PROF. PETER CHECKLAND

Foto: Sokoloff

Excerpts from the Presidential Address to ISGSR Budapest June 1987

IMAGES OF SYSTEMS AND THE SYSTEMS IMAGE

Prof. Peter Checkland

The systems movement – a failure? To a superficial observer it might seem that the success of the systems idea has indeed been very limited. In his talk, however, Prof. Checkland showed that the real impact of systems thinking has been much more profound than is generally assumed.

A great deal of confusion, Prof. Checkland told us, results from the double meaning of the term "system". It is used both to designate parts of reality and as an abstract concept for a relationship among things. In order to choose the appropriate method for a given problem, we have to understand what kind of system we are talking about in a particular case. Practicing clear thinking could help to advance the systems cause.

Prof. Checkland began his talk by tracing the origin of systems science. In the 1920's the Russian Bogdanov developed a general science of organisation, which he called „tectology". Unfortunately, because of the language barrier, his writings remained unknown in the West. Who were then the pioneers of our systems movement?

idea for what became the Society for General Systems Research was hatched, writes (1984) "Ludwig von Bertalanffy is rightly regarded as the founder of general systems".

What Bertalanffy did was to point out that general ideas which he and fellow organismic biologists had developed concerning **organisms** could in fact be applied to whole entities (systems) of any kind. Bertalanffy was intrigued by such things as the fact that mathematically the curve of the loss of weight of a starving rat is the same as that showing the growth of the scientific literature. Surely there must be some general systems laws behind the unity of such disparate observations? (Bertalanffy, 1968).

What the Palo Alto lunch party of Bertalanffy, Boulding, Gerard and Rapoport did was to agree that a Society should be organised to investigate the isomorphy of concepts, laws and models in various fields, thus promoting the unity of science. Bertalanffy's vision was that general system theory would be developed as a high-level meta theory, mathematically expressed, covering phenomena of many kinds.

I TAKING STOCK HISTORICALLY

Once we have created the notion of "systems thinking we can retrospectively identify as systems thinkers historical figures as different as Spinoza, Marx and St. Thomas Aquinas. But the creation of the notion which enables us to name these historical figures as systems thinkers is recent, occuring only in the late 40's, and its prime creator was Bertalanffy. Kenneth Boulding, who was present at the lunch table at the Centre for Advanced Study in the Behavioural Sciences at Palo Alto, at which the

II CURRENT STATUS

Boulding (1984) rightly points out that:

The fact that the Society for General Systems Research has survived for thirty years suggests that there was an empty niche waiting for it

but he adds:

The niche, however, has been fairly small.

One problem is that the **general** systems idea pays for generality with lack of content. Given the variety in the

world, all you can say about practically everything is virtually nothing. Another problem is the practical professional one: people working professionally within a subject are not easily convinced that outsiders armed with generalised topic-free models can make specific contributions to their field.

For these and other reasons there is less to show for the general systems enterprise in the late 1980's than the pioneers anticipated 30 years ago.

This is less true, however, when we consider the use of systems thinking **within** other subject areas, rather than **across** disciplines in the way Bertalanffy envisaged. Within disparate areas of knowledge the systems image has been shown to be powerful, and systems thinking has been established as a useful tool. This can be shown by conducting a thought experiment. Imagine going into a university library and asking to be shown the systems books. You will be taken to shelves containing books on systems theory, control theory, cybernetics. But clearly the real answer to your query is that the systems books are all over the library. In the politics section David Easton's **Systems Analysis of Political Life** and Karl Deutsch's **The Nerves of Government** (which presents a cybernetic information — processing model of government) are systems books. On the geography shelves Chorley and Kennedy's **Physical Geography: a system approach** rethinks physical geography as the study of systems of four types. The section on social work will no doubt contain Pincus and Minahan's text which treats social work systematically. The books on industrial relations will contain Dunlop's volume conceptualising industrial relations as a system which establishes and administers rules. In this way, in most fields, systems thinking has slipped in — whether as an invited or an uninvited guest — and has made a contribution. Systems thinking has established itself as a feasible approach in most fields, and in so doing has established systems as a meta-discipline, one which can be used to discourse about the subject matter of any discipline.

III WHAT DO WE MEAN BY "SYSTEMS"?

