In particular, it argues for the importance of modifying cultural propagation so that all our main cultures can become “symviable” – that is can come to live symbiotically with one another and with the ecosystems of Earth. And it is argued that, in order to facilitate this enterprise, a cybernetic understanding of the processes and actions of the complex historically emergent higher level cybersystems in which the authors are all embedded, and which are embedded in us, should become the basis for designers, actual practice.

**Findings** – By reviewing designers’ functional levels historically the paper finds that many different kinds of influential designers have actually functioned at the higher cybersystemic levels the authors advocate and hence can be guiding exemplars in this newly precarious situation.

**Originality/value** – A deeper cybersystemic understanding of just how people are all parts of one mutually educating and mutually surviving Earth-life system changes the value of everything. Designers who manage to use such understanding should be both more successful and more satisfied with the value of their work.

**Keywords** Sustainable design, Cybernetics, Design

**Paper type** Viewpoint

Universal educational cybernetics maxim:

Act in such a way as to increase options for acting (von Foerster, 1984).

## 1. Introduction

This paper is designed to address creative designers of many kinds (and especially entertainment and advertising designers) in order to propose important considerations for our collaborative educative work to ensure our “symviability” – mankind’s ability to act together to ensure reasonably pleasant long-term human survival on Earth. A critical-realist ontology (Bhaskar, 2002), and an evolutionary emergent levels epistemology (Boyd, 2000) are used.



### *1.1 Kinds of creative designers*

If one takes a very broad definition of designing as whatever action brings into being new, bounded systems which as wholes have valuable properties that none of their components standing alone have, and then the class of designers is a very wide one. To narrow our scope, let us exclude Darwinian biological evolutionary designing processes which give rise to such things as new emergent insect forms. Our audience can also be better focussed by asserting that what is essential is that you be human designers producing specifications or realisations for valuable (to someone) novel emergent systems/processes. A musical composer producing a new score which she or some others value, is such a designer. A virtual-reality game designer may today be a most important sort of designer. A philosopher producing a new, and by some valued, well-formed philosophical method or system is also a designer in the sense meant here, as is a well received poet. Moreover, in keeping with commonsense pragmatism which tells us that designers are whoever call themselves designers, one should emphasize that for most soi-disant designers: composers artists and many engineering designers, the aesthetic dimension of their work is at least as important, if not more so, than the practical, economic and moral dimensions. Having defined our main audience next we set out three main theses:

- (1) Given limited resources on Earth, and given current and foreseeable technology, and given the humanimal instinct to propagate and most seriously given the human imperative to develop and competitively propagate (quasi)immortal collective cultural identities we are going to experience a devastating collapse of population and civilisation later in this century, unless enough people all around the world can be educated to work toward eco-co-cultural symbiosis – what here is called e-symviability.
- (2) Designs of objects and performances, which are actually experienced by people, are not neutral, but are very important educative or, too often, mis-educative influences.
- (3) Designers and educational technologists really need to learn cybernetic systemic thinking and modelling to adequately understand what they are doing and how to do it more effectively for our collective eudemony and long-term survival.

## **2. Education for symviability is now paramount**

“Symviability” is a new term which we use to refer to the ability of human cultures to adjust harmoniously to each other and to nature, that is to live symbiotically with each other and with as great a diversity of biological systems as possible. It is an extension of Stafford Beer’s conceptualisation of “Viable systems” (Beer, 1984). Each culture arises and is maintained by the evolved-in humanimal imperative to develop preserve and propagate its own cultural identity. Each culture has a survival and propagative imperative. For a culture to survive the people who carry it and the animals and plants which carry them, must all survive together. From this, you may gather that our ontology is a methodologically pragmatically chosen one (Rescher, 1977). The critical realist ontology at first seemed a good candidate but now Bhaskar’s (2002) meta-realist ontology commends itself to us by transcending possessive individualism.

Now that world population is most likely to reach nine billion by 2050, and the ecological footprints of most cities far exceed their local territories, for any civilisation to survive (Rees, 2006) a universal conserving and sharing culture must be developed (Targowski, 2004). Therefore, the over-riding role of life-long education world-wide has to be oriented toward viability through understanding and being committed to ecological and co-cultural symbiosis. Without a deeper understanding of the required modifications to each and every culture in order to limit destruction of non-renewable resources and limit human population, and limit “crimepetitive” competition, we will continue destroying “Space-ship” Earth. For life on Earth to go on surviving, cultural competition for brain space, by advertainment in particular, must be regulated democratically. Such regulation needs to be legitimated discursively (Habermas, 1975) on the basis of scientifically-sound shared understandings. Most ventures normally are legitimated either historically (this is what we have always done!), or on the basis of deference to some respected authority. But Habermas argues for “discursive legitimation” which involves non-dominative negotiative discourse including representatives of all the stake-holders to discuss until, at least near consensus is achieved about what is to be done.

