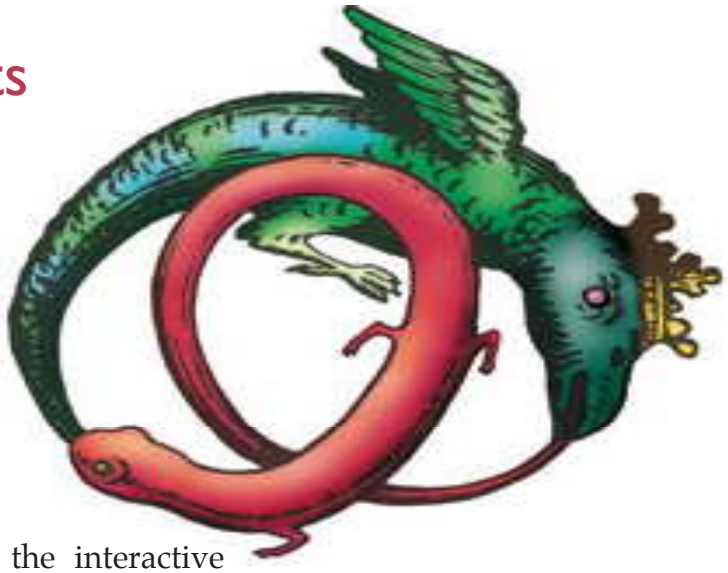
American Society for Cybernetics
2005 Annual Conference

The Many Interpretations and Applications of Cybernetics

Program & Abstracts

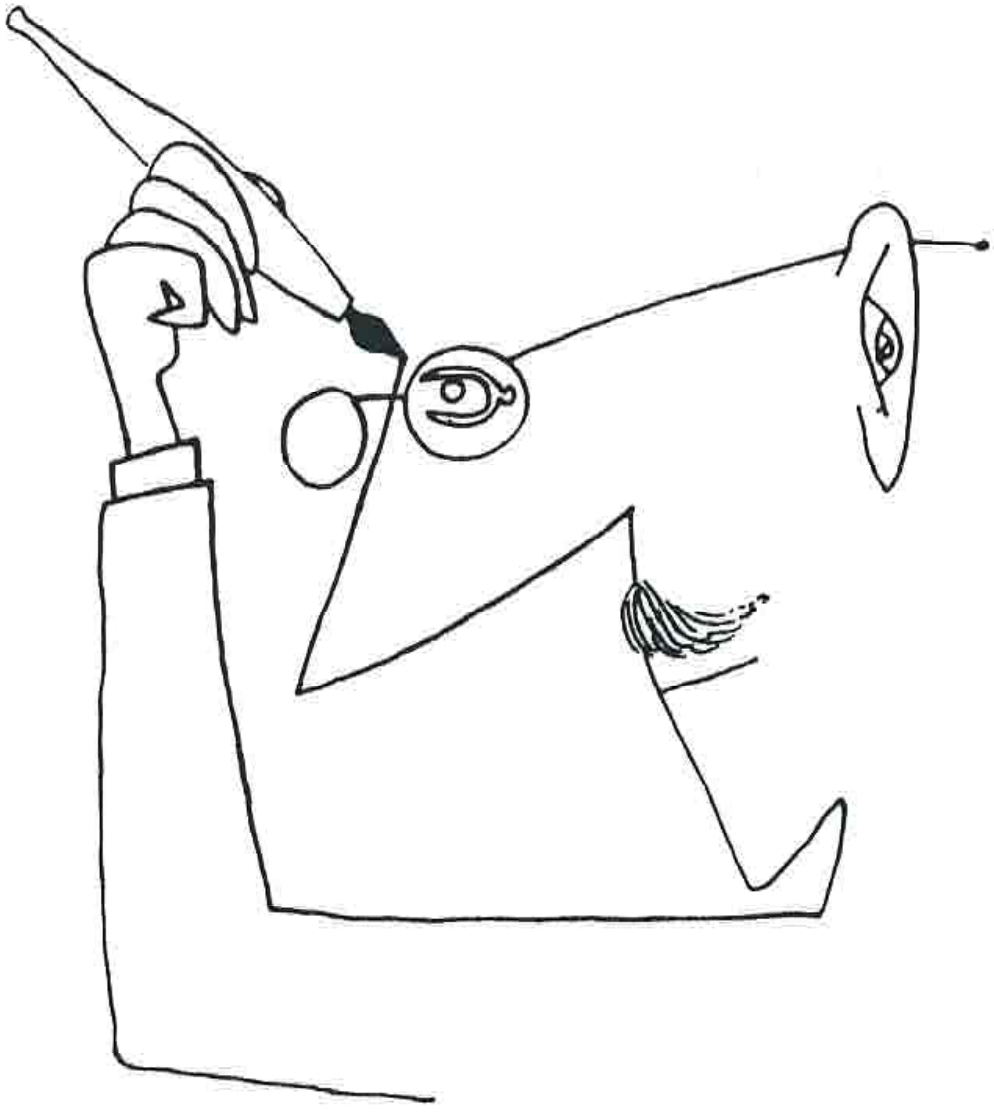


Communication is the interactive computation of a reality.

~Klaus Krippendorff

October 27–30, 2005

The George Washington University, Mt. Vernon Campus
2100 Foxhall Road, Washington, DC



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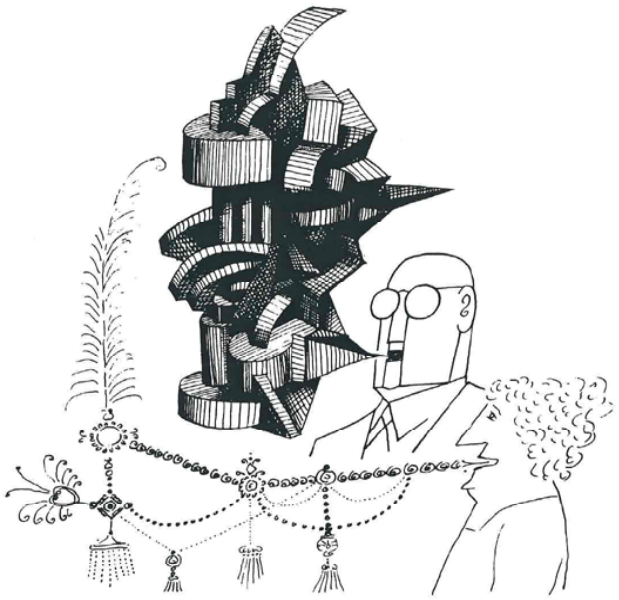
UK Systems Society
World Organization for Systems and Cybernetics

Symposia

A. Constructivism, History and Performance
   Chairperson: Alexander Riegler
B. Management
   Chairperson: Allenna Leonard
C. Epistemology and Mathematics
   Chairperson: Lou Kauffman
D. Therapy and Neurofeedback
   Chairperson: Andrea Maloney-Schara
E. Information Systems
   Chairperson: Raj Kanungo
F. Social Systems
   Chairperson: William Reckmeyer



Most of the figures in this booklet are taken from *Cybernetics of Cybernetics*, edited by Heinz von Foerster, Biological Computer Laboratory, University of Illinois, Urbana-Champaign, 1974.

PREFACE

This conference brings together people who have made important contributions to cybernetics and systems science in recent years. All of the various branches of cybernetics, including engineering cybernetics, biological cybernetics, management cybernetics, and social cybernetics are represented. Here are some highlights.

Takeshi Utsumi, who has been working for many years to bring the benefits of computer-based communications to developing countries will describe his work on creating a global university system. Eric Dent will explain his increasingly widely referred to study of what the various fields of systems science have in common and what obstacles have prevented their further integration. Stuart Umpleby will review reflexive theories, focusing on the work of George Soros, which provides a link between second order cybernetics and the fields of economics, finance, and political science.

Russell Ackoff, who has made well-known contributions to the field of strategic management, will discuss types of systems, models of them, and their implications. Klaus Krippendorff, Bateson professor at the Annenberg School of Communication of the University of Pennsylvania, will discuss language and philosophy. Anthropologist Mary Catherine Bateson will describe how longer life expectancies are affecting cultural transmission.

Karl Mueller, director of a social science data archive in Vienna, Austria, will describe recent developments in meta-analysis and how this work is leading to a second-order science. Ranulph Glanville from the UK and Australia will describe how second order theories are particularly appropriate for activities involving design, such as architecture. John Warfield, who once worked on redesigning the hugely complicated Defense acquisitions system, will review many centuries of thought about thought and reflect on his decades of experience designing and managing very complex systems.

In addition there will be three panel sessions on the philosophy of radical constructivism, three panels on therapy and neurofeedback, two panels on the epistemological implications of quantum theory, and several panels on management methods, information systems, and e-commerce. There will be a workshop on open source approaches to innovation and an evening event by the Performers Workshop Ensemble. The meeting will end with an afternoon participatory strategic planning exercise both to illustrate a particular approach to group facilitation and to chart the future direction of the Society.

For those new to the field, there will be a tutorial on October 27. This meeting promises to be another in a long series of highly stimulating multi-disciplinary conferences.