Unfortunately, the process of mapping the abstract concept "system" onto aspects of perceived reality has been too successful for the good of the systems enterprise. The success has led to a ubiquitous error which pervades the systems movement and has held up the development of systems thinking in the last twenty years.

What has happened is that the success of "system" in mapping aspects of the world is such that it is used in everyday language in an unreflecting way as if it were a label word for an assumed ontological entity, like "cat" or "table". We casually speak of "the education system", "the legal system", "the health care system", "the industrial relations system", as if all these were, unproblematically, systems. Actually you could justify the use of the words; not, "the education system", but some such phrase as "those structures, processes, behaviours and values concerned with the provision of education which **I choose to regard as** a system". It is much easier to say "the education system". But it is still an error to use the same word for an abstract epistemological device and for assumed ontological entities in perceived reality.

The error is endemic, and we have all committed it many times, from the pioneers of systems thinking onwards. Although Bertalanffy chose the word "system" as the name of the abstract epistemological device (and **that** was probably

the crucial error) the first two words in his book **General System Theory** immediately introduce confusion between epistemology and ontology in the heading at the very start of Chapter 1, which is: "Systems Everywhere". And in the article by Boulding quoted earlier (1984, pg 4) the acceptable phrase "the world **as** a system" (my emphasis) becomes in the next paragraph "the world **is** a total system" (my emphasis). That step from "as" to "is" is so easy to make casually, so hard to justify intellectually!

The solution to the problem, of course, would be to abandon the word "system" to everyday unreflecting use, and adopt a new word for the consciously-used abstract concept. The systems literature itself offers "org" (Gerard, 1964) "holon" (Koestler, 1967) or "integron" (Jacob, 1974), none of which has been taken up. Alas, no one loves a neologism!

Now why is this confusion between images of systems and the systems image important? It is important because it constrains and limits systems thinking, without this being noticed. The constraints are not too damaging in relation to the use of systems thinking to conceptualise objects in the natural world — such as frogs and foxgloves — nor in relation to the design of man-made objects such as cars and cow sheds. But the confusion is very damaging in relation to attempts to use systems ideas in trying to understand the phenomena of the social world, since it restricts the application of a systems approach there to a crude form of functionalism.

As a concrete example of the kind of problems that can arise when we confuse the two kinds of systems, Prof. Checkland mentions the debate that has been going on in Britain since the 1970's concerning the relevance of systems thinking to operational research.

In that debate it was normally assumed that adopting a systems approach entailed the assumption that organisations were organism-like systems with departments and sections as sub-systems or sub-sub-systems. In taking part in that debate I found the protagonists consistently quoting the same source for their view of the social theory implicit in a systems approach (Checkland, 1983, Pg 673). They all quoted Silverman's **The Theory of Organisations** (1970) in support of their view that systems thinking is merely a version of functionalism. Silverman's influential but now dated book assumes that a systems approach entails taking organisations to **be** systems.

Now, there is nothing at all wrong with making this assumption **consciously,** as a chosen strategy in a research process. The error creeps in if it is assumed that it is the only systems-based strategy which could be adopted; and that error comes straight from the confusion which is the result of using "system" both as an everyday lable word and as a conscious epistemological device.

In fact, systems research in the 1970's and 80's has shown that there are fundamentally two strategies for using systems thinking in exploring human affairs (Checkland, 1981). The first is that discussed above, namely to make the assumption that R (perceived reality) is systemic, while M (the methodology in which concepts including systems are used to explore perceived reality, R) can be systematic. This characterises what I have termed "hard" systems thinking such as is found in systems engineering and RAND systems analysis. The second strategy, characteristic of "soft" systems thinking, and adopted in characteristic of "soft" systems thinking, and adopted in soft systems methodology, assumes that R is problematical

while M can be **systemic.** In other words, "the System" in question is not part of the world but is the process of inquiry: **that** is the system which is "engineered". Systemicity is shifted from the world to the process of inquiry into the world.

It is obvious that "hard" and "soft" systems thinking are complementary, and that the availability of both enriches the repertoire of approaches to problem solving. But the very possibility of the latter was long obscured by the characteristic error of the systems movement, namely, making the casual, unexamined assumption that „system" is a label for parts of the everyday world.

