INTERNATIONAL FEDERATION FOR SYSTEMS RESEARCH

NEWSLETTER

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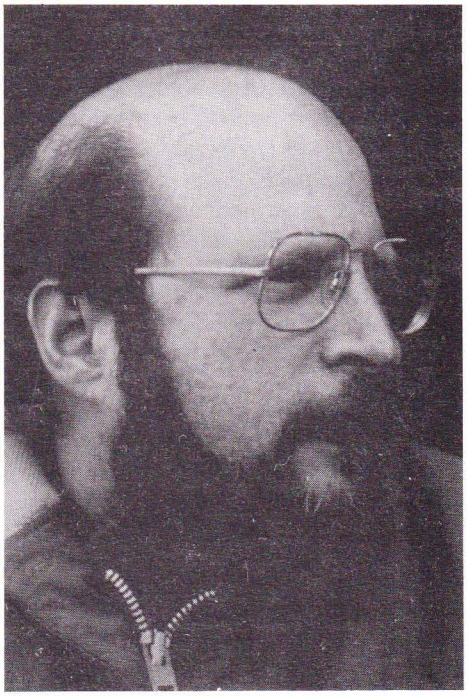

ABOUT OUR NEW EDITOR

Dear Members,

Please allow me to present the successor of our friend and colleague Paul Hanika, who we all held in such high esteem.

Our new editor, Dr. Stephen Sokoloff, 43, can point to both scientific and journalistic accomplishments. He is an American from Detroit, Michigan who couldn't resist the charm of the old world. Interrupting his sientific studies with frequent travels and foreign-language courses, he finally earned his doctorate in genetics from the Max Planck Institut für Biologie in Tübingen, W. Germany, under the supervision of Prof. W. Beermann. His work has been published in "Chromosoma" and other journals.

After a post-doctorate in gene technology, he turned to a career in teaching and popular scientific writing. His articles appear in many different magazines and newspapers, some of them international. He writes a weekly environmental page for a local newspaper and prepares educational radio series for the Austrian Federal Radio Network (ORF). His university courses in my department – he teaches the evolution and manipulation of biological information – always attract a large number of students.

I am very pleased that we have found in Dr. Sokoloff a colleague with both journalistic and scientific experience. I would like to ask you to help him in his work by submitting contributions to the Newsletter.

Franz Pichler
Prof. for Systems Theory
IFSR Board Member

THE NEW IFSR-NEWSLETTER IS FULL OF SURPRISES!

WE WELCOME CONTROVERSY!

Science is – even for scientists – a very limited kind of human activity. We all know that many valuable thoughts, ideas, opinions elude objective verification. This newsletter – which will be localized somewhere near the interface between research and gossip, is intended not to compete with but to complement the professional journals.

This publication can only succeed if you are willing to cooperate. We will be accepting the following kinds of material:

1. Articles of editorial opinion concerning the systems sciences. Some possible topics: desirable research aims and objectives, funding, education (see the contribution by Franz Pichler in this issue), current status of these disciplines.
2. Articles providing a semipopular overview of a particular field of systems research. They should be readily comprehensible to all information scientists.
3. News items – new developments, research projects now being initiated, ideas and speculations.
4. New books, important articles and publications.
5. Forthcoming scientific meetings.
6. Professional opportunities (jobs).

RULES FOR CONTRIBUTERS

You can submit articles or notices in any of the following languages: English, German, Spanish, French, Italian or Russian, Reports in languages other than English will be translated. Faulty English will be rewritten. Please include at least an English translation of all technical terms.

Maximal length: six double-spaced manuscript pages.

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Science Education – a Holistic Approach

FRANZ PICHLER, LINZ

Contemporary science education is largely outdated, according to Franz Pichler. Teachers do to not inform their pupils about many of today's most urgent problems. Pichler believes that mathematics courses should include computer sciences, physics teachers should deal with the technical processes so important in our everyday lives (i. e. production of atomic energy).

Before revealing these theses, Pichler explains what is meant by holistic science education, discussing both historical and systems-theoretical approaches. He then proceeds to acquaint us with three pioneers of integral science.

A familiarity with the classical disciplines such as physics, chemistry, astronomy, geology and biology merely enables us to comprehend isolated natural phenomena. Proponents of the holistic approach to science education do not regard the acquisition of such specialized knowledge as their ultimate aim.

Rather, they demand that this knowledge be applied to the elucidation of broader human and environmental concerns – whereby ethical considerations should not be excluded.