Allenna Leonard and Stuart Umpleby

Co-Chairs of the 2005 meeting of the American Society for Cybernetics

2005 ASC Conference

Overview Schedule

Thursday (State Plaza Hotel, 2117 E Street NW, Washington, DC)

9 a.m.-12 and 1:30-5 p.m.	Tutorial
5:30-7:30 p.m.	Reception and registration
7:30-10 p.m.	Movie: *"What the bleep do we know?"*

Friday (Post Hall at Mt. Vernon Campus of GWU, 2100 Foxhall Road NW)

8-9:30 a.m.	Registration and conversation
9:30-noon	Keynote addresses
Noon to 2 p.m.	Lunch and speaker
2-5:30 p.m.	Keynote addresses
5:30-7:30 p.m.	Break for Dinner
7:30-9:30 p.m.	The Oral Tradition

Saturday (Mt. Vernon Campus of GWU, 2100 Foxhall Road NW)

8-9 a.m.	Conversation, Hand Chapel
9-12:30 p.m.	Symposia, Rooms 100, 102, 127, 129
12:30 to 2:30 p.m.	Lunch and speaker, Hand Chapel
2:30 to 6 p.m.	Symposia, Rooms 100, 102, 127, 129
6-8 p.m.	Break for dinner
8-10 p.m.	Performers Workshop Ensemble, Hand Chapel

Sunday (Mt. Vernon Campus of GWU, 2100 Foxhall Road NW)

8-9 a.m.	Conversation, Hand Chapel
9-12:30 p.m.	Symposia, Rooms 100, 102, 127
12:30-1:30 p.m.	Break for lunch, Hand Chapel
1:30 -6 p.m.	Participatory Strategic Planning with facilitator, Room 100

2005 ASC Conference

Detailed Schedule

Thursday	**Tutorial**
State Plaza Hotel, 2117 E Street NW, Washington, DC	
9-12, 1:30-5 p.m. Ambassador Room	Tutorial: Cybernetics -- Social Activism in Everyday Life Larry Richards
5:30-7:30 p.m. Diplomat Room	Reception
7:30-10 p.m. Diplomat Room	Movie: *What the bleep do we know?*

Friday	**Keynote Addresses**
All events on Friday are in Post Hall, Mt. Vernon Campus of GWU	
8-9:30 a.m.	Registration and conversation
9:30 a.m. to noon	Welcome by Allenna Leonard, ASC President Takeshi Utsumi Global E-Learning for Global Peace Eric Dent Similarities and Differences among the Sub-fields of Cybernetics and Systems Theory Stuart Umpleby Reflexivity in Social Systems: An Introduction to the Theories of George Soros
Noon to 2 p.m.	Lunch with Russell Ackoff Types of Systems and Models of Them
2-3:30 p.m.	Klaus Krippendorff Language in the Constitution of Social Systems Catherine Bateson Relationships between Demographic Changes and Cultural Transmission
3:30-4 p.m.	Coffee break
4-5:30 p.m.	Karl Mueller From Second Order Cybernetics to Second Order-Science Ranulph Glanville Knowledge and Design in the Era of Second-Order Cybernetics
5:30-7:30 p.m.	Break for dinner
7:30-10 p.m.	The Oral Tradition led by Ranulph Glanville and Allenna Leonard, including a videotaped interview with Ernst von Glasersfeld, made by Judy Lombardi

Saturday	**Keynote Address (Hand Chapel, Mt. Vernon Campus)**
12:30-2:30 p.m.	Lunch with John Warfield Thought about Thought: Twenty-four Centuries of Now and then Development and the Consequences

Symposia

All Symposia are at the Mt. Vernon Campus of GWU, 2100 Foxhall Road NW.

If a room number is given, the room is in the Academic Building.

Symposium A. Constructivism, History and Performance

Chairperson: Alexander Riegler

Saturday

9-10:30 a.m.	**Radical Constructivism 1**
Room 122	Alexander Riegler Past, Present and Future of Radical Constructivism
	Albert Muller How (Radical) Constructivism Emerged from Cybernetics – and other Fields of Science: Some Historical Remarks
	Karl Muller Radical Constructivism - The Hidden Agenda. New Research Directions from Old Texts
11-12:30 p.m.	**Radical Constructivism 2**
Room 122	Kevin McGee Enactive Cognitive Science
	Gebhard Rusch From Observer to Creator
	Discussant: Mark Notturno
2-3:30 p.m.	**Radical Constructivism 3**
Room 122	Ranulph Glanville Construction, Design and Knowledge
	Dewey Dykstra Could it be More Different? Radical Constructivism Applied to Physics Teaching
	Discussant: Mark Notturno

Sunday

9-10:30 a.m.	**History of Cybernetics**, Chair: Albert Mueller
Room 127	Howard Eisner A Brief Overview: The Early Days of Cybernetics
	Peter Corning Control Information Theory: The Missing Link in Norbert Wiener's Cybernetics
	Ely Dorsey A Cybernetician's View of Quantum Theory: Three Possible Views
	Discussant: Mark Notturno
11-12:30 p.m.	**Performance and Cybernetics**
Room 127	Arun Chandra If then, what now? Ethics and the "Committee of Criteria"
	Mark Enslin Facing the Power of the Respondent
	Andy Trull An Essay on the Work of Herbert Brun

Symposium B. Management

Chairperson: Allenna Leonard

Saturday

4:30-6 p.m.	**Management Cybernetics**
Room 100	Wenjun Du and Jixuan Hu Applying the Technology of Participation in an Authoritarian Culture
	Jixuan Hu and Wenjun Du Four Dimensional Systems Thinking and Corporate Cultural Change: Three Prescriptions are Better than One
	Frank Anbari and Stuart Umpleby Time and Requisite Variety: Lessons from Project Management

Sunday

9-10:30 a.m.	**Organizational Cybernetics**
Room 100	Joe Truss and Chris Cullen From Local Infoset to Global Infonet - the Extension of Team Syntegrity
	Paul A. Stokes Organizational Cybernetics -- The Next Stage
	Allenna Leonard A Viable System Model Analysis of the Sarbanes-Oxley Legislation: Does It Meet the Variety Challenge?
11-12:30 a.m.	**Emergence in Organizations**
Room 100	Lisa Kimball and Tom Mandel The Opportunity of Open Source

Symposium C. Epistemology and Mathematics

Chairperson: Lou Kauffman

Saturday

9-10:30 a.m.	**Quantum Epistemology 1**
Room 100	Lou Kauffman Quantum Categories
	Ely Dorsey Is Quantum Epistemology Epistemic?
	Hector Sabelli and Lazar Kovacevic Quantum Bios
11-12:30 p.m.	**Quantum Epistemology 2**
Room 100	Gerald H. Thomas, Hector Sabelli, Lou Kauffman Biotic Processes in the Schrodinger Equation
	Discussion of the papers. This workshop has as its background the session that precedes it. We hope to engage the participants in a discussion about the nature of information in cybernetics in the light of quantum theory.
2:30-4 p.m.	**Symbolic Methods**
Room 100	Lou Kauffman Sign/Space -- Eigenform

Jerry Chandler A New Mathematical Notation for the Chemical Sciences and Its Implications for Biocybernetics and Nanotechnology

Hector Sabelli Biotic Feedback: Priority and Supremacy in Nature, Science, and Society

Jeff Long Notational Systems and Cognitive Evolution

Symposium D. Therapy and Neurofeedback

Chairperson: Andrea Maloney-Schara

Saturday

11-12:30 p.m.	**Therapy and Neurofeedback 1**
Room 127	Andy Hilgartner Can We Trust Our Traditional Language?
	Judy Lombardi The Egg, Chicken *and* Rooster: Designing Triadic Relations When Doing Cybernetics
	Fred Steier Family Learning in Community Science Centers
2:30-4 p.m.	**Therapy and Neurofeedback 2**
Room 127	Andrea Maloney-Schara, Kathy Wiseman, and Joan Lartin-Drake The Family as a Force Field or as Pattern Generator
4:30-6 p.m.	**Therapy and Neurofeedback 3**
Room 127	Valdeane Brown and Karl Pribram Non-Linear, Dynamical and Other Advanced Visualization Techniques in EEG: Gabor and Adaptive Transforms

Symposium E. Information Systems

Chairperson: Shivraj Kanungo

Saturday

4:30-6 p.m.	**Information Systems**
Room 122	Vikas Sahasrabudhe and Subhasish Dasgupta Leveraging Collaborative Technologies for Sharing Tacit Knowledge: An Integrative Model
	Matjaz Mulej Synergy of Knowledge and Values Management by Combining the USOMID and Six Hats Methodologies
	Shivraj Kanungo Cybernetics as a Theoretical Base for Information Systems Research

Sunday

9-10:30 a.m.	**E-commerce**
Room 122	John Pourdehnad, et al. User Interface Design -- An Experimental Study
	Kent Myers Organizational Network Alignment
	Edward Cherian The Potential for Electronic Commerce in Developing Countries

Symposium F. Social Systems

Chairperson: William Reckmeyer

Saturday

9-10:30 a.m.	**Complexity and Public Policy**
Room 127	William Reckmeyer The Nature and Use of Systems of Systems Approaches in Public Policy-Making and Program Management
	Henry Alberts Genesis of a Chain of Thought
	David Anyiwo Fuzzy Set Theoretic Framework for Representing Uncertainty due to Vagueness and Imprecision in Knowledge Representation

Sunday

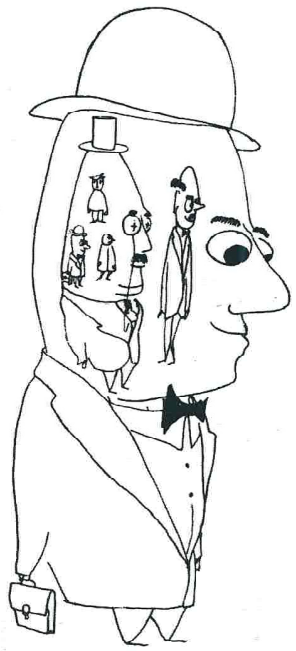
11-12:30 p.m.	**Cultural Strategies**
Room 122	Lowell Christy, Catherine Bateson, and Bill Smith A discussion of the work of the Cultural Strategies Institute which is based on the theories of Gregory Bateson.

Participatory Strategic Planning

Facilitator: Alisa Oyler

Sunday

1:30-6 p.m.	Creating the Future of the American Society for Cybernetics
Room 100	



2005 ASC Conference Abstracts

Tutorial (Thursday, State Plaza Hotel)

Cybernetics: Social Activism in Everyday Life

Larry Richards
Indiana University

This interactive tutorial will explore ideas in cybernetics through the lens of social processes and societal change. It will start with the concept of society and then work back to develop a vocabulary for thinking and talking about the dynamics of human relations and behavior that support the concept. As the concept of human society implies linguistic behavior, language will be a central theme of the tutorial. Special attention will be given to the distinctions that arise from the various linguistic/logical domains of cybernetics, e.g., linearity vs. circularity, causal explanation vs. descriptive dynamics, state-determined vs. structure-determined systems, control vs. autonomy, communication vs. conversation, hierarchy vs. heterarchy, power vs. participation. While every attempt will be made to relate the ideas to everyday life, the potential of the individual to participate in transforming a society will not be ignored. The tutorial should end with a discussion of responsibility and freedom in the context of human desire and action and the process of creating a desirable society.