IV IMPLICATIONS FOR THE SYSTEMS MOVEMENT

Prof. Checkland warns against a too narrow focus on general systems theory. The primary task of the

movement is to find out "whether or not, and if so how, systems concepts can help our understanding of the world".

The learning process can occur in many different subject areas, and will gain cogency from being grounded in the specific issues and problems within the various disciplines. If testable **general** systems theory is to emerge, its source will be the projects within different areas which have in common their use of systems ideas.

Prof. Checkland concludes that general theory should be regarded "as a welcome epiphenomenon of the learning process in multiple fields, rather than the prime goal of systems work".

A DECISION SUPPORT SYSTEM FOR VILLAGE HEALTH WORKERS IN DEVELOPING COUNTRIES

G. Porenta, B. Pfahringer, M. Hoberstorfer, R. Trappl

Austrian Research Institute for Artificial Intelligence

Ambulatory health care in developing countries is often provided by medical or paramedical personnel commonly known as rural health workers. Medical problems within their realm of competence include diarrhoea, infestation with worms, ailments affecting the eyes and the skin, and several kinds of infectious diseases. Assessment of malnutrition is also among the tasks they have to perform.

A knowledge-based system has been designed and implemented to provide them with decision support. Expanded decision-networks are thereby used to represent the diagnostic process for diarrhoea and infestation with worms. The corresponding procedures for diseases affecting the skin and the eyes are covered with a rule-based approach using two certainty factors. Treatment schemes and procedural knowledge about drug prescription are represented in a frame structure. The hybrid and open-knowledge engineering tool VIE-KET is used to construct a modular consultation system that provides entry points for diagnosis, therapy and drug prescription. Various aspects of the design and implementation of the system are discussed, and two sample consultation sessions are also included.

NEW BOOKS AND PUBLICATIONS

FUZZY SETS, UNCERTAINTY AND INFORMATION

by George J. Klir and Tina Folger
Both of the State University of New York at Binghamton

The primary purpose of this book is to bring the new mathematical formalism of fuzzy sets and fuzzy measures into the educational systems. These formalisms, however, are not introduced here merely for their own sake, but as a basic framework for characterizing the full scope of the concept of uncertainty and its relationship to the increasingly important concepts of information and complexity. Since these concepts arise in virtually all fields of inquiry, the usefulness of the material presented in this book transcends the boundaries between the various areas of science and the professions. The book was designed as a text for use in courses offered in a broad variety of programs of higher education. It focuses on general and fundamental topics of the subject area rather than on those connected with special contexts. In addition, applications in a broad range of areas of science, engineering, medicine and management are also presented.

Prentice-Hall Englewood Cliffs, NJ
ISBN: 013-345984-5
Price $ 53,25

A NEW BOOK (in Spanish):

JAVIER ARACIL

Máquinas, sistemas y modelos – un ensayo sobre sistémica

(Machines, Systems and Models – an Essay about Systematics)
© 1986

Publisher: Editorial Tecnos, S. A., 1986
O'Donnell, 27 – Madrid – 9

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vation, decision making and leadership.

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Systems inquiry at Saybrook

This program has been created to assist professionals and researchers who want to gain knowledge and expertise in promoting more productive and effective performance in human activity systems. The students learn how to design supportive environments for groups and organisations and various interdependent systems.

In the last few decades we have learned that the thinking, models, methods and tools of analytically-oriented traditional disciplines are severely limited when applied to complex and pressing problem situations embedded in interconnected human activity systems that operate in dynamically changing and turbulent environments. Systems inquiry has demonstrated a capacity to effectively address these problems. It enables one to orchestrate the efforts of various disciplines within the framework of systems theory and to introduce systems approaches to the analysis and management of problem situations and

to the design, development and evaluation of systems. In response to the need for an integrative approach, Saybrook Institute is shifting from an analytic and reductionist examination of parts and elements to a synthetic and expansionist orientation. In the program all dividing lines between areas of study and knowledge are continually challenged.

