EXPANDING THE CONCEPTION OF SCIENCE: ABSTRACTS PREPARED IN 2013-2014

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PREFACE

The Research Program in Social and Organizational Learning at The George Washington University hosts visiting professors for periods of several months or an academic year. In the 2013-2014 academic year, the Research Program hosted two visiting scholars. Both were Fulbright Scholars. Some of these abstracts were prepared by professors and visiting scholars associated with the Research Program. Others were prepared for panel sessions at conferences on cybernetics or systems science.

The first abstract was for an invited lecture for the Heinz von Foerster Society in Vienna, Austria November 18, 2013. the Second was for a presentation to the faculty of the School of Business at the George Washington university November 21, 2013. The abstracts 3, 4, 5, and 6 were for a panel on Systems and Cybernetics for the Policy Studies Organization in Washington, DC December 6, 2013. Abstracts 7, 8, and 9 were for the biannual meeting of the Washington Academy of Sciences March 29-30, 2014. Abstracts 10, 11, 12, 13, 14, 15, and 16 were for a panel on Country Development in a Time of Globalization at the European meeting on Cybernetics and Systems Research in Vienna, Austria April 22-25, 2014. Two panels were arranged for the IEEE meeting celebrating the life of Norbert Wiener in Waltham, MA June 24-26, 2014. One was on Management Cybernetics and the other introduced the work of the American Society for Cybernetics.

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SECOND ORDER CYBERNETICS: THEN AND NOW

Stuart A. Umpleby
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When Heinz von Foerster coined the term "second order cybernetics" his goal was to include the observer in the domain of science. This was a fundamental change in the conception of science, and Heinz encountered stiff opposition. One consequence of including the observer would be to extend cybernetics (and science) into the domain of ethics. Scientists had previously sought to be objective. Including the observer made science a subjective enterprise. This suggestion was strongly resisted by Heinz's colleagues in the UIUC College of Engineering and elsewhere in the U.S. academic community.

Since Heinz retired and moved to California, the people involved in cybernetics in the U.S. have been mostly social scientists. Rather than people with backgrounds in neurophysiology, psychology, mathematics and philosophy, those interested in cybernetics tended to be therapists, management scientists, sociologists and people concerned with design. Including the observer in science led to interest in scientific theories as part of social systems. Several conceptions of second order science have now been formulated. If we use the correspondence principle (i.e., every new theory should reduce to the old theory to which it corresponds for those cases in which the old theory is known to hold), we can say that two dimensions have been added to the conception of science: a) amount of attention paid to the observer, and b) the amount of effect of a theory on the phenomenon described.

SECOND ORDER SCIENCE:
THE EFFECT ON BUSINESS AND SOCIAL SCIENCE RESEARCH

Stuart A. Umpleby
George Washington University

Presently there are several efforts to redefine science in more general terms. There are several underlying causes. First, a great deal of research and many experiments have been done, leading to a desire to combine and synthesize what we have learned. Second, the internet creates opportunities for cooperation both in integrating past results and in conducting future experiments. Third, there is increased interest in the role of the observer in the scientific process and in the effect of theories on the systems being studied, at least in the social sciences. This presentation will focus on the third factor.

In the social sciences it is clear that theories affect the phenomenon being studied. Indeed, we create theories in the hope that the theory will be accepted, acted upon, and the social system will function better. However, usually social science research is based on the assumption that the theory does not affect the phenomenon. The result is a gap between our assumptions about social systems and the way we do research. Closing this gap is leading to new methods for both research and practice.

Creating a second order science, which includes attention to how theories affect the phenomenon being studied, will make science more relevant for the study of business. The previous philosophy of science was created for describing physical systems. Systems in which participants actively try to influence others require an expanded philosophy of science. This expanded philosophy of science will alter the way that business, and social science, research is done.

A GENERAL THEORY OF REGULATION: IMPLICATIONS FOR SCIENCE POLICY AND EDUCATIONAL POLICY

Stuart A. Umpleby
George Washington University

Regulation (or control or management) occurs throughout biological and social systems. There are many examples. The iris in the eye regulates how much light the eye receives. Hunger controls when and how much we eat. A thermostat on the wall controls the temperature in a room. The driver of a car controls the direction and speed of the vehicle. A manager of a firm or a government agency regulates the policies and operations of the organization. Government agencies enforce standards in air and water pollution and food and drug production. The citizens of the U.S. decide, through their votes, who will represent them in Congress. In each case there is a regulator and a system being regulated, and there is a circular causal process connecting the two. Other disciplines tend to describe a system being regulated rather than the interaction between a regulator and what is regulated. A general theory of control and communication would focus on regulation independent of the material in which the process occurs. Hence, instances of the basic principles of regulation can be found in biological systems, in individuals, groups, organizations, nations, the international system, or in automatic control machines.

