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From your Editors

Dear Readers!

Help us to close the information gap!

You, dear reader, are probably a competent specialist hoping to acquire an overview of the systems field. In our Newsletter we intend to inform you about exciting concepts and developments in the world of systems and about the role our members play in the global intellectual community. The 'Newsletter' is not an academic journal, its content is of more general interest - but we don't intend to reduce complex developments to simplistic and meaningless information fragments.

Our goal is to present the following items:

- Ongoing or proposed or recently completed studies.
- Trends and tendencies in various areas of the systems field.
- New ideas from conferences or journals.
- Major book publications and new periodicals.
- Aims and activities of our member societies.
- Upcoming conferences and seminars.

We feel that we have the right combination of experience and talents for undertaking this task, Gerhard Chroust is a professor of computer science, and an expert in desktop publishing. Stephen Sokoloff is a university lecturer in biology, an environmentalist, a multilingual journalist and an English native speaker.

But we won't be able to do it all alone - we'll need your research and project ideas, congress reports and your news articles - and it will be our policy to pay for longer items that we publish. The quality of the Newsletter ultimately hinges on your commitment, your interest, your involvement!

Gerhard Chroust, Stephen Sokoloff

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Computer Aided Systems Theory (CAST)

A Better Future with Toolmaking Software Tools

Interview with **Prof. Dr. Franz Pichler**,
University of Linz, A-4040 Linz-Austria



Prof. Dr. F. Pichler
University Linz, Austria

Photo: Sokoloff

QUESTION: Professor Pichler, you are a leading proponent of CAST. Of what practical value is this branch of systems science?

FRANZ PICHLER: CAST is concerned with the development of software tools which are based on systems theory. These aid in the designing of complex technical systems. Some important applications of CAST can be found in communication and automation engineering. It can, however, also be used in other fields of the natural, social and economic sciences; wherever one is dealing with the construction of models.

Q: What precisely can one do with CAST?

F.P.: It is comparable to a tool making machine which can be programmed to carry out different production processes. CAST-software provides the designer with tools that are as universal as possible. Using them, he can improve the quality of his products.

Q: Can you give me a practical example?

F.P.: Let's take a look at my own field - the design of computer chips. In order to plan the complex electronic circuits on these chips, computer-aided-design (CAD) tools must be employed. In the course of time very sophisticated CAD-systems have been devised for this purpose. However, they have not been well-planned from a systems-theoretical viewpoint. They could be considerably improved.

Q: What precisely does this mean? Without CAST would one be compelled to plod through each step of the chip-designing process?

F.P.: No, that is an exaggeration. CAD-systems are by their nature universal instruments; a great deal of CAST-work has been invested in their conception. By consequently employing CAST we can, however, enable the elimination of certain intermediate steps which would otherwise have to be accomplished by trial and error. With its help the designer can, based on a scientific analysis, proceed in a direct, deductive fashion.

Q: Does one need CAST to design models?

F.P.: Not really, but it enables us to construct very exact ones, ones of a level of complexity much greater than is attainable solely with common-sense procedures.

Q: One goal of CAST is to enable transformations between various homomorphic systems, for example between finer and cruder ones. How can this be accomplished?

F.P.: According to the top-down scheme one designs rough models first and then refines them. Such relationships between finer and coarser systems are designated as homomorphisms, whereby the cruder ones perform in essence the same tasks as the more exact ones, only with reduced precision. It is necessary to maintain a certain consistence between the models; they cannot contradict one-another. Demonstrating the correctness of such transformations is an aim of systems science.

We can take as an example the motions of a finger. For certain mechanical tasks that can be carried out by robots a crude model would suffice. If one wanted to evaluate the effects of medicines on individual muscles, however, a more precise one would be necessary.

Q: Given CAST's practical importance, why does it have such a low acceptance among engineers?

F.P.: Nowadays engineers are highly specialized. On the job they have increasingly little time to acquire theoretical knowledge. Therefore it is difficult to arouse their interest in CAST. Only in laboratories in which tools are designed can an enthusiasm for such theoretical fields be expected. Engineers who only use tools, and don't construct them themselves, can at best communicate their problems to us and request that we make changes.