Given current communication and entertainment technology, e.g. (TV evangelists’ religious proselytizing and addictive advertainment) cultural competition for Lebensraum and brain space is leading not merely to terrorism and wars, but is becoming unwittingly “vivicial”. There are particularly acute problems with the designs of massive multiplayer online games (Bolton, 2007) and other “mind-altering” media (Phillips, 2007). A global overview of cultural and economic competition and environmental destruction seems to indicate that we are heading toward the extinction of civilised human life, and much other, life on Earth as well (Oelschlager, 1992).

### 3. What everyone needs to learn for symviability, and why

In order for us to co-steer the systems we are in and the systems within us (where it is possible to do so), we have to understand how these complex-conflictual dynamic systems actually work in the physical-biological world (Roth, 2003). Learning to see relevant communicontrol system boundaries and then learning to do histories of systems so that at least roughly predictive modelling becomes possible is the first step. Then learning to do sensitivity analyses to determine where and when small interventions can have big effects in the desired direction, without bad side-effects, is clearly essential for choosing what to do. That is to say, cybersystemic knowledge, tools and skills are essential.

Of course, designers also need deep transcultural appreciations, and sensitive interpersonal negotiating strategies, skills and commitments if successful influence is to be exerted to steer the World’s cultural-economic-political-techno systems away from mutually assured self-destruction.

It is true that modern biology curricula, and control-engineering curricula, and some socio-cybernetics programmes and applied human sciences courses do offer much of the needed knowledge and skills to a small minority of the World’s learners. However, since much of such cybersystemic study tends to be embedded in specific disciplinary work situations, people often have great difficulty transferring their knowledge to other situations where it is now also vitally important. The still strong ideological current of exploitive objectifying modernism (Toulmin, 1990) also tends to exert

pressure against transferring such basic cybernetic understandings to wider socio-political solutions.

Given the present technological advances, with their global character and their encroachment on even spheres traditionally viewed as the most private ones, we certainly require major new adjustments in education to cope with this cultural turbulence. Moreover, given our ecological awareness today, education has to be an organic element supporting the symbiotic viability of the overall environment in which we all live. Consequently, world-wide education for ecological-cultural and multicultural symbioses which can helpfully be called “Symviability” should be our highest educative priority for the next few decades (After that it will probably be too late).

#### **4. All designs are: educative or/& mis-educative unless ignored**

##### *4.1 Kinds of designers*

We recognize very different salient types of designers – the practical problem solver – engineering designer, the aesthetic seducer, the game-player negotiator, the dramatic romantic “auteur” individualist, the utopian visionary and yes, philosophical discourse designers’. All create visions which when embodied in drawings, writings or musical scores, etc. inform the work of performers, makers and builders – also that of suicides, murderers and wreckers. **Art is successful as art if and only if it captures people’s attention, is held in memory and informs their future actions so that it goes on propagating. The aesthetic dimension is crucial here both for the attractiveness of the works and for their retention and re-creation (Pye, 1978). Signed art generates reputations, for designers that connect art with markets for survival and growth. All art is first of all then, the design of successful memes and memplexes (Dawkins, 1976; Balkin, 1998) – ones which are aesthetically seductive and prompt continuing reproduction by their hosts. Important art changes, the options people feel and/or understand to be available to them. If the newly perceived options are practically and socially-ecologically valuable to the receivers then the art is educative, if they are not it is mis-educative. Valuation, like all valuations, is not an intrinsic property of the design, but has to be assessed relative to the characteristics of audiences (Lemos, 1994).**

##### *4.2 Designers as educators and mis-educators*

For our purposes, properly educative experiences are defined as only those which guide and support persons to construct socially and ecologically responsible attitudes and commitments together with potent knowledge and skills. Cultivating potent knowledge and skills without responsible commitments is mis-educative. Since, culture is whatever is transmitted from human generation to generation by other than genetic-cytosomic means, all of our designed artefacts are at least passive propagators of culture, are indeed educative or mis-educative, whatever else they may have been intended to be. A round table promotes affable discourse, a long narrow table authoritarian discourse.