Cybernetics, the field which has developed this general theory of regulation, has evolved considerably since its early days in the 1940s. It has passed through a period of engineering cybernetics when most work was concerned with computers, automatic control devices, and man-machine interfaces; a period of biological cybernetics when the emphasis was on understanding cognition; and a period of social cybernetics when the focus has been on management, economics, and creating a stable interaction between the environment and human society. There has also been attention to the philosophy of science in an effort to ensure that it describes the social sciences as well as the physical sciences. Science expands by adding a new dimension – any new theory should reduce to the old theory, to which is corresponds, for those cases in which the old theory is known to hold. This "correspondence principle" can also be applied to the philosophy of science. Accordingly, two dimensions could be added to the classical philosophy of science – amount of attention paid to the observer and the effect a theory has on the system it describes. Both dimensions can be disregarded in the physical sciences, but not in the social sciences.

Expanding the philosophy of science would change how social science is done. There would be less emphasis on finding linear relationships and more attention to circular processes – positive and negative feedback loops. There would be more attention to decision methods, such as group facilitation, since social scientists participate in as well as observe social systems. There would be more attention to multi-disciplinary or interdisciplinary research to counteract overly narrow disciplinary research. Presently the fields of systems and cybernetics are growing in other countries but declining in the U.S. as indicated by the addresses of the authors of articles in the journals in the field. Currently there are no university departments in the U.S. that teach systems and cybernetics, other than systems engineering. The fields of systems and cybernetics have been developing a general theory of management, of information society, and of knowledge management. They offer theories that can help the social sciences communicate with each other more successfully. Consequently, increasing support for these fields would seem to be wise policy.

REFRAMING FEDERAL MICROGRID DEVELOPMENT

Kent Myers

The federal government is currently replacing conventional electric power plants with advanced microgrids at major military bases. A microgrid is a significant upgrade, having high potential locally by exploiting new energy sources and better ways to integrate, but also setting a new national pattern.

Policy levers are being applied to make the transition to microgrids a success. A direction has been set, and this has been followed up with favorable acquisition mechanisms, ample funding, and political support. It would seem that everything is in place, except that an underlying organizational culture is poorly matched to what microgrid development requires, and this organizational culture is relatively immune to the policy levers that have been applied.

By "culture" we mean interlocking management practices that are actively reinforced in the everyday dealings of the federal workforce. Several common and even best practices in federal acquisition and project management are not well matched to microgrid development and may seriously limit their benefits. These practices grew from experience with technologies, organizations, and standards of a different era and continue to be considered the proper way to purchase and manage services. While these practices continue to be workable in many situations, they suppress systemic, evolutionary approaches to technology development. An alternative approach and associated practices are proposed that are more likely to bring out the full potential of microgrids while maintaining conventional safeguards.

In sum, an important overlooked target is identified for policy intervention that will unlock microgrid development, but successful intervention hinges on overcoming a persistent organizational culture – a difficult prospect.

REFLEXIVITY OF THE OCEAN AND THE HUMAN

Peter Tuddenham

The College of Exploration

This session will explore how reflexivity and theories of communication and control offer approaches to help different groups develop shared language and actions concerning the relationship of the ocean and humans.

Ocean scientists tend to focus on one of the following fields: Ocean Physics (i.e. ocean structure, circulation, tides and internal waves), Ocean Chemistry, Biological Oceanography, Air-Sea Interactions, Ocean Models (i.e., physical, chemical, biological and biochemical, coastal and shelf edge processes), and Paleooceanography. Each field has its own language and sub-discipline scientific and academic career paths. Most K-12 schools do not teach about the ocean. Did you learn about the ocean in school? Up to now the topic of the ocean is not necessarily included in science education or other topics, including geography. There are some policy makers from coastal areas of the USA who are concerned about ocean policy.

Most adults are not literate about the ocean. Being ocean literate means understanding the ocean's influence on you and your influence on the ocean. There are seven essential principles. 1. The Earth has one big ocean with many features. 2. The ocean and life in the ocean shape the features of the Earth. 3. The ocean is a major influence on weather and climate. 4. The ocean made Earth habitable. 5. The ocean supports a great diversity of life and ecosystems. 6. The ocean and humans are inextricably interconnected. 7. The ocean is largely unexplored.