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Address

Saybrook Institute
1772 Vallejo Street
San Francisco, CA 94123
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MEETINGS – DETAILED INFORMATION

AN INTERNATIONAL CONFERENCE IN STOCKHOLM, SWEDEN
May 30 – June 3, 1988

Culture, Language and Artificial Intelligence

The purpose of the conference is to encourage research in the domain "computers and skill", which is related to artificial intelligence. Lectures and workshops will be held by renowned researchers in the following fields: philosophy of language, artificial intelligence, work organisation, medicine, computers and law, mathematics, literature and history of ideas. A number of artistic events (theater, cabaret, music, exhibitions) are also included within the framework of the conference.

The initiative to organise this meeting was taken by the research team concerned with education – work – technology at the Swedish Center for working Life. Together with research institutes in Norway and Austria this group has a contract for a project on AI-based systems and the future of language, knowledge and responsibility in professions within the Cost 13 program of the European Commission.

Address: see meetings list.

A meeting in East Berlin:

3rd International Symposium on

Systems Analysis and Simulation

Berlin (GDR) September 12. – 16. 1988

SCOPE

The symposium aims to provide a forum for the presentation and discussion of the recent advances in system analysis, mathematical modelling and simulation techniques of complex systems.

TOPICS

O Decision support
O Optimization and control
O Computer-aided modelling
O Large-scaled systems, decentralized and hierarchical multilevel systems
O AI-methods for analyzing systems
O Analysis of qualitative behaviour
O Parallel processing, computer architectures
O Simulation systems and languages
O Simulation games
O Applications (Economical, Ecological, Environmental, Agricultural, Medical, Water systems, Energy systems, Industrial and technical systems, New materials)

LIST OF MEMBERS OF IFSR – UPDATED JANUARY, 1988

I. NORTH AMERICA

American Society for Cybernetics
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President
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George Mason University
Fairfax, VA 22030
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Systems Science Institute
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Dr. Charles Francois, President
Libertad 742
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III. ASIA

The Society of Management Science
and Applied Cybernetics (SMSAC) (50)
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V. CENTRAL EUROPE
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College de Systemique de l'AFCET
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Sozialkybernetik (GWS)
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für Kybernetik (ÖSGK)
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VI. SOUTHERN EUROPE

Sociedad Espanola
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Dr. Rafael Rodriguez Delgado, President
Dr. Gomez Ulla, 4
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Greek Systems Society
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Greece

VII. EASTERN EUROPE

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(Polish Cybernetical Society)
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Design Methodology Unit
Dept. of Praxiology
Polish Academy of Sciences
Nowy Swiat Str. 72
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We would like to welcome our new Hungarian member

John v. Neumann Society For
Computing Sciences
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Bathori U. 16
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DEAR CONFERENCE ORGANIZER: Your notice hasn't appeard in our newsletter and you want to know why not? I can tell you! We are (at best) a quarterly publication. Please send us information at least eight months before your deadline.

MEETINGS and COURSES

Title	Date 1988	Place	Deadlines	Further Information
5th Symposium on Theoretical Aspects of Computer Science	11 – 13 February	Bordeaux France	15 August 1987	Robert Cori UER de Mathématiques et Informatique Université de Bordeaux I 351 Cours de la Libération F 33405 Talence France
5th International Working Seminar on Production Economics	22 – 26 February	Igls Near Innsbruck Austria	Abstracts 1 Nov. 1987	J. Lundquist Dept. of Production Economics Linköping Institute of Technology S 58183 Linköping Sweden
Ninth European Meeting on Cybernetics and Systems Research	5 – 8 April	Vienna Austria	15 Oct. 1987	Prof. Robert Trappl Dept. of Medical Cybernetics & AI Freyung 6 A 1010 Vienna, Austria
4th International Software Process Workshop	11 – 13 May	Devon England	16 Oct. 1987	Colin Tully STC Technology Limited London Road Harlow Essex CM 17 9NA, U. K.
1988 National Meeting International Society for General Systems Research (ISGSR)	23 – 27 May	Omni Hotel St. Louis Missouri USA	–	Jamshid Gharajedaghi Program Chairman Interact 3440 Market St. Suite 320 Philadelphia, PA 19104, USA
International Conference Culture, Language and Artificial Intelligence	30 May – 3 June	Stockholm Sweden	–	Maritta Nilsson Box 5606 S 11486 Stockholm, Sweden Tel. (8)-7909500 (Birger Viklund)
Ninth European Workshop on Application and Theory of Petri Nets	22 – 24 June	Venice Italy	15 Jan. Abstracts 15 May Papers	Giorgio De Michelis Dipartimento de Scienze dell' Informazione Università de Milano Via M. da Brescia 9 I 20133 Milano, Italy
4th International Conference on System Science in Health Care	4 – 8 July	Lyon France	Sept. 1987 Abstracts Dec. 1987 typed papers	G. Duru, director G. S. Sante Lyon 1, Bat. 101 43 BD DU 11 novembre 1918 F 69622 Villeurbanne France