When any designs are realised and used by people education (or mis-education) invariably arises from them. Technology increases the educational impact and the number of persons “educated” by designs. Therefore, nearly all technology whatever its professed purpose, is actually about people-making – steering, leverage and coverage, not just efficiency or profit. For example, because they evoke the metaphor of

bridging gaps between people which is so important to us, physical bridges should be designed to look inspiring, not just to carry a lot of traffic safely.

A great deal of serious mis-education goes on today through the creative designs of the mass media including the internet, and irresponsibly designed addictive toy-games (Phillips, 2007).

## 5. Cybersystemics which designers as educators need to learn

The visions of designers have five essential dimensions – the practical, the aesthetic, the political, the moral and the teleogenic (- that which generates aims and goals). Cybernetics as the science of communication and control obviously has much to contribute to the practical, the aesthetic and the political dimensions of design. “Cybersystemics” (which is Boyd’s (2000) name for the science of historically and evolutionarily emergent levels of cybersystems, including “second-order” (von Foerster, 1984) cybersystems) has much to contribute to the aesthetic, moral and teleogenic, not just the practical, dimensions of design. Philosophy (Toulmin, 1990; Bhaskar, 2002) and ecological science (Rees, 2006) can and should contribute greatly to the teleogenic dimension of design if it is to educate towards long-term human survival, rather than against it.

### 5.1 *Optimally chosen emergent cybersystemic levels*

An ontology of at least three emergent levels is generally, although even that is not, alas, universally, accepted to be what nature has designed through evolution. It is accepted that life emerged from highly dissipative non-living physical mass-energy sources, and that Homo-sapiens sapiens emerged as it were “designed” by evolution from other mammal life and that coherent cultures emerged designed by human life.

For purposes of education and educational design it is very useful to define a somewhat more fine grained model framework of emergent cybernetic systemic levels (Abbott, 2007), one where each level is characterized by what it must control in order to exist, and that is by the functional control capability which it must both protect and exercise in order to exist (Table I).

Abbreviation	Name of emergent level	Type of uncertainty reduced by its actions
EHS	Earth-humanity-symviability	Uncertainty of very long-term reasonably pleasant eco-co-cultural survival on Earth
S	Scientosophic	Uncertainty about how everything and everybody is likely to behave if X is done
L	Liberative	Uncertainty of overcoming pathological cognitive-fixities, addictions and neuroses
ICP	Identity conjugo-propagative	Uncertainty of transvidual identity-memplex survival
N	Negotiative	Uncertainty of on-going continuing ability to negotiate
V	Viral	Uncertainty of formal (Gestalt) reproduction
S	Sustenential	Uncertainty of short-term survival
P	Physical mass-energy carriers	Various

**Table I.**  
Emergent levels of  
cybersystems

At the bottom is the oldest Physical systems level. Energy-mass systems are entropic-they just get colder and messed up and spread out. Above that we have various classes of systems which either we maintain or which maintain themselves by using a lot of energy and varied materials. A “Sustenential level system” must preserve and exercise its ability to seek, acquire and use appropriate forms of available energy, and get rid of waste, in order to survive. A “Viral” level parasitic system must preserve and exercise its ability to attract (perhaps aesthetically) and connect into hosts which will reproduce it. A “Negotiative” level system must preserve its ability to negotiate (perhaps morally) with other negotiative systems to sustain its capacity to go on doing so. An “Identity Conjugative-reproductive” level system must marry into such other complementary systems as will enable its indefinitely ongoing reproduction. A “Liberative” level system must liberate others from behavioural (neuroses) and cognitive fixities in such ways as will ensure its ability to continue learning as a liberative system. A “Scientosophic” level system enlarges and deepens its coherent reliable model of the universe in whatever ways enable it to go on doing so. The slowly coming into being universal “Ecolo-co-cultural Symviable” system preserves and improves whatever it finds sustains the desire and ability to survive happily together on Earth longer – indefinitely if possible.

Can educational systems actually be “designed” in sufficiently inspiring ways to get most people to become productive members of these two higher-order systems? -and if so how? Perhaps – yes. Let us consider what designers have done and are doing now.