Keynote Addresses (all day Friday, Post Hall, Mt.Vernon Campus)

Global E-Learning for Global Peace

Takeshi Utsumi
Global University System (GUS)
www.friends-partners.org/GLOSAS, utsumi@columbia.edu

Economic interdependence among nations and cultures is spawning a global economy. Globalization also highlights clashes of divergent cultures and belief systems, both political and religious. If global peace is ever to be achieved, global-scale education, with the use of the modern digital telecommunications, will be needed to nurture mutual understanding among nations, cultures, ethnic groups, and religions. The Internet is the future of telecommunications and can be a medium for building peace. The Global University System (GUS) is a worldwide initiative to establish advanced telecommunications infrastructure for access to educational resources across national and cultural boundaries. The

Globally Collaborative Innovation Network (GCIN) with emerging GRID computer network technology enables collaborative, distributed, experiential learning and creation of new knowledge, and will foster the creativity of youngsters around the world and hence promote global peace.

Similarities and Differences among the Sub-fields of Cybernetics and Systems Theory

Eric Dent
University of North Carolina, Pembroke

It is in vogue to "take a systems approach," yet what exactly a systems approach is varies considerably depending upon the systems science tradition examined. Systems science traditions tend to share a set of underlying assumptions which are less common in other scientific fields. Still, philosophical assumptions are not consistent across systems science traditions. The philosophical assumptions that are not shared, such as in the areas of self-organization, observation, causality, reflexivity, predictability, environment, and relationships provide some explanation as to why the different systems approaches have developed somewhat separately rather than integratively. Differing philosophical assumptions also explain why models from fields such as cybernetics, general systems theory, organizational learning, operations research, total quality management, and system dynamics may produce different results.

Reflexivity in Social Systems: An Introduction to the Theories of George Soros

Stuart Umpleby
The George Washington University

We can think of the process of social change as consisting of four steps. Ideas are invented by one or a few people. Groups of people who support the idea then form and attempt to persuade others. Eventually they achieve enough influence to produce some noticeable change in a social system, for example the passing of legislation or a new industrial product. This event has some effect on the character of the social system, which can be measured by variables, such as average level of education, life expectancy, or level of pollution. By studying these variables, a new idea for change or reform is formulated and the process repeats. The usual conception of science focuses primarily on the last step, from variables to ideas. However, the process whereby science affects society involves all four steps: ideas, groups, events, and variables. This paper compares a narrow, seemingly objective conception of social science with a broader, participatory conception. Reflexivity theory includes the participant in the action and the observer in the description. Although other versions of reflexivity theory will be mentioned, this paper will focus on the work of George Soros. His work provides a connection between second order cybernetics and economics, finance, and political science.

Types of Systems and Models of Them

Russell L. Ackoff

Systems are grouped into four exclusive and exhaustive classes: deterministic, animate (organismic), social, and ecological. The same is done with models of them. This yields a 4x4 matrix. It is possible to apply each type of model to each type of system. The application of the wrong type of model to the right type of system is dysfunctional, particularly where social systems are involved. Nevertheless, it is commonplace for animate models, in particular, to be applied to social systems. This significantly limits the amount of improvement in the functioning of social systems that can be obtained.

Language in the Constitution of Social Systems

Klaus Krippendorff
Gregory Bateson Term Professor for Cybernetics, Language, and Culture
University of Pennsylvania

Traditional theories of social systems are saturated with biological metaphors that lead social theorists to conceptualize such systems from their outside, as observers, seeking to explain – as would be appropriate for biological systems – their organization in relation to their (presumably knowable) environment. Entering the biology of observers in the description of such systems does not allow one to escape biological determinisms either.

The key to this escape and the starting point of my conception of second-order cybernetics is the recognition that theories, metaphors, and descriptive accounts, including of autopoiesis, occur in the domain of language. Social systems do not exist the way biological systems do. They are constructed in language, constituted by enacting their constructions, justified in local accounting practices among their stakeholders, and essentially hide themselves from detached observers. While acknowledging the bodily participation of language users, I am suggesting that social systems need to be understood from what languaging does, not from what biology has theorized and detached observers can observe. This presentation will develop and illustrate second-order cybernetic concepts of social phenomena and take a critical or emancipatory perspective.

Relationships Between Demographic Change and Cultural Transmission

Mary Catherine Bateson
Institute for Intercultural Studes, New York City
www.marycatherinebateson.com

Human societies have developed over history to depend on three overlapping generations (children, adults, and elders). Due to technological changes, societies now have four overlapping generations, with the grandparent generation active and in good health and a great grandparent generation now in the health condition that used to characterize grandparents. There has been considerable discussion of the economic implications of this shift but little discussion of its

implications for cultural transmission and cultural change, both in societies in general and in such intellectual traditions as the cybernetics movement.

From Second-order Cybernetics to Second-order Science

Karl H. Müller
WISDOM, Vienna

The main thesis of this talk lies in a radically changed view on the importance of conducting meta-level research or, closer to the ASC-agenda, second order cybernetics. During the 1950s and 1960s, philosophy of science was considered to be the one and only meta-science for all scientific disciplines and cybernetics was assumed to be a general pool for trans-disciplinary models in communication and control research. Towards the end of the 1960s Heinz von Foerster coined the term second order cybernetics and developed a dual agenda for it. On the one hand, second order cybernetics was introduced as an epistemological device, emphasizing the role and the importance of observers. On the other hand, second order cybernetics was also conceptualized as an innovative analytical engine with a heavy emphasis on self-referentiality and on its far-reaching repercussions across nature and society.

Thirty years later, both philosophy of science and second order cybernetics seem to have lost much of their former appeal and innovative meta-scientific analyses along with fresh investigations in the spirit of second order cybernetics have become rare events. However, three new arenas are gradually emerging which will lead to a radical reconfiguration of the relations between first and second order science (SOS). Moreover, all three areas offer substantial work space for cybernetics both in its first and in its second order versions. The talk will be mainly concentrated on these three new areas and especially on the high potential importance and relevance of cybernetics within these new SOS-domains.

Knowledge and Design in the Era of Second-Order Cybernetics

Ranulph Glanville

Second order cybernetics may be thought of as a way of thinking, or seeing the world and our relationship to it. By considering what this way of thinking offers us, and its implications, we may come to see the world in a new way, a way that may match more closely the experience we recognize and which is what we live in.

One way of distinguishing second order cybernetics is through the choice of prepositions: in first order cybernetics, the observer is an observer of the system, whereas in second order cybernetics, the observer is an observer in the system.

The observer in the system is the active observer. The active observer is involved in making the world he believes he is part of. But the sort of knowledge that this observer needs is not the traditional knowledge that has been developed in the academic world, which can be characterised as knowledge of (what is). It is, rather, what I propose to call knowledge for (action).

One area in which knowledge for has, traditionally, been at its heart is design.

Gordon Pask sensitively and perceptively described design as a form of conversation. Not only do designers develop knowledge for, they also use this knowledge in the construction of new "things"—objects, processes, entities, worlds. In this keynote I will explore this argument and some of the connections between design, knowledge for and second order cybernetics.

Thought about Thought: Twenty-four Centuries of Now and Then Development and the Consequences

John Warfield
George Mason University (Emeritus)
www.jnwarfield.com

Thanks to the pioneering study of Father I.M. Bochenski ("A History of Formal Logic") we are able to trace the key milestones in the evolution of thought about thought and identify a few key events in this evolution. I will identify these milestones, show how they are interrelated, and describe the present state of this subject, explaining what the consequences of this work are for the future of higher education for those who choose to take advantage of the present state of this subject.

Symposium A. Constructivism, History and Performance

Chairperson: Alexander Riegler

Radical Constructivism 1 (Saturday, 9-10:30 am, Room 122)

Past, Present and Future of Radical Constructivism

Alexander Riegler
Center Leo Apostel, Belgium

The transformation from an information-based to a knowledge-based society is not only accompanied by an increased need for knowledge discovery and knowledge management, it also reflects a rising interest in the (radical) constructivist worldview. It replaces the concept of absolute and mind-independent information "out there" in favor of asking how knowledge comes about. Radical constructivism and constructivist approaches in general have the potential to provide the fruitful framework for alternative forms of knowledge management which excel compared to traditional approaches that have proven insufficient as solution strategies for complex problems and the demands of the faster moving global economy, science, and culture. I will review the past, present, and future of the constructivist movement championed by cyberneticians such as Heinz von Foerster and Ernst von Glasersfeld among many others.

In a broad sense, the constructivist program can be characterized as follows. (a) Questioning the Cartesian separation between objective world and subjective experience; (b) Including the observer in scientific explanations; (c) Rejecting representationalism; (d) Maintaining an agnostic relationship with reality; (e) Moving the focus from the world that consists of matter to the world that

consists of what matters; (f) Emphasizing the "individual as personal scientist" approach; (g) Focusing on self-referential and organizationally closed systems which strive for control over their inputs rather than their outputs; (h) Preferring process-oriented approaches over a substance-based perspective; (i) Asking for an open and less dogmatic approach to science in order to generate the flexibility that is necessary for today's social and scientific challenges.

The first six points have already been subject to various philosophical argumentations and scientific investigations. Future constructivist research may therefore focus on points g to i. The first of these three remaining points refers to the role of formal self-organizing networks and their capacity to base (radical) constructivism on formal rather than empirical foundations such that knowledge and reasoning can be adequately accounted for in formal networks and their properties. The second point is closely related to the first in the sense that networks are considered process ontologies. This leads to the question whether the material basis of networks plays a subordinate role. The third point links to defining a knowledge society by its ability and willingness to continuously revise knowledge rather than to cling to traditional habits.

Finally, in order to encourage and promote constructivist research I will introduce the new peer-reviewed international journal Constructivist Foundations available at http://www.univie.ac.at/constructivism/journal/ It is concerned with the interdisciplinary study of all forms of constructivist sciences, especially radical constructivism, cybersemiotics, enactive cognitive science, epistemic structuring of experience, second order cybernetics, the theory of autopoietic systems, among others. Its first edition appears simultaneously with the ASC conference.

How (Radical) Constructivism Emerged from Cybernetics and Other Fields of Science: Some Historical Remarks

Albert Muller
University of Vienna, Austria

There is some irony for the historian of Radical Constructivism. One of its worldwide best known representatives told us that he declines to be regarded as a constructivist since he—more or less—ever hated any -isms. (Heinz von Foerster in an interview 1997). Or there is a leading promoter of Radical Constructivism declaring his "farewell to constructivism" at least in the title of one of his recent books (Siegfried J. Schmidt—"Abschied vom Konstruktivismus", 2003)

Never mind: Radical Constructivism seems to have made its way from a revolutionary paradigm over a sheer fashion to normal science (to cite S.J. Schmidt again). Such processes always tend to provoke the interest of history of science. On several occasions Ernst von Glasersfeld, the creator of the term of Radical Constructivism engaged in writing longue durée-histories of constructivism, starting with pre-Socratic philosophers, passing medieval theorists, mentioning Giovanni Battista Vico as a key figure, acknowledging Neo-Kantians (like Vaihinger), and arriving with Jean Piaget as predecessors of actual Radical Constructivism. This seems to be all right. RC as a sort of radical epistemological

innovation indeed stands in such a long tradition.