Since 2002 small groups of scientists, educators and policy makers have worked together to help advance the idea of ocean literacy in the USA and recently globally.

WHEN GOOD ENOUGH IS BETTER THAN BEST: CYBERNETICS AND DESIGN, PRECONDITIONS AND POLICY

Ranulph Glanville

Cybernetics offers us much more than control, feedback and communication! In this talk I shall introduce several concepts that are central to thinking in contemporary cybernetic terms, and which may have considerable value when we try to consider policy, especially what policy might, in principle, be able to achieve. I will not explore a particular example, as the others in the panel do, but will introduce the broad range of these concepts, pointing to how we can treat them as bringing benefit rather than detriment.

The ideas include the unavoidability of error; insoluble (wicked) problems; undecidable propositions; side effects; and the value of being good enough.

I will suggest that many of our most highly regarded professions act on and incorporate these concepts.

EARLY HUMAN REFLEXIVITY

Kent Myers

Reflexivity is a recognized feature of modern human consciousness. It is on display when humans talk about imagined states and subject the results of these deliberations to further imagining and talking, without ever grounding the activity in anything other than itself. This activity occupies the attention of many people, though not all, and not all the time. We are speaking here of reflexivity in terms of a distinct human behavior as observed "in the wild"; we are not pointing to any strict logical definition or simplified laboratory behavior.

In animals we see evidence of consciousness but no reflexive capability. Given that humans emerged from an animal existence, there must have been a time when humans, or near-humans, were not reflexive. We will trace how reflexivity may have come about within the broader context of an evolving human consciousness. By doing so, we may gain a better appreciation for how reflexivity has changed human experience, and what its limitations and dangers are as well as its advantages.

This is of course difficult territory in many respects. Neither human consciousness nor reflexivity is well understood. There is no agreement on how either came about, and there are many methodological disputes that undercut any approach one may take. Our path will be to examine and compare two accounts of reflexivity. The first is Robert Bellah's synthesis of recent and widely respected work in the area. Methodologically, it is broad-minded, nonreductive, and respectful of ancient and traditional insights. The second is from Julian Jaynes who builds a theory that explains troublesome anomalies that other thinkers ignore. Many find his theory absurd, yet it has survived many tests. Surprisingly, the two accounts provide different but converging perspectives on reflexivity that lead to further speculation about its significance for humans and our future.

CYBERNETIC OCEAN SCIENCES AND OCEAN SCIENCE CYBERNETICS

Peter Tuddenham

Ocean Sciences offer an opportunity to teach and learn science in an integrated way. Very often science is taught and learned in a very stove-piped manner. Encouraging ocean science literacy, the understanding of the ocean's influence on you and your influence on the ocean, is a goal of many ocean educators. The ocean covers 70% of the planet and contains the vast majority of all living matter on the planet, yet we know very little about it, and less than 5% is explored. The ocean is a major influence on weather and climate. The ocean and humans are inextricably interconnected. Yet the ocean and is hardly taught in K-12 schools or in undergraduate courses. The general public is generally ignorant about the role of the ocean.

Cybernetics is an integrating science and art. Over 50 years of recent articulation and centuries of study of topics embraced by cybernetics have created a deep resource of knowledge and information on the control and communications of systems and the role of the observer on a system. The application of cybernetics to the challenges of creating an ocean literate public will be explored. Recent evidence of participative processes and large scale communication to promote ocean science literacy will be presented.

THE SCIENCE OF SCIENCE EDUCATION: BUILDING A CONCEPTUAL SCHEMA OF SCIENCE IN THE MINDS OF MIDDLE AND HIGH SCHOOL LEARNERS IN DISADVANTAGED ENVIRONMENTS

Lowell F. Christy Jr, Ph.D.

Is there a science underlying science education? To move education from its current empirical base of trial and error, a science of science education requires principles which explain the dynamics of learning and innovation in the mind of the operational scientists and how to build it in the learner. Science tends to veer away from living systems when the concept of Mind {1} is raised but must be addressed going deeper than the current hit and miss research base of teaching and understanding of the learner's mind. The purpose of the seven year experiment with middle/high school students in environments of high poverty, violence and minority representation was to test the learner's construction of "information", "relationship", and the impact of "entropy" and "work." The objective is training the "pre-perceptual, "pre-conceptual" {2} schema or matrix enabling an interactive three way conversational construction of reality characteristic of scientific processes. This "learning to learn"{3} hypothesis is based on activating three domains/levels of symbolic interaction 1) within the mind of the learner, 2) between the learner and his/her environment and 3)lateral trust networks of social networks. At each level the conceptual schema of information/relationship/entropy/work must be modeled directing the type of learning needed to "INTERLACE" the background, foreground thereby creating a whole ground {4} allowing the learner to orient and navigate in today's Exobyte storm of data.