*5.1.1 A categorization of designers who have learnred to work at the successive emergent cybersystemic levels.* Designers play a number of roles, depending on the situation and on their ambitions:

- (1) *Sustenential designers.* The designer as “Servant” sees a need and imagines how it can be met by practical means and works professionally to achieve a satisfying result. Such designers are well reputed within their profession but remain largely unknown to the public. The typographers: Christophe Plantin, William Caslon and Robert Bringhurst come to mind, millions of students have read more easily and thoughtfully because of their unobtrusive work without ever noticing its peculiarities – or knowing their names. Many cyberneticists and computer scientists, etc. have designed practical systems such as dynamic systems simulators of great educative value. Others have specifically designed systems to serve educative purposes and a few of these have actually called themselves “educational cyberneticists” – notably; Gordon Pask, Helmar Frank, Milos Lansky and Gary Boyd. There have been and are many educational technologists who make cybernetic systems theory central to their work without labelling themselves as cyberneticists *per se*. Lawrence Stolurow and Lev Landa were important pioneers in its use, as were Leonard Silvern and Bela Banathy. Currently, Diana Laurillard, Charles Reigeluth and David Jonassen, are leading exemplars.
- (2) *Cost-effective designers.* Designers of mass-production goods and services who design-out manufacturing and delivery costs, while designing-in attractiveness to customers. The anonymous Texas instruments’ designer of “Speak & Spell™” and Barry Richmond the designer of the dynamic systems modeller Stella™” and the designers of CoSy™ and Web-ct™ are good examples. They too are



mostly anonymous outside their professional niches, but have benefited many thousands of learners.

- (3) *Conjugo-propagative designers*. These get you to clone parts of their identity into yours. The “Auteur” the prima-donna of design whose work has a clear striking form – a stylistic signature, to ensure recognition and memorability is archetypical. Their works have been monuments of renaissance as in the cases of Andrea Palladio, or Pugin and are contemporary inspirational models such as the works of Gaudi, Hundertwasser and Ghery. Specifically, for education some of the most notably successful identity-propagative designers have been educational television producers such as David Suzuki. In the computer-aided learning field Seymour Papert with his LOGO language and Mindstorms marketing book is probably the best known designer personality.
- (4) *Liberative designers*. Here we find the great artists who changed the ways of seeing altogether Giotto, Leonardo, DuChamp, Picasso, and more recently say Francis Bacon the painter. More mundane “Therapist” designers are, for example, clothing designers and interior designer/decorators who, like good portrait painters, get to know their clients so that they can design wonderfully supportive works. Then too here belong the designers of the monumental modern architecture revolution – Walter Gropius and Mies Van der Rohe – Bauhaus minimalism – “less is more” *et alia*. Their educational equivalents are perhaps: – Johann Amos Comenius with the first illustrated textbooks, Maria Montessori with her experiential *realia*, and B. F. Skinner with teaching machines employing intermittent positive reinforcement to shape learning through hundreds of tiny steps. Seymour Papert too was liberative with the introduction of his educational version of the recursive string-handling language LISP which he named LOGO. LOGO liberated teachers and students from the conceptual and rigid syntactic limitations of COBOL and FORTRAN, etc. and from the strait-jackets of programmed-instruction type CAI – as did the unfortunately less well publicized designers Collmaurer &co. with their declarative logic language PROLOG. In education today, perhaps Nunan (1983) who rails against constricting instructional design technology, and Sternberg and Facione who insist that the teaching of critical thinking is essential to free creativity in learners, are prime exemplars.
- (5) *Scientosophic designers*. Historically one thinks of the inspiring designs embodied in:- Plato’s *Republic*, Francis Bacon’s *Novum Organon*, Thomas More’s *Utopia*, Bento Spinoza’s, *Ethics*, Jean Jacques Rousseau’s *Emile*, Thomas Hobbes’ *Leviathan* and John Locke’s theory of the state, more recently Dewey’s (1928) *Progressive Education*, has been perhaps the most influential philosophical design for education. Rescher’s *Methodological Pragmatism* could be written up into an inspiring scientosophic educational design. Some think this of Von Glasersfeld’s *Constructivism and of Carl Bereiter’s* steps toward a better theory of mind (Bereiter, 2002).
- (6) *Trans-integrative earth-symviability designers*. Although this is the category we might all well aspire to, it is not altogether apparent who may actually be working at this quasi-transcendent level. Perhaps, we can include – Buckminster Fuller as exemplified in his tensegrity designs and his

*Nine Chains to the Moon*, and Lovelock with his *The Gaia Hypothesis*. Probably Targowski's "From Global to Universal Civilization" in the journal *Dialogue & Universalism*. Some of the science fiction writers and artists should qualify – perhaps Arthur C. Clarke with the film 2001 and Doris Lessing are with her Science Fiction. Homer-Dickson's *The Up-side of Down*, is a good recent example. Also, Bhaskar's (2002) *Reflections on Meta-Reality* fits very well here and its critical integrative meta-realism will endure and grow in significance we believe.