But a historian's point of view still might be different. At a closer look it turns out that quite a lot of the leading figures and founding fathers of RC (there are apparently only a few mothers) have been engaged in another revolutionary paradigm in the 1950s, 1960s and 1970s: they have been part of the cybernetics movement. This is true at least for Heinz von Foerster, Gordon Pask, Ernst von Glasersfeld, Ranulph Glanville, Humberto Maturana, Francisco Varela and Gregory Bateson.

I do not want to refer to Kuhn's notion of scientific revolutions since things often appear to be more complicated. Nevertheless there was an apparent internal and external crisis in cybernetics around 1970. In his—afterwards worldwide recognized—paper "On constructing a reality" of 1973 Heinz von Foerster wrote one of the key manifestos of Radical Constructivism. This paper gathers and integrates findings of classical cybernetics and system theory and makes use of observations of the observer (as done by Spencer Brown, Maturana, and von Foerster himself). One year later, 1974, a 'book' was published by Heinz von Foerster and some of his students and colleagues: The Cybernetics of Cybernetics, the first in a series of central documents of Second Order Cybernetics. I still feel justified to regard this piece as the major break-through on the road towards Radical Constructivism. And it is an irony that the publication of this book also marked the end of the Biological Computer Laboratory at the University of Illinois.

Radical Constructivism—as a label, trademark, and movement—then emerged apparently more or less by chance by activating or re-activating existing networks, as Ernst von Glasersfeld put it in an interview in 2005, networks going back mainly to cybernetics.

But things are still more complicated. When Warren Sturgis McCulloch finished the series of Macy Conferences on cybernetics in 1953, his introductory remarks ended up with one of the nicest constructivist metaphors: a bear participating in a scientists' conference. At least McCulloch's interpretation of cybernetics then seems to be a clearly constructivist one.

Radical Constructivism - The Hidden Agenda. New Research Directions from Old Texts

Karl Muller
WISDOM, Austria

In this short contribution I would like to stress three major points. First, looking more closely on articles by Heinz von Foerster and BCL-research reports from the late sixties and early seventies one finds a basic assumption which can be labelled as Radical Cognitive Holism (RCH). Moreover, RCH offers two interesting methodological corollaries, namely a de-constructivist heuristic device and a more constructivist one.

On the one hand, the de-constructivist device stresses the importance of the unity of cognitive processes and points to all sorts of semantic traps which result from

taking different semantic notions as sufficient condition for basic differences in cognitive mechanisms and processes.

The constructivist device, on the other hand, emphasizes the necessity of a single cognitive mechanism plus appropriate recombinations and reconfigurations which in turn should be sufficient to account for seemingly different cognitive performances.

Radical Constructivism 2 (Saturday, 11-12:30 pm, Room 122)

Enactive Cognitive Science

Kevin McGee
Linköping University, Sweden

Enactive cognitive science is an outgrowth of and has its roots in constructivism, developmental psychology, systems theory, "constructivist AI", and co-evolutionary models of biology. This radical constructivist approach to cognitive science differs from others in that the emphasis is not on the "recovery" of (pre-given) features of the world, but rather on how the mechanisms of autonomous systems can arise and participate in the generation and maintenance of viable "phenomenal worlds" through their activity.

Within the constructivist tradition we can distinguish between realist and radical constructivism. The former leaves largely untouched the belief in an external, objective, knowable world. By this view, constructive mechanisms tend to be "in the head" of the cognitive agent -- and cognitive construction is a way by which a cognitive agent comes to have such things as interpretations, opinions, beliefs, and models of that objectively existing world. For this view on constructivism, knowledge is still a "mirror of nature," but some of that knowledge is the result of active construction by the cognitive agent. To the extent that constructivist thought has become a force in educational theory, it is this realist version that is most prevalent. And, as such, constructivism is often treated as one option among many for pedagogical design; that is, discussion often turns on such things as "when one should use constructivist approaches in teaching" and "techniques for motivating students by having them engage in constructive activities."

The latter, radical, orientation holds that it is not just (some) "knowledge of The World" that is constructed by the cognizing agent, but rather, the phenomenal world -- the world as it is for the cognitive agent -- is inseparable from the agent's knowledge about it (and indeed, inseparable from the agent's knowledge about self). Further, this knowledge, the known world, and the agent itself, are all the result of active construction. Within this radical orientation, researchers take different positions on such questions as whether there is an objective reality ("behind the phenomenal reality"), whether there is an "ultimate" grounding (and if so, what it is). Nonetheless, by and large, radical constructivists agree that an objective reality, whether or not it exists, is not the world to which humans have direct access. The world as we know it is the result of constructive activity. And this fundamental belief informs in a radical way the study of cognition -- and the development of materials based on the insights of such study.

Radical constructivism as a philosophical study of mind in the Western tradition can be traced back at least 2500 years; within the scientific study of mind, the pioneering efforts Jean Piaget, Lev Vygotsky, and Jakob von Uexkull initiated research to propose and empirically verify possible constructivist mechanisms of cognition. During the 20th century relevant research also occurred within the fields of cybernetics, the life sciences, artificial intelligence, and artificial life.

Enactive cognitive science emerged at the end of the 1980s as a specific extension of the radical constructivist approach to cognitive science. In addition to the basic radical constructivist premises, it added a number of key concerns as part of its research agenda: structural coupling, embodied action, situatedness, emergence, intersubjectivity, consciousness (or first-person cognition), and neuro-phenomenology. A further, crucial unifying theme for the entire enactive research agenda is that it does not merely focus on some particular "enactive" phenomenon or mechanism, but is crucially concerned with co-specification, co-determination, co-adaptation, and co-evolution. Thus, to take the example of emergence, the enactive approach is not only interested in how "higher level phenomena may emerge out of lower level mechanisms," but simultaneously concerned with whether/how higher-level phenomena have causal efficacy with regard to their constituent components ("out of which they arise").

As with other scientific efforts based on the constructivist orientation, enactive cognitive science is broadly "conventional" in its scientific methodology. That is, there is a strong emphasis on testable hypotheses, empirical observation, confirmable (or disconfirmable) models and mechanisms, and the like. Nonetheless, the constructivist approach to scientific enquiry does raise a number of specific methodological questions and assumptions, particularly as regards the nature of verification.

Although enactive cognitive science was initially introduced in terms that make it clear it is clearly within the radical constructivist tradition, the term has since been taken by realist cognitive scientists who wish to stress their own interest in certain key features, such as embodiment, emergence, or situatedness. Thus, it may become necessary to begin distinguishing between radical (original) and realist enactive cognitive science; however, for the remainder of this paper we will concentrate on the radical orientation.

This paper is a brief introduction to enactive cognitive science: a description of its main characteristics, its methods, its potential as both a theoretical and applied science, work to date, and several of its remaining major research problems.

From Observer to Creator

Gebhard Rusch
University of Siegen, Germany

Maturana´s concept of the "observer" together with certain constructivist epistemological theorems will be challenged by introducing and discussing six axioms of an empirical constructivist point of view:

1. Everything done, is done by a creator.

2. A creator is an observer making sense of his observations by conduct, i.e. by changing his states.
3. Oberservation means representing states or processes; creation means changing states.
4. Creation needs behaviour which itself is observable.
5. Comparing observations means representing changes of states.
6. Changes of states are qualities of action.

Radical Constructivism 3 (Saturday, 2:30-4 pm, Room 122)

Construction, Design and Knowledge

Ranulph Glanville
CybernEthics Research, UK, and Royal Melbourne Institute of Technology University, Australia

I do not want to become involved in arguments for and against a constructivist position in this workshop, not do I want to become involved in arguments about whether there is any such thing as knowledge or whether knowing would better express an appropriate concept. Therefore I shall talk in a framework that I hope will be understood as essentially and unavoidably constructive.

One area in which our activities are, almost without question, constructivist, is the area of design.

There are those who attempt to mechanise design, aiming to turn it into a predictable and quasi-objective activity. Their failures do not convince them of the falsity of this approach. But if we are to produce something that is new, as designers believe they do, what is produced (what is new) cannot be predicted—else, in an important sense, it is not new. (This argument applies, also, to such notions as emergence.)

Designing is, I have argued, the quintessential cybernetic activity. It is, equally, quintessentially constructive. To talk about design is, therefore, to talk about cybernetics and/or constructivism. It is also, as I have also argued, the quintessentially human activity: we design what we know, and hence, we design not only our concepts but the world they relate to.

But this understanding raises a question about the knowing that we are involved in in design, and therefore cybernetics and construction.

Design is an action, an activity. It is a doing that leads to the making of something—it generates an outcome. Cybernetic and constructivist systems, which involve active observers (observers in as opposed to observers of systems) are also concerned with action.

The sort of knowledge that designers need, is, therefore, a knowledge for action, which I abbreviate to knowledge for. This sort of knowledge is in sharp counter distinction to knowledge of what is there, the conventional, non-constructivist knowledge which has to be re-configured if it is to accommodate a constructivist viewpoint and thus be truly cybernetic. This sort of knowledge is

the knowledge science is concerned with when it attempts to unravel the world. When the scientific notion of knowledge is used, a separate and specialist type of knowledge is used that will help translate knowledge of into knowledge for: transform knowledge. This sort of knowledge is the knowledge of engineers and technologists.

I do not claim that the notion of knowledge for is un-connected to to other types of knowledge, just that it's a rather clear and catchy way of talking. What I am interested in is discussion about this type of knowledge, including discussion of how it relates to other knowledge categories.

Could it be More Different? Radical Constructivism Applied to Physics Teaching

Dewey Dykstra
Boise State University

"When students can repeat something verbatim, it is obvious that they have learned it.—Whether they have understood it, is a question these tests avoid." --Ernst von Glasersfeld in "Radical Constructivism and Teaching," to be published in French in Archives Jean Piaget, Geneva

"...a physics major has to be trained to use today's physics whereas a physics teacher has to be trained to see a development of physical theories in ... students' minds." -- Hans Niedderer in "International Conference on Physics Teachers' Education Proceedings" Dortmund: University of Dortmund, p. 151, 1992.