Level one is the sixteen hours over four weeks of intensive training in Science Knowledge Management (SKM). SKM consists of a hundred always true interrelationships and constraints of Nature forming an anchoring framework to build future In-Formation upon and self-assembly of knowledge. The three week summer program takes SKM students through an Immersive Academy (IA) such as the Space medicine Science Academy where practical tasks as building and launching rockets, creating hydroponic food sources, etc., draw upon the SKM conceptual matrix forming an interacting, conversational scaffolding to conduct scientific inquiry. The design of constrained environments like space crews face facilitates rapid feedback loops and permits activation of prior knowledge or building new learning on prior learning. Team based tasks activates lateral trust social networks were information must be pooled, developing selfregulating and self-motivated behaviors in learners. This seven year experiment testing an alternative set of assumptions for science education seeking a scientific basis for STEM education has provided startling practical results advancing disadvantaged learners dramatically whilst illuminating the dynamics of how the learner actually moves from an observer of scientific facts and scientific literacy to thinking in scientific terms. The bottom line for minority STEM education is a new scientific means of informal education that can complement current fact and core curriculum based approaches. The experimental results have profound implications for how Science, Technology, Engineering and Math) STEM is taught and the desired output of innovative students who can think beyond the facts given and expand their thinking to be larger than the problem at hand.

FROM SYSTEMS TO INTEGRAL MODELING – IS IT TIME?

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One can say the world consists of wholes and parts. Systems thinking has contributed significantly to appreciating wholeness and the need to model the whole in order to understand the world. Most scientific disciplines have focused on the parts and through modelling the parts have tried to understand the world.

However, descriptions of wholes and descriptions of parts are both useful. When we model the world it is useful to include the whole, the part, and their relations to develop an integral model of the world. However, it is important to note that our conceptions of the world are based on an individual construction and then co-constructed through interactions among individuals. Thus, in order to create an integral model of the world, the modelling approach should provide an opportunity for inclusion of individual constructions and co-construction.

This presentation in the beginning will discuss the need for development of integral models and integral modelling approaches. Then it will explore the possibility of using holon and holarchy theory as a base for integral modelling of the world. At the end a proposal for an integral modelling approach is made and its basic features are presented.

INTELLECTUAL DEVELOPMENT AS AN INTERACTION BETWEEN SYSTEMS OF CHANGE: A METHODOLOGICAL ASPECT

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Theoretical section. The main idea is that both the regulator and the system being regulated could be considered as systems that are changing. They interact "in the opposite direction". But they both are not immutable. Each of them can play the role of the regulator from one point of view, and the system being regulated – from another. For example, in intellectual systems, intellect, as some kind of inner system, regulates some other set of objects and processes that constitute an external system being regulated. Intellect itself is being regulated by this external system acting like a regulator. Further, the interaction between some systems of change forms a new system on a higher level which provides the possibility for regulation. As a whole it is similar to complex adaptive systems in cybernetics but not the same and is in the field of systems philosophy.

Applications.
1. Paradigm shift and the "Central Problem of Intellectual Development": transition from Kuhn's concept of scientific revolutions (driven primarily by balance of puzzle-solving power based on insight, 'a gestalt switch', which has been criticized so much and did not allow any rational regulation at all) to Jean Piaget's concept of "total balance", based on the process of assimilation and accommodation (joining together in intellectual adaptation), as the most essential feature of intellect.
2. Creation of a university consortium as a higher level of scientific-educational-business system (educational consortia are very popular in Ukraine and Russia right now; I was directly involved in creating such a consortium in our region this summer).

This theme is connected to cybernetics and system philosophy, science and education, intelligence (including emotional intelligence which is interesting to Vladimir Motov), intellectual technologies (my past theme), neo-cybernetics and reflexivity (may be interesting to Stuart Umpleby and Karl H. Müller).

SOCIAL AND LABOR CHALLENGES AND THE SEARCH FOR AN ADEQUATE RESPONSE

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Under the influence of globalization and informatization of the economy, organizations are changing their structures from hierarchies to networks, resulting in the development of horizontal enterprises that operate through internet technology with multiple distributed agents. This change is bringing about a new model of social and labor relations.