Q: Professor Pichler, do you believe that CAST can help to ameliorate our everyday lives and to bring about improvements in such areas as peace research, driver training and city planning?

F.P.: Yes, I do. Many useful CAST-systems could be realized with the help of multi-media computers. These enable one to incorporate photos, videos, acoustic signals, to call upon speakers from various conferences. That would open enormous new possibilities for planning instruments, especially in the social and economic sciences. However without an appropriate theoretical basis such systems end up being little more than computer games.

One example is the training systems for pilots. The learners sit in a simulated airplane interior and "fly" from airport to airport. On the computer video they see essentially what the pilot perceives from the cockpit window. In this way they can be trained to master emergency situations without having to crash-land three times.

This technology is already highly sophisticated. However the same kind of system will in the future become more generally available. For example, its basic principle might be adapted to driver training. Employing CAST, such programs could be conceived in a truly comprehensive fashion, so that they not only incorporate the kind of material already used by driving schools but also police suggestions, ethical and environmental considerations, etc. This is only one example of the practical benefits which would accrue to mankind through a consequent application of computer aided systems theory.

The IFSR-Newsletter would like to thank Prof. Franz Pichler for his time and patience.

Interview conducted and edited
by Dr. Stephen Sokoloff

NEW TRENDS

Individual Heterogeneity in Different Cultures

Prof. Dr. Magoroh Maruyama
School of International Politics, Economics and Business,
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Prof. Dr. Magoroh Maruyama, Tokyo

Individual epistemological and psychological heterogeneity exists in every culture. An individual type that is found in any one of them also occurs in the others. Various traits are used to characterize the diverse types. For example, one kind of person prefers to learn by experiencing and perceiving things in a given context (the Japanese method of training), whereas another learns better by a sequenced transmission of information which is divided into categories and arranged hierarchically into topics and subtopics (predominant in the USA):

Cultural differences involve the ways in which a type becomes dominant and utilizes, suppresses or transforms other types. Nondominant types may survive in niches, in disguise or in repression, or they might rebel or emigrate. Cross-cultural data can be analyzed with the help of this new conceptual and methodological framework.

Until now, the most frequent method for cross-cultural study has been to compare the test score means of various countries to see whether there is a statistically significant difference between them. This procedure is based on the assumption that each country is homogeneous except for a statistical spread around the mean (Figure 1).

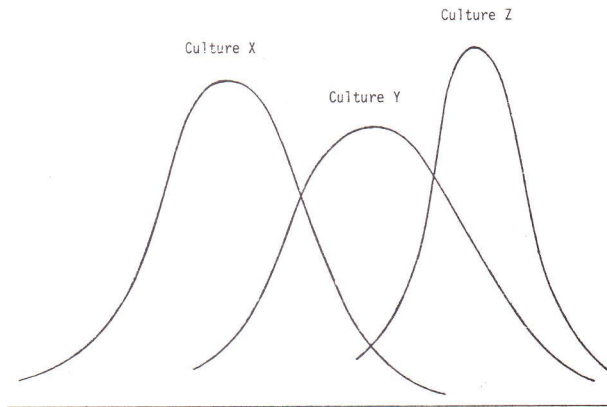


Figure 1: Homogenistic View of Cultures:

However, individual epistemological heterogeneity has been found to exist in each culture (Maruyama 1974, 1980, Harvey 1966). Any type that is found in one of them occurs in others too (Maruyama 1974, 1980, 1993), as is shown in Figure 2.