The program of physics teaching at any level is best described as: the presentation of the established canon by approved methods for the benefit of the deserving. This practice is rooted in a 'normal science' of teaching physics, to use T. S. Kuhn's expression. This 'normal science' manifests a view of the essential nature and meaning of human knowing: The true nature of reality, what causes our experiences when we interact with it, can ultimately be known by our mental effort. We can compare two statements and ascertain which is closer to the true description of this reality. We can present such statements to others and they can know what we know.

This 'normal science' entails a view of the nature and value of people. We know the deserving because they 'get' what has been presented. The deserving, by definition, have the requisite mental capacity and have worked hard enough to 'get' what is presented. Many do not to 'get' what is presented, but we cannot all be physicists! With this program we troll through society finding the deserving and initiating professional training and indoctrination. The undeserving are helped to adjust to their status and to accept the authority of the deserving on issues of physics.

Could a pedagogy were based on an entirely different view of the nature and significance of human knowing such as radical constructivism? Given the hegemony of the 'normal science,' this new 'science' of physics teaching is a 'revolutionary science.' The program of this new physics teaching is to engage students in examining their conceptions of physical phenomena by comparing their pre-

dictions with actual experiences with the phenomena. When students decide their predictions are inadequate, they are engaged in constructing and testing new explanations for the phenomena. It is not about presenting the established canon. Student understanding and the effort to formulate explanation that enables assimilation of experience drive the process. All students are capable of noticing when an explanation does not work for them and of collaboratively formulating explanation that better fits their experience. The intended and actual outcomes are also decidedly different.

We cannot decide what is a true description of objective, external reality, but we can ascertain the degree of fit and usefulness of an alternative 'science.' Evidence of change in student understanding will be shared for comparison of these two programs of physics teaching.

History of Cybernetics (Sunday, 9-10:30 am, Room 127)

A Brief Overview - The Early Days of Cybernetics

Howard Eisner
The George Washington University

This short talk presents some early perspectives with respect to Cybernetics, emphasizing an historical overview of the efforts of key contributors. Starting in the '40s of the 20th century, and quickly acceleration into the '50s and '60s, we see the views of people like Wiener, Ashby, Beer, Bertalanffy and others. Important elements of Cybernetics have included communications, control, automata and information theory, bionics, artificial intelligence (AI), learning, linguistics, and many other fields of investigation and application. A few key questions for today are posed for exploration and discussion.

Control Information Theory: The Missing Link in Norbert Wiener's Cybernetics

Peter A. Corning
Friday Harbor, WA

Norbert Wiener's cybernetic paradigm represents one of the seminal ideas of the 20th century. It has provided a general framework for analyzing communications and control processes in purposeful systems, from genomes to empires. Especially notable are the many important applications in control engineering. Nevertheless, its full potential has yet to be realized. For instance, cybernetics is relatively little used as an analytical tool in the social sciences. One reason, it is argued here, is that Wiener's framework lacks a crucial element -- a functional definition of information. The functional (content and meaning) role of information in cybernetic processes cannot be directly measured with Claude Shannon's statistical approach, which Wiener also adopted. Although so-called Shannon information has made many valuable contributions and has many important uses, it is blind to the functional properties of information. Here a radically different approach to information theory is described. After briefly critiquing

the literature in information theory, a new kind of cybernetic information will be proposed which we call "control information." Control information is not a "thing" but an attribute of the relationships between things. It is defined as: the capacity (know how) to control the acquisition, disposition and utilization of matter/energy in purposive (cybernetic) processes. We will briefly elucidate the concept, and we will propose a formalization in terms of a common unit of measurement, namely the quantity of "available energy" that can be controlled by a given unit of information in a given context. However, other metrics are also feasible, from money to allocations of human labor. Some illustrations will be provided and we will also briefly discuss some of the implications.

A Cybernetician's View of Quantum Theory: Three Possible Views.
Ely Dorsey

In this paper, I posit views on Quantum Theory from the points of view of Cybernetics and Systems Science based on the works of William Powers, Ernst von Glasersfeld, and Humberto Maturana. I show how these thinkers may have considered Quantum Theory from their writings on Control Theory, Radical Constructivism and Second Order Cybernetics.

Performance and Cybernetics (Sunday, 11-12:30 pm, Room 127)

If then, what now? Ethics and the "Committee of Criteria"
Arun Chandra

Facing the Power of the Respondent
Mark Enslin
Urbana, Illinois

This paper reflects on the dynamics of interactions that might be called "composition" as analogous to interactions that might be called "teaching", including conditions and consequences of the calling, and draws on concepts of cybernetics in/of education, teaching, learning, as formulated and enacted by Heinz von Foerster, Herbert Brün, Annetta Pedretti, Gordon Pask, Larry Richards, and Humberto Maturana. The paper also reflects on the conditions and consequences of describing a dynamic as a power dynamic, and the desirability of approaching an interaction as a composer.

An Essay on the Work of Herbert Brun
Andy Trull

Symposium B. Management

Chairperson: Allenna Leonard

Management Cybernetics (Saturday, 4:30-6 pm, Room 100)

Applying the Technology of Participation in an Authoritarian Culture

Wenjun Du and Jason Jixuan Hu
WINTOP Consulting Group, Washington, DC, and Shanghai, China
www.wintopgroup.com

General consensus, group leadership, and cross-functional teamwork are all widely accepted concepts and practices in Western societies but do not necessarily exist in other cultures, such as China. There are a number of practical tools being used in the U.S. to enable groups to have a greater capacity for sharing the knowledge and wisdom of every member and to foster team wisdom. ToP® (Technology of Participation) developed by the Institute of Cultural Affairs is one of these tools. We believe the time is ripe in China to promote a participatory working environment and a facilitative leadership style in the current hierarchical leadership dominated culture, i.e., in an authoritarian culture, in order to generate real collective wisdom rather than collective stupidity. For this purpose, we have developed a group facilitation methods training course named "Roundtable Leadership" based on ToP® for the China market. In the last two years, we have been offering this training product to various business entities in China, from the private sector to state-owned companies. From the training evaluation and a follow-up survey, we have gathered feedback from people living and working under the top-down system about the new participatory culture they experienced in the training. This paper describes the initial feeling that people experience during the training, shares stories about how people apply the methods in their work and lives, and discusses how this new decision-making procedure changes the work place culture to a more participatory environment, thus encouraging each individual to think, to create, to share, to take responsibility and to be accountable.

Four Dimensional System Thinking and Corporate Cultural Change: Three Prescriptions Are Better than One

Jason Jixuan Hu and Wenjun Du
WINTOP Consulting Group, Washington, DC and Shanghai, China
www.wintopgroup.com

This paper is an extension of the author's work on cultural types of business entities (Hu, 2001) and Four-Dimensional System Thinking (4-DST) (Hu, 2004), applying 4-DST to address the issue of corporate cultural change. Through consulting and training activities being conducted in China, the author identified cases of difficulties or failures when organizations tried to implement change on any one dimension: be it cultural (such as, promoting a culture of a "Learning Organization"); structural (such as introducing Business Process Re-engineering or Enterprise Resource Planning or even Stafford Beer's Viable System Model);

or micro-process improvements (Detail Management, 5S, TQM, etc). Especially, through the practice of promoting a participatory cultural change through a corporate training course called "Roundtable Leadership" in China (where a non-participatory culture is dominant), feedback from clients indicates that single-dimensional efforts have a much higher failure rate compared with multi-dimensional ones.

The author's hypothesis is that, for effective changes within an organization to happen, change efforts must be implemented on all three basic dimensions – organizational culture, organizational structure, and individual behavior – based on the 4-SDT model. A few cases of "single-dimension" efforts at implementing change in organizations are discussed using the 4-DST model, along with suggested improvements. The hypothesis presented in this paper is subject to further experimentation to test its usefulness. Fellow cyberneticians doing consulting work are invited to join this interesting exploration.

Time and Requisite Variety: Lessons from Project Management

Frank T. Anbari and Stuart A. Umpleby
The George Washington University

The law of requisite variety was first proposed by Ross Ashby in 1952. Usually it is described in a game theory context where a regulator must be able to cope with each state that the system being regulated can generate. Or, the regulator needs information to perform selection. For Ashby, time was a different dimension than variety. However, taking additional time, for example by extending a deadline, is one way to increase the capacity of a regulator. This strategy, so well-known to project managers, has rarely been discussed in the cybernetics literature. In contrast, much of the project management literature focuses on methods and strategies for completing projects within time, cost, and other constraints. Using examples from project management, this paper will describe how taking additional time increases the capacity of a regulator, but at a price.

A theoretical consequence of this discussion is improved understanding of the difference between cybernetics and behavioral science. Whereas in cybernetics time and requisite variety are different dimensions, in most social sciences behavior occurs in time. Hence, cybernetics lends itself to mathematical formulations while behavior often is described in terms of stories.

Organizational Cybernetics (Sunday, 9-10:30 am, Room 100)

From Local Infoset to Global Infonet - the Extension of Team Syntegrity

Joe Truss and Chris Cullen
Team Syntegrity, Inc, Toronto, Ontario, Canada

Using core principles underlying Team Syntegrity we will show how a coherent democratic planetary network could evolve. Syntegration provides requisite protocols for participation. Orthogonal sets and other features of the underlying

icosahedral architecture provide the structural integrity to support geodesic extension from an initial set of thirty people to over seven billion in only twelve iterations. Application of these same principles to less ambitious initiatives, such as conferences, will also be presented.

Organizational Cybernetics -- the Next Stage

Paul A. Stokes
University College, Dublin, Ireland

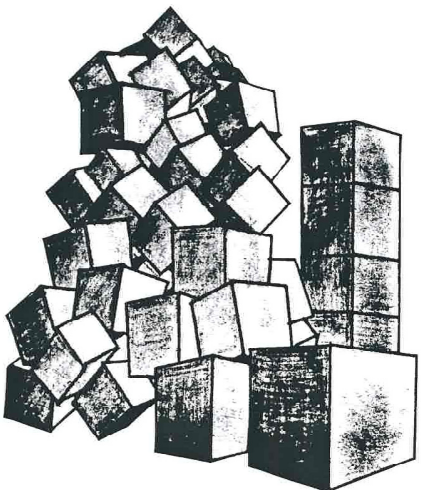
Metaphorum was established to continue the work of Stafford Beer, the founder of managerial cybernetics. It is based in the UK and Ireland but involves participants from six continents.