In the age of Chernobyl and gene technology the value of this kind of science instruction should be immediately apparent. Teachers could more readily promote an interest in natural phenomena by emphasizing their relevance to fundamental societal problems. Two different integrative methods will be considered here: 1. the historical – and 2. the systems-theoretical one.

When we use the historical method we follow step-by-step the development of scientific ideas. We not only deal with the theories ultimately considered correct but also with erroneous conclusions and models which turned out to bei irrelevant. General systems theory, on the other hand, has a different emphasis. It provides us with tools which enable various levels of abstraction.

This makes it possible for us to attain an integrative overview, whereby the classical disciplines are relegated to the mere elucidation of the component bits of information.

Pioneers of integrative science

In the last two centuries a few researchers with broad-ranging interests have combined particular aspects of diverse fields, thereby creating new interdisciplinary sciences devoted to problems formerly ignored by classical scholars. Astrophysics and biochemistry can serve as examples. Most of these pioneers are relatively unknown.

One of the first was Alexander von Humboldt, who lived in the last century, travelled widely and undertook extensive, multifacetted studies. These ultimately enabled him to found whole new pursuits such as plant geography. In his popular lectures in Berlin he dealt with a great variety of natural phenomena, explaining them to his listeners in a generally comprehensible but stylistically elegant language. These performances were greeted with an enthusiasm today generally reserved for the performing arts.

Are Humboldts' educational ideas still attainable today? In an essay, the Nobel-Prize physicist Heisenberg concluded that they are no longer feasible; there is simply too much detailed information available. The specialist can, however, he concluded, acquaint himself with a generalized scheme of things which will allow him to rapidly orient himself in diverse disciplines. Although Humboldt's specific scientific concerns might seem outdated today his multidisciplinary approach is still highly relevant.

Even in his own times Humboldt was an exception. It is difficult to find a comparable personality among the scholars of the last century. Irrespective of their impressive intellectual accomplishments, Goethe and Herder did not have anywhere near the same profound comprehension of scientific phenomena. Haeckel and Helmholtz were, on the other hand, specialists lacking a holistic orientation.

The second integral researcher we shall consider here is Raoul H. Francé, a scientist whose name is now only familiar to some collectors of antique biological works. As a young man he devoted himself to the life sciences in order to acquire the prerequisite specialized knowledge. His system of values and priorities, however, did not ultimately coincide with those of his colleagues; he left academia to become a free-lance scientist, ultimately writing more than 60 books.

Although in the years prior to the Second World War France devoted himself to the promulgation of popular scientific education, he was also a very original thinker. He was able to skillfully combine results from different disciplines, thereby opening new avenues of scientific endeavor. On the basis of his book about the technical accomplishments of plants, "Die Technischen Leistungen der Pflanzen", he can be regarded as the founder of bionics. In another work, "Edaphon", he demonstrated the importance of soil microorganisms. His composting studies, which show how humus can be manufactured from garbage, were epoch-making.

Our third pioneer is the biologist Ludwig von Bertalanffy, who is considered the father of general systems research. This field of science provides us with the methodological tools enabling the construction of integrative models which can be used to analyze complex multidisciplinary problems. Bertalanffys' contributions are best summarized in his book "General Systems Theory".

It is certainly not just a coincidence, that the three aforementioned scientists were all biologists. The investigation of living systems often necessitates the development of complex models encompassing various aspects of a problem. This tendency towards a comprehensive orientation is today often shared by engineers. Engineers and biologists have some things in common – the machine has now become more or less an extension of our living world.

What is integral knowledge?

In respect to natural systems, a prerequisite for this kind of cognition is that interactions and relationships be taken into consideration. An organism must be viewed in the context of its environment. Today a great deal of lip service is paid to this ecological approach, but results deriving from it are rarely applied to really important decisions such as the construction of hydroelectric stations or the arms race. In functioning democracies this situation can only be altered by enhancing the general appreciation for ecological interactions.

The only kind of change that is realistically possible is a gradual one. Nowadays economic considerations – including pressures for increased production and consumption of industrial goods – predominate. The slogan "Knowledge is power" has been replaced by "Money is power". Contemplation is often regarded as superfluous, one must simply produce.

How can this prevailing attitude be reversed? We will have to begin in the schools. To be universally effective this

change will have to simultaneously take place in many different countries, including the somewhat less-developed nations which are often the worst pollutants of our environment.