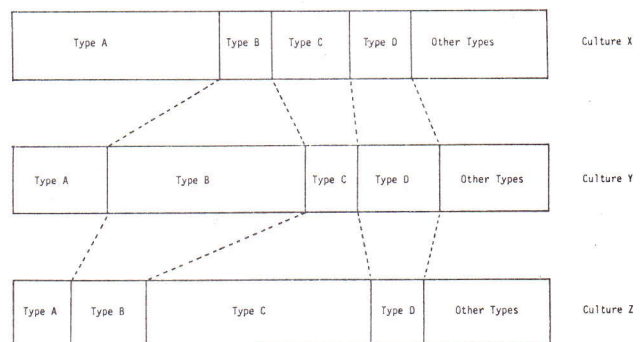


Figure 2: Individual Heterogeneity across cultures

In many cases non-dominant types are covert, i.e. they are disguised or repressed. That means that upon questioning many individuals claim to be of the dominant type, although they don't really fit into it.

The concept of **individual heterogeneity across cultures** (IHAC) can be extended to mental and behavioral aspects other than epistemological types. This new framework will necessitate basic revisions in many of the theories in social sciences and psychology. It will also generate new methodologies.

Moreover, many of the data collected in the past can be re-analyzed if the raw scores are still available. Of all the various kinds of psychological examinations, aesthetic preference tests are expected to show the least amount of repression. For this reason, let us take one of them as an example; the theoretical rationale for it has been explained elsewhere (Maruyama 1992).

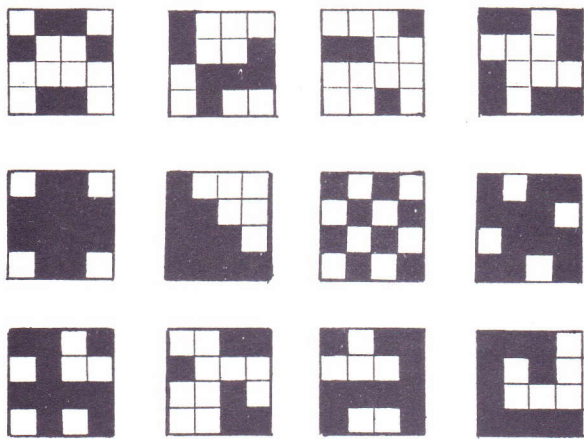


Figure 3: Examples of TOB patterns

Each TOB pattern consists of a 4 by 4 grid composed of 16 squares; some of them are black and others are white. There are $2^{16} = 65,536$ possible TOB patterns. TOB stands for Tokyo, Budapest and Bruxelles, where the first test run took place. The subjects rated each of them in respect to 18 adjective pairs on a 7-point scale.

In most studies, adjective pairs are correlated and factor-analyzed. But in the current one, **the stimuli (the patterns) are correlated and factor-analyzed** to identify the aesthetic preference types. As a simplified example, let us take the adjective pair "I like / I do not like". In the factor analysis, **stimuli-dimensions** are identified. An individual's aesthetic preference type is determined on the basis of his choices.

In the test run, spurious factors were found. Some of the TOB patterns turned out to have

symbolic significance in certain countries, so that the subjects were responding to that rather than to the aesthetic quality. Others had representational meaning. An example of a symbol is the Swastika. Representational meanings are "dog looking back", "bird", "prison". Patterns which were found to be symbolic or representational were not used in the determination of aesthetic preference.

The new analysis can proceed in the following sequence: (1) Eliminate the stimuli which have symbolic or representational meanings; (2) Find stimuli-dimensions and individual types in each country; (3) Check whether the results are similar across cultures; (4a) If they are, combine the raw scores from all countries, then factor-analyze the stimuli to find international stimuli-dimensions and international individual types; (4b) If they are not similar, reject IHAC for this adjective pair or for this set of TOB figures, and try other adjective pairs or other sets of figures; (5a) If IHAC can't be shown, reject IHAC for this type of test; (5b) On the other hand if IHAC is confirmed, then we move onto other questions such as longitudinal factors, i.e. changes within an individual as he progresses, from childhood to adulthood; (6a) These, if found, may be due to maturation, which is common in all countries, or due to the influences from the mainstream type in the form of socialization, acculturation, marginalization, ostracism, sublimation, repression, identification, etc., which vary from culture to culture. We need many tests to arrive at well-founded conclusions.

IHAC is a new concept. It has been confirmed in respect to epistemological types, and it can be extended to other fields of social sciences and psychology. This will make it necessary to revise many of the current theories.