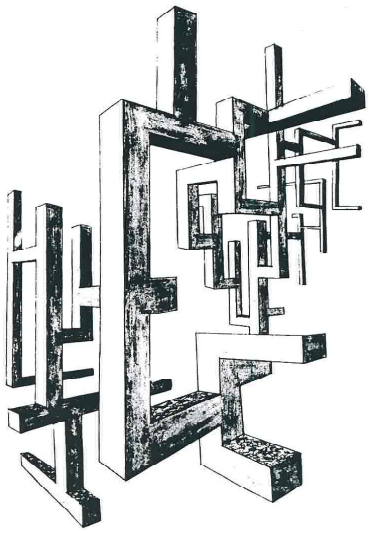
In this paper I will set out the principle features of the deliberations of Metaphorum to date, one of which is that Beer's work has been rediscovered as cybernetics of identity. As identities are the very stuff of social life, this understanding allows a major breakthrough in terms of the application of his work and cybernetics to the social sciences and sociology, specifically under the auspices of the cybernetic formulation of governance, an issue that Beer addressed later in his career.

A Viable System Model Analysis of the Sarbanes-Oxley Legislation: Does It Meet the Variety Challenge?

Allenna Leonard
The Complementary Set, Toronto, Ontario, Canada

A comparison is made between an organizational diagnosis using Stafford Beer's Viable System Model with the diagnostic coverage implicit in complying with Sarbanes-Oxley regulations. It is contended that Sarbanes-Oxley compliance is not a sufficient guide to organizational diagnostics as it does not give sufficient attention to either planning for the future or providing for identity and coherence. Furthermore, research done to improve the quality of enquiry as a form of acquiring audit evidence indicated that there was much information, including information about plans for future actions and an organization's ability to maintain its identity while adapting to changing conditions, that was relevant to assurance expectations but which could not be adequately captured by relying solely on historical financial information.





Emergence in Organizations (Sunday, 11-12:30 pm, Room 100)

Emergence in Organizations: The Opportunity of Open Source

Lisa Kimball, The Plexus Institute
Tom Mandel, consultant and expert on Open Media

This session will explore the idea of Open Source as a complex responsive process that can stimulate and support innovation in organizations. The open source movement has transformed software development by stressing transparency, permeable boundaries, and peer collaboration. To what extent can the Open Source approach go beyond the domain of software and provide a template for collaborative work in other domains? Can geeks actually have shown the way? How can we understand Open Source using principles of complexity? How can we use Open Source to change the way we think and talk about emergence in an organizational context? Presenters will share a framework they are using to work with corporate and non-profit organization change initiatives and describe several case examples from this work. Participants will have the opportunity to engage in conversation about the theory and practice and identify potential connections with their own work.

Symposium C. Epistemology and Mathematics

Chairperson: Lou Kauffman

Quantum Epistemology 1 (Saturday, 9-10:30 am, Room 100)

Quantum Categories

Lou Kauffman
University of Illinois in Chicago

This talk will begin by describing how teleportation works in quantum information theory, how a quantum state can be transported from one place to another. In order to understand this "beam me up Scotty" scenario, we need to talk about basic principles of quantum information, why one cannot clone quantum states (that's right if you are a quantum state and we are teleporting you to Mars we'll have to distintegrate you here on Earth, not to worry -- your perfect copy appears on Mars...). Then we see that the information can be traced through a network of interactions. These interactions involve observers and it is here that we can begin to discuss the relationships of quantum information transfer and second order cybernetics.

Is Quantum Epistemology Epistemic?

Ely Dorsey

By first presenting Quantum Theory as a Physical Theory, I examine what is commonly referred to as Quantum Epistemology (QE). From the perspective of

Analytic Philosophy, I examine the basic tenets of QE and argue that QE is a very different epistemology which has far-reaching societal as well as technological implications. Some of these implications are economic, educational, and political. I will argue that QE is bringing about a new politic. For example, through QE it is possible to integrate the Spiritual Religious paradigm with the Scientific paradigm and not continue to view them as competitors for a Theory of Everything.

Quantum Bios

Hector Sabelli and Lazar Kovacevic
Chicago Center for Creative Development

Time series generated by Schrödinger's equation for describing the behavior of quantum dynamic systems display biotic features, namely diversification (increase standard deviation with embedding or length of the series), novelty (less recurrence than surrogate copies randomized by shuffling), high proportion of consecutive recurrence (indicative of nonrandom causation), arrangement (a measure of nonrandom complexity), and asymmetric statistical distribution. Bios is an expanding aperiodic pattern with higher sensitivity to initial conditions than chaos, generated non-randomly by recursions of bipolar feedback (positive and negative opposition) and by physiological processes such as cardiac rhythms driven by neural opposites. The defining characteristics of bios are the features expected from a creative process, and are absent in chaos. Finding bios in Schrödinger's series suggests that quantum processes may be causal and creative, satisfying Einstein's demand for rationalism, epistemological realism, and mathematical certainty. Universal mathematical forms such as Bourbaki's three "mother structures" of mathematics (lattice asymmetry, group opposition, and topological transformation), which are necessary to create bios, may be the mathematical generators of primordial physical processes. The potential for creative evolution is already present in causal processes at the quantum level.

Quantum Epistemology 2 (Saturday, 11-12:30 pm, Room 100)

Biotic Processes in the Schrodinger Equation

Gerald H. Thomas, Louis H. Kauffman, and Hector C. Sabelli

Let Psi(x,t) denote the solution to the Schrodinger equation for a single particle in a square well. We consider times series generated by A(t) = Psi(x,t) for fixed values of x and varying values of t, and show that these time series exhibit biotic behaviour. Bios has many properties of chaos with further properties in common with natural time series such as heartbeat intervals and with mathematical recursions such as $x(t+1) = x(t) + g \sin(x(t))$ for sufficiently large values of g. The significance of this last process equation is that it embodies characteristics associated with a combination of positive and negative feedback. The talk will discuss the physical background to this work, the method of verification for these biotic properties and the context of bios, time series and quantum chaos.

Symbolic Methods (Saturday, 2:30-4 pm, Room 100)

Sign/Space -- Eigenform

Lou Kauffman
University of Illinois at Chicago

The purpose of this talk is to discuss the Heinz von Foerster concept of Eigenform in the light of concepts about signs, symbols and the spaces they occupy/create. HVF said that an object is a token for an eigenbehaviour. That is, an apparent object in the "world" is a stability for the perception of an observer, a stability that comes from the behaviour of the observer in maintaining integrity in his/her "world." The way such stabilities come about is subtle, involving recursion and linguistic shifts. The talk will discuss these matters in the light of the distinctions that can support such behaviour (as if there were such distinctions). This is an autopoetic approach.

A New Mathematical Notation for the Chemical Sciences and Its Implications for Biocybernetics and Nanotechnology

Jerry LR Chandler
Krasnow Institute for Advanced Study, George Mason University

The existential logic of the material sciences motivates a new mathematical notation for chemical, biological and material species. The notation composes the subatomic particles of chemical elements into networks of species. A network is composed from proto numbers, proto units and relations (ordered pairs). Molecules are represented as labeled bipartite graphs. The absence of chemical symbols allows mathematical extensions of species and hence the developments of unique isomeric chemical structures (polynomials).

I will speculate about the meaning of the novel existential logic on the nature of biochemical logic, dynamic attractors and the emergence of life.

Biotic Feedback: Priority and Supremacy in Nature, Science, and Society

Hector Sabelli
Chicago Center for Creative Development
www.creativebios.com

This article presents a new cybernetic concept, biotic feedback, meaning a process of bipolar, mutual, and hierarchical interactions. Natural and human processes invariably include both positive and negative feedback, and typically involve mutual feedback between systems that stand in a hierarchical relation. Simple processes have priority and generate complex processes that acquire supremacy. Mathematical models indicate that bipolar (positive and negative) feedback generates bios, a non-stationary aperiodic pattern characterized by measurable features of creativity that uniquely resembles the patterns found in physiological, socioeconomic and other empirical data. Bipolar feedback may thus be a creative process present in many natural and human systems. The concept of

biotic feedback is here advanced as descriptive of many natural and social interactions, and as prescriptive for institutional and political governance. In science, objective reality has priority; interpretations have supremacy. In medicine, biological processes have priority and psychological ones supremacy. Socioeconomic processes are co-determined by physical and biological environment and by culture and ideology. Participatory democracy offers an alternative to top-down governance.

Notational Systems and Cognitive Evolution

Jeffrey G. Long
jefflong@aol.com

For individual people, the process of acquiring literacy with a particular notational system seems to result in significant new analytical, descriptive, and creative capabilities. For such individuals, and for society as a whole, science must account for this apparent birth of new cognitive abilities that arise by means of new and revolutionary notational systems. Just as language is not "just another tool," notational systems (which include language as an instance) are not just another tool: they seem to affect what we can see and think about, as well as how we calculate and communicate. The proper study of this subject will require a longitudinal and comparative approach across multiple notational systems. The goal must be an understanding of the nature of notational revolutions, and the creation of new tools allowing us to solve or dissolve currently unsolvable problems.

Symposium D. Therapy and Neurofeedback

Chairperson: Andrea Maloney-Schara

Therapy and Neurofeedback 1 (Saturday, 11-12:30 pm, Room 127)

Can We Trust Our Traditional Language?

C. A. Hilgartner
Hilgartner & Associates
www.hilgart.org

In this paper, I compare and contrast two different groupings of fundamental premises, one traditional and largely concealed, and the other explicit and entirely non-traditional.

As their point of departure, the non-aristotelian premises set forth in 1941 by Alfred Korzybski reject the logical construct of identity as not-valid. Although unprecedented—new to the human race, when proposed—these non-traditional premises have enabled me to account for how living organisms survive in the biosphere. I designate this protocol for surviving as self-correcting. Non-human organisms occupy only non-verbal environments. Humans, who inhabit both non-verbal and verbal environments, can show both self-correcting behaving-

and-experiencing and its antithesis, which I designate as self-defending.

In 1950, already dissatisfied with the available theories of human behavior, I adopted Korzybski's premises as my own. On them, I built up an alternative frame of reference. This developing framework has become a two-prong inquiry.

As one aspect, this approach has become a novel basis for conducting inquiries. It has already yielded at least the beginnings of its own versions of logic, mathematics, physics, biology and the human psycho-social sciences.