Relevant Sciences

In order to bring about a broad general comprehension of nature it will be necessary to stress certain disciplines which enable the integration of diverse scientific viewpoints. In former times this function was fulfilled primarily by philosophy, perhaps by theology as well. Modern systems sciences serve to complement these classical academic fields. They include: statistics, operations research, cybernetics, systems theory, systems engineering and applied mathematics. Of course these pursuits cannot be precisly separated, and there is considerable overlap. Simultation, which is computer-science oriented, also plays an important role, since the computer has become one of our most valuable scientific instruments.

Today the computer sciences, which are only about forty years old must, together with the systems sciences, compete with classical studies such as physics and chemistry. At least in Austria, funds for research are limited, and so is the time devoted to the natural sciences in school and university curricula. Because of their traditional predominance, the universality of chemistry and physics is greatly overestimated. After receiving his college or university degree, a mathematics teacher is not competent to deal with computer sciences. The physics teacher is not prepared to inform his pupils about the technical problems which influence their everyday lives. Of course the educators can acquire proficiency in these fields if they are particularly idealistic, but the overcrowded curricula hardly allow them time to transmit this knowledge to their pupils.

Recommendations

Now we can understand the difficulties confronting us. How will it be possible to surmount them and promulgate an integral comprehension of nature? The following measures would be advisable:

1. Improved teacher training in relevant pursuits.
2. Integral knowledge should be taught in the schools es-specially ecology, effects of technical innovations on our environment and means of minimizing pollution.
3. Current school curricula overemphasize formal, geometrically-oriented mathematics. These should be replaced by methodical disciplines such as systems theory, operations research and cybernetics.
4. Information sciences including simultation should be stressed.
5. It will be necessary to promote adult education in integral sciences by means of lectures, courses, books and magazines.
6. The media, especially television, should be recruited to participate in this educational endeavor.

- the description of problems encountered when applying a well-known method and how they were solved
- a comparative evaluation of existing techniques,
- a tutorial exposition showing how a certain technique works,
- user experience and resulting recommendations,
- AI applications in a hitherto new and promising area, etc.

In any case, the n + 1st application of a well-known method will not be published.

Submission of manuscripts: Authors should send three copies of their manuscripts, prepared according to the instructions below, to the **Editor-in-Chief, Robert Trappl, Austrian Research Institute for Artifical Intelligence, Schottengasse 3, A-1010 Vienna, Austria (Europe).**

Copyright: The Copyright Transfer Form is available from the Editor-in-Chief. Authors will be asked to transfer the copyright of accepted articles to the publisher. This transfer will ensure the widest possible dissemination of information.

General typing instructions: All manuscripts must be typed doublespaced, on only on side of the paper with margins of at least 1" all around.

Title, authors, and affiliations: Page one of the paper should contain a brief, clear, and descriptive article title (10 words or fewer); the names and institutional affiliations of all authors; an abbreviated title (maximum 40 characters); and the name and complete mailing address of the person to whom all correspondence and proof should be sent.

Abstract: Every paper must have an abstract (on page one or two) of about 50-100 words.

Equations: Wherever possible, mathematical equations should be typewritten, with subscripts and superscripts clearly indicated. Greek letters and other special symbols must be identified in the left-hand margin the first time they appear. Distinguish carefully between one and "ell", zero and upper and lower case "oh", letter t and Greek tau, etc. Underline vectors with a wavy line for boldface. Only equations explicitly referred to in the text should be numbered serially on the right-hand side by Arabic numerals in parentheses.

Computer languages and instructions: Computer languages should be written in capitals, LISP, PROLOG, etc. Use bold (indicated by wavy line underneath) for syntax words, roman for comments, and italic (straight underline) for everything else.

Tables and figures: Number each consecutively with single Arabic numerals, e.g. Figure 1, Figure 2, Table 1, Table 2. Briefly title each and refer to in the text.

Tables: Type each on a separate page.

Figures: Type legends on a separate page at the end of the manuscript. Draw line illustrations clearly in India ink on good-quality white paper or vellum; clearly label them in ink or by typewriter. Figures drawn by a plotter or a high-resolution printer may be used. Photographs should be sharp black-and-white glossies (5" × 7" or 8" × 10"). The author's name and figure number should be indicated on the back of each figure.

References: Alphabetize the reference list by author and doublespace it in a separate section at the end of the paper. Cite in text by author and date. Use abbreviated title of journal as given in WORLD LIST of Scientific Periodicals.

Spelling: Follow Webster's New International Dictionary of the English Language.