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- Maruyama, M. 1992: Entropy, Beauty and Eumorph. *Cybernetica* 35:195-206.
- Maruyama, M. 1993. Mindscapes, Individuals and Cultures in Management. *Journal of Management Inquiry* 2:140-155.

News from the Bookmarket

Analysis and Modelling

Korson T., Vaishnavi V. (eds.)

The September issue of the Communication of the ACM is devoted to the timely subject of software development through the use of analysis and modelling: object modelling, process modelling, data modelling and knowledge modelling. 9 full-sized articles and 4 short reports discuss these topics from all angles. 3 articles concern themselves with object-oriented techniques, two further articles discuss at great length issues related to describing development processes, two deal with data modelling, also for technology transfer. The last two discuss knowledge modelling.

Communication ACM vol. 35 (Sept 1992) no. 9, pp. 33-165

Computer Aided Systems Theory -

EUROCAST'91

Pichler F., Moreno-Diaz R. (eds.)

This volume contains a selection of papers presented at the second European workshop EUROCAST'91, held in Krems, Austria, April 15-19, 1991. It gives an overview of the current state of Computer Aided Systems Theory research and its relation to CAD applications in the engineering fields. CAST research requires the application of the most advanced information processing technology in software and hardware for implementing CAST method base systems.

Lecture Notes in Computer Science 585

Springer Publ. House Berlin 1992, 761 pp., ISBN 3-540-55354-1, price (softcover): DM 142.

CAST Methods in Modelling

Computer Aided Systems Theory for the Design of Intelligent Machines

Pichler F., Schwärtzel H. (eds.):

Microtechnologies and their corresponding CAD tools have now reached a level of sophistication that necessitates the application of theoretical means on all modelling levels of design and analysis. Besides there is a growing need for a scientific approach in modelling. Many concepts provided by Systems Theory are turning out to be of major importance. This is especially valid for the design of 'machines with intelligent behaviour'. When dealing with complex systems, the engineering design has to be supported by CAD tools. Consequently, the methods of

Systems Theory must also be computerized. The newly established field of 'computer Aided Systems Theory' (CAST) is a first effort in this direction. This book is written for engineers who are interested in using and developing CAST systems, particularly in the field of Information and Systems Engineering.

Springer Publ. House, Berlin 1992, ISBN 3-540-55405-X, 375pp., price (hardcover): 138 DM.

From the Treasurer/Secretary

Dear Members of the IFSR!

Changing my hat I will now address you as the treasurer. I am quite happy that the new newsletter has received some positive responses - and it is considerably cheaper than it was before. We still could save a lot of money, if all members (as requested in my January letter) would let me know how many newsletter copies they needed. It is our money and what we save can be put to better use than printing redundant newsletters. So get in touch with me,

Gerhard Chroust

Our Members:

At irregular intervals we will present IFSR members.

ISI- International Systems Institute

The ISI is a non-profit, public benefit, scientific and educational agency. Organized as a community of scholars and practitioners and a network of institutions, ISI aims to apply systems and design thinking: (1) to create models and methods for the design of educational and other human activity systems and (2) to design and develop resources for systems and design learning. The objectives of ISI include:

- Foster individual and collective research in systems and design sciences
- Design and develop models, approaches and methods applicable to the analysis, design, development and management of educational and other human activity systems
- Organise and support conferences providing opportunities for professional development in systems and design applications
- develop a knowledge-base in support of the above objectives
- Develop and publish learning resources, conference proceedings and monographs that are relevant to the work of ISI.

The program is carried out by research fellows working in their own organisations as well as in several ISI program areas and research teams.

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Erratum:

Regrettably there was an error in the last issue's list of members: By mistake I welcomed the Cybernetics Society, a long-standing member of IFSR, under a false name ('London Cybernetics Society') as a new member. The correct entry is: Cybernetics Society, c/o Dr. H. Fatmi
33 Clairview Rd., London SW16 6TX, UK

Conference Announcements

For contact address, etc. see Calendar of Events.