## 6. Practicalities

Of course, in daily life, in order to survive professionally, designers must function at least at all the basic levels up to and including the negotiative level. The negotiative level is essential for establishing the legitimacy of our endeavours through non-dominative discourse and for obtaining the co-operation and resources needed to realize our designs.

Beyond that, ideological educators function fiercely at the identity conjugo-propagative level. Emancipative critical thinking developer-designers such as radical artists, teachers (and psycho-therapists) and artist therapists function at the liberative level. Some philosophy and science professors design education at the scientosophic level. Some now also do so at the level of e-symviability cultivation.

Educational recursion is involved – designers first need to understand cybersystemics in more than intuitive and rule-of-thumb ways in order to design education embodying such understanding to educate everyone.

Why, to make our designs more beneficial should we aim to support global symviability capability by modelling how people can learn to participate in the three top-level socio-cybersystems? Because, only if these are more clearly and systematically incorporated in our designing can we clearly appreciate which kinds of uncertainty-reduction capabilities people are acquiring through our works and choose the most appropriate. All the levels of cybersystems have historically evolved to try to control their own survival. Because, we can pretty clearly determine as we go along, what it takes for them to be reasonably successful, they are a good basis for positively educative designing. Certain levels of positive educative value are most crucially important today. In order to function as symviability-educators, we designers need to function not merely on our habitual levels, but also at the top three emergent cybersystem levels – the liberative, the scientosophic and the Earth-symviability transintegrative levels.

## 7. Conclusion – designing global education for Earth-symviability is more likely if many more designers educate themselves to think cybersystemically

Designing legitimate public global education has to be carried out at many levels by many kinds of designers. To do so, all need to understand appropriate uses of cybernetic principles and how underlying cybersystemic processes generate our experienced world.

Moreover, while most designers operate within one sphere of design and are usually by sheer necessity of professional life limited to one of the roles mentioned above,



symviability would remain a purely theoretical construct unless they understood principles and importance of roles other than their own. Such broadening of horizon requires not just cybersystemic thinking in general, in its methodological aspects, but some understanding of interdependence of those various roles. Thus, goals and values in various areas of human activity as well as on less and more inclusive or general levels must be viewed as interconnected in their status as well as in their consequences. Designers' purely instrumental use of reason for immediate reputational advantage sours quickly and in the long run often becomes downright pathological for us all — as is the case with violent entertainment media designs. Such opportunism is a form of what Garrett Hardin explained to us as the “tragedy of the commons”; let us together learn to rise above such myopic designing.

## References

- Abbott, R. (2007), “Emergence explained; getting epiphenomena to do real work”, available at: [Russ.Abbott@GMail.com](mailto:Russ.Abbott@GMail.com)
- Balkin, J.M. (1998), *Cultural Software; A Theory of Ideology*, Yale University Press, New Haven, CT.
- Beer, S. (1984), “The viable system model: its provenance, development, methodology and pathology”, *Journal of the Operational Research Society*, Vol. 35 No. 1, pp. 7-25.
- Bereiter, C. (2002), *Education and Mind in the Knowledge Age*, L. Erlbaum Associates, Mahwah, NJ.
- Bhaskar, R. (2002), *Reflections on Meta-Reality; Transcendence, Emancipation and Everyday Life*, Sage, New Delhi.
- Bolton, J. (2007), “Distinguishing addiction and high engagement in the context of on-line game playing”, *Computers and Human Behavior*, Vol. 23 No. 3, pp. 1531-48, including the special Issue: Avoiding simplicity, confronting complexity: advances in designing powerful electronic learning environment.
- Boyd, G.M. (2000), “The identification of levels of action through the use of stratified computer-communications media; towards the thoughtactorium”, *Systemica*, Vol. 12 No. 1, pp. 29-41.
- Dawkins, R. (1976), *The Selfish Gene*, Oxford University Press, Oxford.
- Dewey, J. (1928), “Progressive education and the science of education”, *Progressive Education*, Vol. 5, pp. 197-204.
- Habermas, J. (1975), *Legitimation Crisis*, Beacon Press, Boston, MA.
- Lemos, N.M. (1994), *Intrinsic Value: Concept and Warrant*, Cambridge University Press, Cambridge Studies in Philosophy, Cambridge.
- Nunan, T. (1983), *Countering Educational Design*, Croom Helm, London.
- Oelschlager, M. (Ed.) (1992), *The Wilderness Condition*, Island Press, New York, NY.
- Phillips, H. (2007), “Mind-altering media”, *New Scientist*, Vol. 94 No. 2600, pp. 33-7.
- Pye, D. (1978), *The Nature and Aesthetics of Design*, Van Nostrand, New York, NY.
- Rees, W. (2006), “The global integrity project”, available at: [www.globalecointegrity.net/ecofp.html](http://www.globalecointegrity.net/ecofp.html) (accessed 30 April 2007).
- Rescher, N. (1977), *Methodological Pragmatism*, New York University Press, New York, NY.