Proofs and author's alternations: One set of page proofs is sent to the specified author. Please check carefully and return it promptly. Author's alterations in excess of 10 % of the original composition cost will be charged to the authors.

Reprints: Twenty (20) free reprints shall be provided for each contribution. Additional reprints may be purchased from the publisher. A reprint order from is supplied with the proofs.

BOOKS AND PUBLICATIONS

A VERY INTERESTING BOOK

COMPUTER, INFORMATION, & SYSTEMS SCIENCE

July/August 1986

POWER, AUTONOMY, UTOPIA NEW APPROACES TOWARD COMPLEX SYSTEMS

Edited by **ROBERT TRAPPL,** Austrian Society for Cybernetic Studies, Vienna, Austria.

Leading scientists from various disciplines present their views on the problems we encounter in using mathematical, computer-simulated models to deal with the complexities of the world around us.

Computing milieu; social issues in science; management information systems (D4, J6)
ISBN 0-306-42361-8 approx. 170 pp. US and Canada $ 39,50/elsewhere $ 47,40

Prices subject to change without notice. Prices 20 % higher outside US&Canada

CONTENTS: Recursions of power (S. Beer). Not quite human – science and utopia (H. Nowotny). Physics of complexity (R. Rosen). Knowing natural systems enables better design of man-made systems – the linkage proposition model (L.R. Troncale). Guidelines for influencing social policy through strategic computer simulation models (D.L.Meadows) Reducing international tension and improving mutual understanding through artifical intelligence – three potential approaches (R. Trappl). Steps in construction of "others" and "reality" – study of self-regulation (E. von Glasersfeld). Steps to cybernetics of autonomy (F. Varela). Second order cybernetics in the Soviet Union an the West (V.A. Lefebvre) Methods for making social organizations adaptive (S.A. Umpleby). Guiding questions and conceptual structures in cybernetics and general systems theory – comparative studies (S.A. Umpleby). Indexes.

Plenum Publishing Corporation, 233 Spring Street, New York, N.Y. 10013

Do you know THE SYSTEMIST?

This publication is the newsletter of the United Kingdom Systems Society. It appears quarterly and is distributed free to members.

What sort of contributions can be submitted? According to the editors, they must be systems orientated, "but beyond this, few constraints will be imposed. The editors hope that **The Systemist** will reflect all the different strands in the systems movement. Whether your interest is in systems philosophy, in systems theory, in the application of systems ideas to practical problems (of management, medicine, education etc.) you should be able to communicate your ideas through the pages of this newsletter".

It is hoped that each Newsletter will include a section on systems thinking and one on systems practice. The May 1986 issue was 34 pages and included an editorial, the chairperson's message, three articles, book reviews, notes on the European Working Group on Systems Science,

minutes of U. K. S. S. committee meetings and a list of U. K. S. S. committee members. Please send contributions to: Mike Jackson or Paul Keys, Department of Management Systems and Sciences, University of Hull, Cottingham Road, Hull, HU 6 7RX.

AN IMPORTANT BOOK:

Multifacetted Modelling and Discrete Event Simulation

Bernard P. Zeigler
Academic Press, May/June 1984, 374 pp., 42.50 / 25.50 (UK only)

Reality is often multifacetted, and current simulation languages encourage a piece-meal approach to it. In contrast, this book develops a modelling methodology that supports both the selection of appropriate partial views as well as their integration into a coherent whole. The author explores the formalism of discrete event systems and applies it to the design of computer bases for multifacetted modelling.

This book can be ordered from: Academic Press, 24 – 28 Oval Road, London, N. W. 1, U. K. or 111 Fifth Avenue, New York, N. Y. 10013, USA.

Announcing a reprint

Theory of Modelling and Simulation
Bernard P. Zeigler, Ph. D.

Original edition 1976, reprint 1984
460 pages. 32,50
order from:
Krieger Publishing Co. Inc.
P. O. Box 9542
Melbourne Fl 32902-9542
USA

Announcing a new book from one of the founders of the Society for General Systems Research

GENERAL SYSTEM THEORY

Essential Concepts and Applications

Anatol Rapoport, January 1986, Abacus Press

The author attempts to present an integrated overview of the various existing approaches, organizing them not by content (technical, biological, social) but around conceptual and methodological tools. The word "general" in "general system theory" means transcending specific content; features which are common to various systems regardless of content are hereby singled out.