Title	Date 1988	Place	Deadlines	Further Information
Systems Prospects: The next ten years of systems Research (Conference)	12 – 15 July	Hull U. K.	Abstracts 31. March	M. C. Jackson Dept- of Management Systems and Sciences University of Hull HU 6 7 RX, United Kingdom
International Conference on System Science and Engineering (ICSSE '88)	25 – 28 July	Beijing (Peking) People's Republic of China	Abstracts 15 Sept 1987 Papers: 15 Febr. 1988	Prof. Wei-Min Cheng, Chairman International Programme Committee of ICSSE '88 Department of Automation Tsinghua University Beijing 100084, China
European Conference on Artifical Intelligence	1 – 5 August	Munich F. R. Germany	15 Febr.	Prof. Dr. Bernd Radig Technische Universität München ECAI-88 Institut für Informatik Postfach 20 24 20 D 8000 München 2, F. R. Germany
Working Conference on Office Information Systems The Design Process	15 – 17 August	Linz Austria	15 Febr.	Roland Wagner Johannes Kepler University A 4040 Linz, Austria Papers: Dr. Barbara Pernici Dipartimento di Elettronica Politecnico di Milano Piazza Leonardo da Vinci, 32 I 20133 Milano, Italy
4th IFAC Symposium Computer Aided Design in Control and Engineering Systems	23 – 25 August	Beijing (Peking) People's Republik China	15 April 1987	Prof. Chen Zhen-Yu Cadcs '88 Secretariat Application Committee of the Chinese Association of Automation P. O. Box 919 Beijing, PRC
IFAC/IFORS Symposium Identification and System Parameter	27 – 31 August	Beijing (Peking) People's Republic of China	15 April 1987	Prof. Chen Han-Fu Institute of Systems Sciences Academia Sinica Beijing 10080, P. R. Chína
13th Symposium on Operations Research	7 – 9 Sept.	Paderborn F. R. Germany	15 Febr.	SOR-PB Universität – GH Paderborn D 4790 Paderborn, F. R. Germany
3rd International Symposium on System Analysis and Simulation	12 – 16 Sept.	Berlin DDR (East Germany)	Abstracts: 1. Dec. 1987 Papers: 1 May 1988	Mrs. Böttcher Zentralinstitut für Kybernetik und Informationsprozesse Kurstraße 33 1086 Berlin, DDR
First International Congress of the Spanish Society for General Systems – Systems for Development (sponsored by IFSR)	14 – 17 Sept.	Murcia Spain	Papers 15 April	I. Congreso Internacional SESGE Escuela Universitaria de Informática Universidad de·Murcia Santo Cristo 1 E 30001 Murcia, Spain Tel. (968)833190 or 833908 Ext. 190 or 204
33rd Institute for Medical Informatics Conference Topic: Expert Systems and Decision Support in Medicine	26 – 29 Sept.	Hannover F. R. Germany	—	Ms. U. Piccolo Medical School Hannover Institute for Medical Informations P. O. B. 61 01 8J D 3000 Hannover 61, F. R. Germany Tel. (0511)-532-2540
3rd International Workshop on Spectral Techniques	4 – 6 Oct.	Dortmund F. R. Germany	2 April	Claudio Moraga Dept. Computer Science University of Dortmund P. O. Box 500500 D 4600 Dortmund 50, F. R. Germany
Beijing International Conference on System Simulation and Scientific Computing	**Date 1989** 15 – 18 August	Beijing (Peking) People's Republic of China	Abstract or Paper 15 March 1988	Chinese System Simulation Council Beijing Institute of Aeronautics and Astronautics Beijing, China