As its other main aspect, this approach has enabled me to disclose some of the hidden presuppositions encoded in the WIE grammar. These serve as unacknowledged premises of the traditional "disciplines"—the WIE logics, mathematics, sciences, philosophies, jurisprudences, religions, etc. Among these premises, I find at least one which appears untenable (a restricted and restrictive presupposition so restrictive as to apply under no circumstances whatsoever). When I posit that a human relies on this hidden untenable assumption, I can account for the ways s/he finds her/himself at least tempted to pretend to "absolute certainty" and other god-like powers. Behaving-and-experiencing based on this untenable assumption turns out to be self-defeating—anti-survival in its consequences.

The Egg, Chicken *and* Rooster: Designing Triadic Relations When Doing Cybernetics

Judy Lombardi

Once, when visiting Heinz Von Foerster on Rattlesnake Hill in California, he gave me an article he had written in the 1970s entitled "The Cybernetics of Cybernetics." In this article, among other things, he writes about observing, language, circular relations and the importance of designing triadic relations when describing social systems.

As a professor I have found the practice of nesting three concepts together to be useful in generating circular distinctions and clarifications rather than linear ones. That is, triadic thinking and doing provoke a relational language that helps me, and hopefully my students, to think circularly and systemically about social issues.

During my presentation I will explore the idea of designing triadic relations when explaining social systems. I will introduce a variety of triadic relations that might be interesting to those interested in cybernetics. For Example:

Morals, Ethics and Manners, Conversation, Conflict and Contradiction

Physical Constraints, Social Constraints and Human Agency, Social Structures, Floating Hierarchies and Consensus Model Structural Determinism, Radical Constructivism and Social Systems.

Family Learning at Community Science Centers

Frederick Steier
University of South Florida, Tampa

Cybernetic principles have been used in all aspects of design for learning at a regional science center. This has included, in addition to a rethinking of the scientific ideas themselves, issues of the design of exhibits/galleries, the role of explainers/interactors as part of the science center staff, and the organization of the science center itself. In particular, cybernetic understanding has led to thinking about the ways that families learn, as a system, in their visits to the science center, and the implications of this (including family therapeutic techniques) for ways of inviting learning in a systemic context at a science center. Implications for cybernetic issues of public understanding of science in general are also discussed.

Therapy and Neurofeedback 2 (Saturday, 2:30-4 pm, Room 127)

The Family as a Force Field or as Pattern Generator

Andrea Schara, Kathy Wiseman, and Joan Lartin

Any of us are vulnerable to pressure, (kind of like gravity) from other people who surround us. Their influence on our direction has less to do with their weight as an object, and more to do with the kinds of conversations which are co created.

The conversations leave patterns of brain waves that can be described as overly determined, chaotic or as attractors. Joan Lartin will provide a demonstration for anyone in the audience who is interested in watching his or her brain learn from its own feedback. This feedback is fast, and allows individuals to alter their functioning in a radical way. We can compare the speed of the possible changes due to neurofeedback to altering one behavior in the multigenerational force field. In the family force field one's functioning alters at slow… slow… speed. Yet, one without the other cannot lead to long term creativity or even the appreciation of differences in the emotional system. Listening to family members describe efforts to understand their patterns and then trying to alter these patterns gives us great respect for this multigenerational force field.

Kathy Wiseman will present examples from family business where there is no monetary positive feedback for running away. Self determined individuals have found magical ways to separate or alter negative conversations while deeply respecting the conservative nature of biological systems. It is a paradigm break to know that a problem in one person is a function of a multigenerational force field, and not a mental illness in one person.

Therapy and Neurofeedback 3 (Saturday, 4:30-6 pm, Room 127)

Non-Linear, Dynamical and Other Advanced Visualization Techniques in EEG: Gabor and Adaptive Transforms
Valdeane Brown

Non-Linear, Dynamical Control Theory represents the cutting edge in many fields, including applied Neuroscience. This panel will present leading concepts in this field of application, including the latest research into the use of "Anti-Control of Chaos", "Synchronization Through Chaos" and sophisticated data analysis techniques including Gabor and other Joint Time-Frequency Transformations to more accurately visualize emergent and off-line EEG patterns.

As the field of Neurofeedback continues to progress, it is incumbent upon us to continue to deepen our comprehension and appreciation of advances in digital signal processing and how these will affect what we see, what we do and how we understand the process of promoting transformation. Traditional time-based and frequency-based analyses have formed the essential foundation of our field; however, a whole new array of advanced analytic techniques have begun to emerge over the last decade: including, non-linear, dynamical techniques, Joint Time-Frequency Analyses and Wavelets.

Symposium E. Information Systems

Chairperson: Raj Kanungo

Information Systems (Saturday, 4:30-6 pm, Room 122)

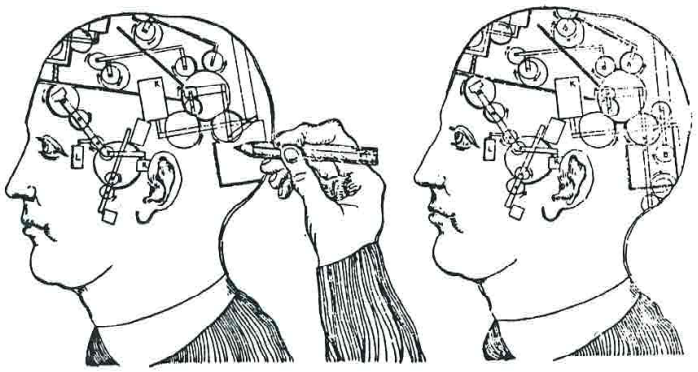
Leveraging Collaborative Technologies for Sharing Tacit Knowledge: An Integrative Model
Vikas Sahasrabudhe and Subhasish Dasgupta
The George Washington University

Collaborative technologies (such as e-mail, instant messaging, chat rooms, discussion groups, groupware, etc.) seem uniquely positioned to assist in sharing of knowledge within in any organization, and between an organization and its environment. Collaborative technologies have the potential to help large, global organizations where employees neither know who within the organization may have expertise that can solve their problems, nor have the opportunity to gather around a "water cooler" to share ideas and knowledge. A number of studies are looking at ways to make knowledge within an organization explicit and share that explicit knowledge. Nevertheless, a large subset of knowledge within any organization is still not explicit, or is tacit in peoples' heads. Organizations are eager to "tap" that tacit knowledge capital in the interest of the organization's objectives, and yet current collaborative technologies have not met that challenge. Our research question is how can the potential of collaborative technologies for sharing tacit knowledge (without making it explicit) be assessed and

what can be done (in terms of features, functions, policies, etc.) to make the collaborative technologies effective "virtual water coolers" for organizations.

The starting point for this integrative model is the Technology Acceptance Model that covers individual and organizational characteristics that affect the use of technology. We extend the model to examine the sharing of tacit knowledge within a collaborative environment. We use research in the area and other theories (viz. Theory of Planned Behavior, Innovation Diffusion Theory and Social Cognitive Theory) to identify individual and organizational characteristics that affect sharing of tacit knowledge. The presentation will cover a conceptual model and a set of individual and organizational characteristics affecting use of collaborative technologies, and individual and organizational characteristics affecting sharing of tacit knowledge. The implications are that collaborative technology must have the necessary features and functions to support those individual and organizational characteristics which in turn will, within appropriate policy framework, enable sharing of tacit knowledge among those individuals in such as organization.

The presentation will also include the results from a set of experiments conducted in the use of discussion forum to share knowledge among groups of students at a large mid-Atlantic university. The experiments were conducted intentionally with no organizational settings or constraints, except that the students belonged to specific courses. The students in each of those courses were given access to a discussion forum in the Blackboard system used at the university. The students were not required to use the forum, nor were they given any incentives or disincentives, such as points towards their course grade. Without any such organizational settings, as anticipated by the conceptual model, very few students tried to use the discussion forum for sharing knowledge. The survey data collected from students, who did not use the forum, included their reasons for not using the forum and their perceptions of if and under what circumstances they may use it. Analysis of that data provided useful information in support of the conceptual model, namely the lack of certain organizational characteristics did affect the (non-)use of such a collaborative technology for sharing tacit knowledge, and students' perceptions of circumstances under which they may use the forum supported the individual and organizational characteristics and propositions from the conceptual model. The presentation will conclude by identifying a series of experiments that will be conducted in the future to test the whole conceptual model.



Synergy of Knowledge and Values Management by Combining the USOMID and Six Hats Methodologies

Matjaz Mulej
University of Maribor, Slovenia
mulej@uni-mb.si

USOMID is my methodology. We have applied it for 23 years to attain informal dialectical systems thinking in over 400 cases in companies and several thousand cases with students. About 20 years ago the famous professor of creative thinking Eduardo de Bono created his methodology called Six Hats of Creative Thinking. Both are very supportive of holism, but from different angles. We recently tried to put them in synergy with an interesting result. Knowledge and values management are facilitated at the same time. USOMID elaborates well the procedure of work and interdisciplinary co-operation in human teams, thus providing for a synergy of knowledge helping the team meet the Law of Requisite Holism, among other effects. Among the six hats the blue one receives good support from USOMID. On the other hand, all team members use – at the same time and per phases – the white hat when collecting facts, the black hat when using the pessimistic values, the red hat when using the emotional values, the yellow hat when using the optimistic values, and the green hat when using the creativity oriented values. Thus, both the knowledge and the values are well managed to foster creativity with no arguing, but a lot of discussion in which brain writing and brain storming are used as well.

Cybernetics as a Theoretical Base for Information Systems Research

Shivraj Kanungo
The George Washington University

This paper proposes the use of cybernetics as a theoretical base for conducting research on information systems. The problem of "fragmented adhocracy" in IS research is analyzed on four levels (philosophical, methodological, technique and tool). These disparate and apparently incongruent viewpoints can be encapsulated by the proposed framework. The paper discusses how principles from general systems theory, cybernetics and second-order cybernetics can be used to study and analyze specific IS problems. Specifically, the paper analyzes how the notions of purpose and purposefulness can be used to study IS-enabled value, how Ashby's law of requisite variety can be used to study interorganizational systems, how notions of emergence, hierarchy, communication and control can be used to study extended enterprises, and how autopoesis, complexity and self-organization can be used to study the interaction of information systems with other organizational systems like culture. Finally, the paper explores how cybernetics and systems theory can be used to incorporate both qualitative and quantitative variables, static and dynamic variables, and subjectivity and objectivity when operationalizing information systems research.