- Roth, W.-M. (2003), "From environmental determination to cultural-historical mediation: toward biologically plausible social theories", *Cybernetics and Human Knowing*, Vol. 10 No. 2, pp. 8-28.
- Targowski, A. (2004), "From global to universal civilization", *Dialogue and Universalism*, Vol. 14 Nos 3/4, pp. 121-42.
- Toulmin, S. (1990), *Cosmopolis: The Hidden Agenda of Modernity*, University of Chicago Press, Chicago, IL.
- von Foerster, H. (1984), *Observing Systems*, Seaside California, Intersystems, Salinas, CA.

### Further reading

- Boulding, K. (1956), *The Image*, University of Michigan Press, Ann Arbor, MI, pp. 200-7.
- Boyd, G. (2006), "Reinventing education for realistic hope of on-going eco-co-cultural humane long-term viability", in Nolan, V. and Darby, G. (Eds), *Re-inventing Education*, Synectics Educational Initiative, London.
- Boyd, G. and Zeman, V. (1995), "Multiple perspective co-channel communications as a knowledge and attitude reform tool for a sustainable civilisation", in Burkhardt, H. (Ed.), *Proceedings of the Ryerson Conference on Knowledge Tools for a Sustainable civilisation*, Ryerson University, Toronto.
- Britan, S. (2004), "A review of learning design: concept, specifications and tools", A report for the JISC e-learning pedagogy programme, available at: [www.jisc.ac.uk/uploaded\\_documents/ACF1ABB.doc](http://www.jisc.ac.uk/uploaded_documents/ACF1ABB.doc) (accessed on October 2006).
- Facione, P.A. (1990), "Critical thinking: a statement of expert consensus for purposes of educational assessment and instruction", ERIC document reproduction service no. ED315423, American Philosophical Association, Newark, DE.
- Frank, H. (1969), *Kybernetik Grundlagen der Padagogik*, Agis Verlag, Baden Baden.
- Homer-Dixon, T. (2006), *The Upside of Down; Catastrophe, Creativity and the Renewal of Civilization*, Knopf, Toronto.
- Klir, G.J. and Weierman, M.J. (1999), *Uncertainty-Based Information*, Physica Verlag, Springer Verlag, New York, NY.
- Lakoff, G. and Johnson, M. (1980), *Metaphors We Live By*, University Chicago Press, Chicago, IL.
- OED (1955), *The Shorter Oxford English Dictionary*, Oxford University Press, Oxford.
- Vickers, G. (1981), "Rationality and intuition", in Wechsler, J. (Ed.), *On Aesthetics in Science*, MIT Press, Cambridge, MA, pp. 143-65.
- Zwicky, F. (1948), "The morphological method of analysis and construction", *Courant Anniversary Volume*, Intersciences Publishers, New York, NY, pp. 461-70.

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Gary Boyd, PhD is a Professor of education (educational technology). He received his PhD in Geophysics from the University of British Columbia. Since 1968, he has been teaching in the MA and PhD educational technology programmes of Concordia University. His research specialty there is Educational Cybersystemics – his main research question being – what are the underlying processes which generate educative experience, and how can they be better co-steered with the aid of theory and technics? His research has been about; how to collaboratively design and conduct the knowledge building credibility-status games through modelling, simulations and structured conversational learning. He is also a serious amateur photographer, poet of sorts, and an amateur architect. Some main influences have been:

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Francis Bacon, Shakespeare, Dewey, Frank Lloyd Wright, Virginia Woolf, Norbert Wiener, Ross Ashby, Gordon Pask, Stafford Beer, Nicholas Rescher and Roy Bhaskar. Gary Boyd is the corresponding author and can be contacted at: [boydg@alcor.concordia.ca](mailto:boydg@alcor.concordia.ca)

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