How does the emergence of a new economy alter the social dialogue between labor and capital? Are we seeing the end of a collective consciousness among workers, amid more individualistic behavior? The participants in social and labor relations are now in conditions where they are forced to learn the principles of network organization and in this way have the opportunity and responsibility to protect their interests in the new economy. The article explores the direction of influence of globalization and infomatization on social and labor relations. It identifies the organizational foundations and principles of social and labor relations in the emerging new economy. It reviews the development of the network of social and labor relations in Russia.

SOCIETY AND MENTAL HEALTH

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Reform of Mental Health (MH) services has been conducted in Georgia since 2011. There has been a reduction in the number of beds in large psychiatric hospitals. Some general hospitals have established acute psychiatric units. Crisis intervention services and a pilot program of Mobile Assertive Care Service have been created. Unfortunately, the reform path is partial, fragmented and inconsistent two years after the reform government and the professional community started constructing a Mental Health Strategic Plan. In this context, societal attitudes toward mental health play a crucial role as public opinion could be the basis for predicting success in building community based services. Method: Societal beliefs about mental health issues, psychiatrists and people with mental disorders were measured by a survey, "Mental Health and Society." The survey contained 25 questions with multiple choice answers. The poll involved 250 adults (mentally healthy subjects). Results: Only 8% of respondents agree that they would contact a psychiatrist in the case of “signs of mental disorders, as well as emotional disturbances.” Almost 45% of respondents believe that there is “no protection of confidentiality of medical records”, and that is caused by technical staff (32%) and psychiatrists (28%), or both. Despite expressions of sympathy toward mental patients, 36% of respondents believe that “it is necessary to stop the spread of mental illnesses by certain social restrictions (prohibiting birth, etc.)”. Noteworthy is the fact that 32% of participants in the study still believe that “Georgian psychiatrists have medications that will lead to the development of mental disorders in mentally healthy individuals”. The answer: "I do not know,” was received in 40% of surveys, while only 8% denied the existence of “such medication”. Conclusions: The data clearly indicate that attitudes of society to mental health is a constraint and is preventing people from gaining access to appropriate psychiatric services. Ongoing mental health reform needs involvement and more communication with community and mental health service consumers for stigma reduction along with stimulation and development of “formal and informal” community based mental health services.

ONTOLOGICAL THEATRE OF ART, SCIENCE AND TECHNOLOGY: A CYBERNETIC JOURNEY FROM DIGITAL CULTURE TO ARTIFICIAL LIFE

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Cybernetics is responsible not only for scientific and technological achievements but also for social and cultural changes in the late Twentieth Century, including artistic experiments with emergent technologies and development of so called digital culture. Approaches to analysis, foundations and phenomena of digital culture is the focus of this presentation. The underestimated role of cybernetics and its historical impact as well as its methodological potential as an 'ontological theatre' (A.Pickering) is discussed with special attention to works of technological artists. Cybernetics is also critically important for understanding the current shift from digital culture to artificial life - the hypothesis that the author claims to be a centre of his ongoing research.

HOW SCIENCE WILL BE AFFECTED BY AN EXPANDED CONCEPTION OF THE PHILOSOPHY OF SCIENCE

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Country development requires the implementation of wise policies. Science is the principal means whereby people today decide what is a wise policy. But is our knowledge of social systems adequate to the task we have set for ourselves? Stated differently, are our assumptions about how to create knowledge in the social sciences adequate to the task of creating the knowledge we need? This paper describes how the philosophy of science has changed in recent years so that it can more successfully guide the creation of knowledge of social systems.

THE INFLUENCE OF CULTURE ON COUNTRY DEVELOPMENT: MODERNIZATION PATHS OF BRITAIN, FRANCE, RUSSIA, GERMANY, JAPAN, AND CHINA

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In a paper submitted to a different symposium at this conference, "Multi-Level Self-Organization as a Framework to Understand Emergence of Social Institutions," I suggest that Culture in the form of Belief-Behavior-Codes [BBCs] are the key agents determining organizational behaviors and the specific institutions being formed by those organizational behaviors. In this paper I discuss how BBCs also play an important role in strategic decision-making processes. I shall review briefly the zigzag paths from traditional society [rule by a king] towards modern society [rule of law] in Britain, France, Russia, Germany, Japan and China. Each of these paths has identifiable BBCs due to their language and traditional cultural characteristics. A comparative table is presented and historical turning points are identified to establish the relationship between each country's unique BBCs and the actual path it takes. Using an open discussion format I shall invite suggestions from colleagues in this symposium. The final post-conference paper will include contributions from the conference participants.