User Interface Design -- An Experimental Study

Barry G. Silverman, John Pourdehnad, Gnana Bharathy, Melanie C. Green, and Joyce A. Salisbury
University of Pennsylvania

The Internet is becoming an increasingly vital medium in our information society. More Americans are going online to conduct such day-to-day activities as business transactions, personal correspondence, research and information gathering, and shopping. Now that a large number of Americans regularly use the Internet to conduct many daily activities, it is no longer good enough to rely on generalized visual library and hypermedia principles to support all these activities as if they were the same. Further, the pace of development of e-commerce website designs and of online decision support tools have dictated that companies put them out there before the competition does. There has been little time to study these designs and how they impact consumers (e.g., is the linear, visually flashy process of a Gucci website worse than the non-linear visually functional site of a Sears Roebuck? It is vital to develop a better understanding of how web designs facilitate consumer needs (or not), and to assess the role of individual differences and whether designs that reflect such differences provide improved service.

There are many consumer-oriented websites, yet the science of website design is relatively immature. There are few scientific principles upon which to base such designs, although many designs are used in practice. In this research, buyer behavior theory was examined to see if it could be used to enhance the DSS functionality of e-commerce websites. Specifically, other models of consumer cognition and affect that might lead to improved website designs, increased online traffic, and greater consumer loyalty were investigated.

A number of different approaches to user interface design improvements were considered. Of the various possible approaches to human computer interface (HCI) design, the most common practice in the past, and to a great extent today, is to assume one uniform user group with similar characteristics, needs, and preferences. This approach usually requires an iterative design procedure to minimize the differences between users and the system. Another design approach is to assume different user groups with different characteristics, needs, and performances who will be using the system. This approach requires a careful examination of the population in order to identify such groups, as well as different interface modules for the same service/product.

The approach taken in this study was to assume a null hypothesis that there are no differences among the users (although our belief is the opposite) and to try to disprove that theory. For this purpose, the following research tasks were embarked on:

* Development of a model to study HCI (this entailed creating a structured model of the intended user),
* Development of instruments for measurement,
* Validation of the instruments,
* Application of instruments to test the model,
* Analysis of the results obtained through the application of the model, and
* Development of recommendations for the use of the model.

The study thus far has rejected the null hypothesis that there are no differences among the users and has shown that individuals can be classified and separated based on Need for Cognition and Personality (Utilitarian vs. Lifestyle). This results in a 2 x 2 classification, or the sorting of consumers into one of four types. The method of classification used in this study was a survey or questionnaire. Self-selection was also exercised, but it was shown that individuals are not perfect when it comes to classifying themselves.

The Potential for Electronic Commerce in Developing Countries

Edward J. Cherian
The George Washington University

The developed nations are rapidly moving to embrace electronic commerce as an easy, efficient, and less costly business model, while offering increased customer satisfaction. The pace of acceptance and implementation of electronic commerce in developing nations has been slow, and many barriers remain to be addressed. Barriers to the successful implementation of electronic commerce in developing countries have been postulated: these include technical, business and government obstacles.

These issues have been presented and discussed with a group of World Bank staff, at Workshop Sessions in Washington, DC in March 2004. Some of the Bank participants have been intimately involved in planning, funding and implementing electronic commerce projects in developing countries, while others are members of information technology groups. This paper builds on work previously reported by the author and reports on some electronic commerce projects underway in developing countries. In addition, the paper presents the results of discussions and inputs from World Bank staff regarding the obstacles to overcome in the successful implementation of electronic commerce in developing countries.

Organizational Network Alignment

Kent Myers
Science Applications International Corp., McLean, VA

Organizational alignment is a commonly used diagnostic concept. It draws attention to the relationship between parts, and hence serves as a systems-oriented corrective to a parts-oriented analysis. There is a bare spot in the literature, however. The concept is rarely used to diagnose the external relationships of an organization. This is partly because the concept has not been generalized but is tied to a specific schema of internal parts (i.e., people versus process) or to a specific type of relationship (i.e., a customer). In a project for the military we developed a new concept and measure of interorganizational alignment. We applied it to five varied relationships between major interacting nodes, constituting the bulk of the network that administers manpower and personnel. The concept, data collection apparatus, and results are reviewed, with emphasis on the use of multiple perspectives. The benefits of this method for developing network-centric organization and enterprise-wide robustness are discussed.

Symposium F. Social Systems

Chairperson: William Reckmeyer

Complexity and Public Policy (Saturday, 9-10:30 am, Room 127)

The Nature and Use of Systems of Systems Approaches in Public Policy-Making and Program Management

William J. Reckmeyer
Stanford University and San Jose State University
reckmeyer@sbcglobal.net

As human society grows more interconnected and complex, government agencies are faced with evolving needs to provide better services in more timely ways to their stakeholders in domestic as well as foreign affairs. The central challenge for public policy makers and program managers lies in the highly fragmented nature of the enterprises in which they work and the approaches they use to fulfill their responsibilities. Many current issues are hyper-complex, with multiple interdependencies among independent components, and solutions require significantly greater degrees of integration than has historically been the case.

During the past decade there has been increased interest in the use of Systems of Systems (SoS) approaches to help address these challenges, especially within federal agencies of the United States (initially within the Department of Defense, but more recently in other groups like NASA, EPA, and Department of Homeland Security). These emerging approaches focus on developing scientifically

rigorous and practically useful ideas, processes, methods, and tools that improve the coordination of independent components systems (highly complex and often self-organizing phenomena) to create different sets of recomposable systems of systems (hyper-complex and self-evolving phenomena) which provide integrated capabilities that cannot be achieved by the component systems themselves.

This presentation summarizes the history and basic natures of these SoS approaches, which are fundamentally based on advanced contributions of systems science/cybernetics, and shares how they are being used in a variety of selected application arenas (national strategy, defense acquisition, defense logistics, critical infrastructure protection, homeland security, elder care, organizational transformation, and nanotechnology policy).

Genesis of a Chain of Thought

Henry C. Alberts
Adjunct Professor, University of Maryland, University College

In 1995, six years of study of a complex process; "The Process Used By The U. S. Government in its Acquisition of Materiel", was completed. I began the study in 1989 examining the problems experienced by the Department of Defense in procuring (developing new and advanced state of the art weapons, or simply purchasing existing equipment) needed materiel. The study was sponsored by the Office of the Undersecretary of Defense, Acquisition through the Defense Systems Management College (DSMC) where, at that time, I was Professor of Engineering Management. During the course of the study, staff members of the U.S. Senate Armed Services Committee requested DSMC support for their efforts in re-codifying applicable acquisition law and DSMC's Commandant complied by establishing a research project and assigning me as Principal Investigator.

During the period between then and now, I have reviewed all of the lessons learned from that and other projects in the U.S. and abroad to try and construct a train of thinking that incorporates what I have learned. The learning has been detailed in three papers presented at the annual meetings of the International Society for the System Sciences (ISSS) that will be discussed and made available during this meeting. The basic points in the argument are:

1. There may be limits to the degree of complexity that can be treated in existing analytical processes
2. The process of analysis and synthesis of ideas may be bounded by the language used in the process
3. The individual capacities of those involved in examining complex issues may play a role in determining how well the results achieved fit the purpose of the work.

Fuzzy Set Theoretic Framework for Representing Uncertainty Due to Vagueness and Imprecision in Knowledge Representation
Azene Zenebe and David Anyiwo
Bowie State University, Bowie, MD

This paper presents a fuzzy set theoretic framework for representing subjectivity and the associated uncertainty due to vagueness and imprecision in knowledge representation. The framework is applied for movie objects representation and reasoning in movie recommender systems. Related recent development includes Fuzzy RuleML - a rule language framework for representing both certain and uncertain information, as well as fuzzy extension of OWL.

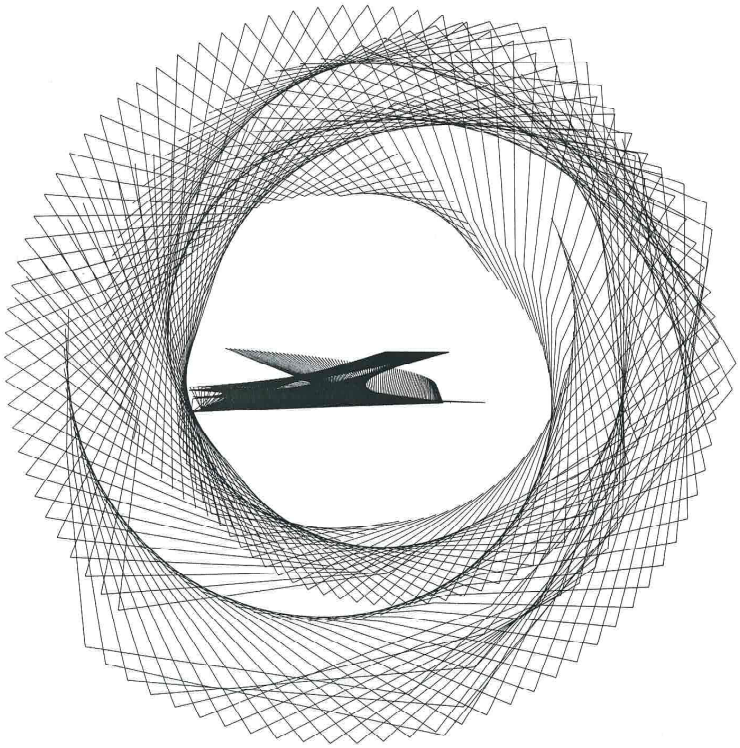
Cultural Strategies (Sunday, 11-12:30 pm, Room 122)

A discussion of the work of the Cultural Strategies Institute which is based on the work of Gregory Bateson
Lowell Christy, Catherine Bateson, and Bill Smith

Participatory Strategic Planning

Facilitator: Alisa Oyler

Creating the Future of ASC (Sunday, 1:30-6 pm, Room 100)



Author Index

Room	Thursday			Friday			Saturday			Sunday	
(Capacity)	AM	PM	Evening	AM	PM	Evening	AM	PM	Evening	AM	PM
SPH Ambassador	Tutorial										
SPH Diplomat			Recep. Movie								
MVC Post Hall				Conv.	Keynotes	Oral T					
MVC Hand Chapel							Conv.	Lunch	Perf.	Conv.	Lunch
Room 122 (40)							RC1 RC2	RC3 IS1		IS2 SS2	
Room 100 (40)							QE1 QE2	SM M1		M2 M3	Planning
Room 127 (30)							SS1 T1	T2 T3		Hist. Perf.	
Room 129 (10)							TWK		TWK		

SPH - State Plaza Hotel, 2117 E Street NW

MVC - Mount Vernon Campus of George Washington University, 2100 Foxhall Road NW