Order from:
Abacus Press, PBS P. O. 643, Cambridge, MA 02139 USA ($ 34,50)
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updated July 4, 1986

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Prof. Dr. J. Baetge, Director General
Universitaetsstrasse 14/16
D-4400 Muenster, FRG

MEETINGS and COURSES

Title	Date	Place	Deadlines	Further Information
11th International Congress on Cybernetics	**1986** 25 – 29 August	Namur, Belgium	31, December 1985 (Abstracts)	International Association for Cybernetics Palais des Expositions Place André Rijckmans B-5000 Namur, Belgium Tel. 081/222209 · Telex: 59101
4th IFAC/IFORS Symposium Large Scale Systems: Theory and Applications	26 – 29 August	Zurich, Switzerland	__	Prof. M. Mansour, IFAC/IFORS Symposium ETH Zentrum CH-8092 Zurich, Switzerland
2nd IFAC Workshop Modelling and Control of Electric Power Plants	16 – 18 September	Philadelphia PA, USA	__	Dr. H.G. Kwatny, Prof. of Systems Engineering, Drexel University Dept. of Mechan. Engg. and Mechanics Philadelphia, PA 19104, USA
Avanced School on Stochastics in Combinatorial Optimization	22 – 25 September	Udine, Italy		Paolo Serafini CISM-Piazza Garibaldi 18 I-33100 Udine, Italy Phone (39) (432) (294989) or (297169)) Registration free: $ 150,–
IFAC Workshop Fault Detection and Safety in Chemical Plants	28. September 1. Oktober	Kyoto, Japan	__	Prof. T. Takamatsu Dept. of Chemical Engineering, Kyoto University Kyoto 606, Japan
Polish Cybernetical Society System Modelling Control	6. – 12. October	Zakopane, Poland	__	Institute of Informatics, Technical University of Lódż, ul. Piotrkowska 220 90-369 Lódż, Poland
IFAC/IFIP/IMACS Symposium Theory of Robots	3. – 5. December	Vienna, Austria	__	Dr. P. Kopacek Technical University of Vienna Karlsplatz 13 A-1040 Vienna
4th International Symposium on Modelling and Simulation Methodology: Intelligent Environments and Goal-Directed Methods	**1987** 21. – 23. January	Tucson, Arizona, USA	1. October – Abstracts (about four pages)	Prof. B.P. Zeigler, Dept. of ECE The University of Arizona Tucson, AZ 85721, USA Phone: (602) 621-2108
Annual Meeting, International Society for General Systems Research	1. – 5. June	Budapest, Hungary	1. October – Abstracts 15. February final Papers	Dr. István Kiss, Bureau for Systems Analysis PoB 565, Budapest, Hungary, H-1374
World Organization of General Systems and Cybernetics – 7th International Congress of Cybernetics and Systems	31. August – 4. September	Budapest, Hungary		Prof. J. Rose, WOGSC Office 5 Margate Rd., St. Annes-on-Sea FY8 3EG Lancs, England, UK Tel. 532-727 or 530-214

Offenlegung:
Das Medienwerk „IFSR Newsletter" wird als Organ der "International Federation For Systems Research (IFSR)" verlegt und ist Eigentum dieser internationalen Föderation, deren Tätigkeit der Förderung und Koordinierung von Lehr- und Forschungsaktivitäten auf dem Gebiet der Systemforschung dient. Die Föderation hat ihren Sitz in Wien und ist nach österreichischem Recht als gemeinnütziger Verein angemeldet. Sie verfolgt weder wirtschaftliche noch praktische Ziele. Der Beschluß zur Gründung der IFSR wurde 1978 in London gefaßt, die Konstituierung erfolgte 1979 in Los Angeles. Das Sekretariat der IFSR befindet sich aufgrund eines Übereinkommens mit der österreichischen Bundesregierung seit 1980 in Österreich.
Der „IFSR Newsletter" erscheint in unregelmäßigen Abständen in englischer Sprache unter der Redaktion von Dr. Stephen Sokoloff. Die Zeitschrift dient der Information über die Aktivitäten der IFSR. Sie wird kostenlos an Mitglieder ihrer insgesamt 13 Mitgliederorganisationen in 12 Ländern versandt, die Kosten werden von der IFSR aus den Beiträgen der derzeit 13 Mitgliedsorganisationen getragen.
Präsident der IFSR ist für 1986/88 Prof. Dr. Robert Trappl (Österreich), Vizepräsident Dr. Bela H. Banathy (USA), Sekretär-Schatzmeister Prof. Dr. Gerard de Zeeuw (Niederlande). Alle Funktionen werden ehrenamtlich ausgeübt.
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