CAST'94

May 9-13, 1994, Ottawa, Canada

The emphasis is on Computer Aided Systems Technology. Papers are expected on:

- Applications of CAST to practical problems
- Development of tools/ environments for CAST
- Object-oriented tools/environments for CAST

- Quantitative and qualitative systems concepts for modelling, model processing, and behaviour generation
- Artificial intelligence applications in CAST
- Reliability issues in CAST
- Goal-oriented system models for CAST: autopoietic systems, anticipatory systems, self-organising and reproducing systems, ...

KR'94: 4th Int. Conf. on Principles of Knowledge Representation and Reasoning

May 24-27, 1994, Bonn, Germany

The KR conferences emphasize the theoretical principles of knowledge representation and reasoning, the relationships between these principles and their embodiments in working systems and the relationships between these approaches and corresponding approaches in other parts of AI and in other fields.

Calendar of Events

Title	Date and Place	Further Information
<i>Abbreviations: CfP, CfA: Call f. Papers/Abstract, FP: Final Paper due, <No. nn>: more details in issue.nn</i>		
CES2: 2 ^o Congrès Européen de Systématique (2nd Europ. Congress on Systems Science)	Oct. 5-8 1993, Prague	AFCET, CES2, 156 Bd Pereire, 75017 Paris, France tel: +33-1-47662419, fax: +33-1-42679312 <No. 29>
INTERAKTION - Modellierung, Kommunikation und Lenkung in komplexen Organisationen	Oct. 8-9, 1993, Koblenz, Germany	Prof. Dr. B. Schiemenz, Inst. f. Wirtschaftsinformatik Rheinau 3-4, 5400 Koblenz, tel: (0261) 9119-481 fax 37524
5th Annual Conf. on Comprehensive Systems Design of Education	Nov. 14-19, 1993, Monterey, Calif.	Bela H. Banathy, 25781 Morse Drive, Carmel CA 93923 tel/fax: (408) 625-3178, <No. 29>
12th European Meeting on Cybernetics and Systems Research, Vienna	Apr. 5-8, 1994, Vienna, Austria CfP: Oct 5, 1993 FP: Dec 1993	Robert Trappl, Dept. of Med Cybernetics & AI Univ. of Vienna, Freyung 6/2, A-1010 Vienna, Austria tel: +43-1-53532810, fax: +43-1-5320652 E-mail: sec@ai.univie.ac.at <No. 29>
CAST'94, 4th Int. Workshop on Computer Aided Systems Technology	May 9-13, 1994, Ottawa, Canada	Tuncer I. Ören, Univ. Ottawa, Computer Science Dept. Ottawa, On., Canada K1N 6N5 tel: + (613) 564-5068, fax (613) 564-7089 email: oren@csi.uottawa.ca <No. 30>
KR'94, 4th Int. Conference on Principles of Knowledge Representation and Reasoning	May 24-27, 1994, Bonn, Germany CfA: Nov. 8, 1993 FP: Feb. 28, 1994	John Doyle, Lab. for Computer Science, 545 Technology Square, Cambridge, MA 02139, USA, tel: +1(617)253-3512, email: doyle@ics.mit.edu OR: Piero Torasso, Università di Torino, Corso Svizzera 185, I-10149 Torino, Italy, tel: +39-11-7712002, email: torasso@di.unito.it <No. 30>
CAISE'94, 6th Conf. on Advanced Information Systems Engineering	June 6-10, 1994, Utrecht, The Netherlands CfP: Nov. 30, 1993	Gerard M. Wijers, SW Engineering Res. Centre, PO box 424, 3500 AK UTRECHT, The Netherlands, tel: +31-30-545-412, fax: -948, email: gwijers@serc.nl <No. 31>
Interdisciplinary Conf. on Neural Modelling	June 20-24, 1994, Lyon, France CfA: Oct 15/Dec 15, 1993	Mdm Claire Rigaud-Bully, AIDRI Bat. 101, Univ. Claude Bernard, Lyon 1, 43 Bd du 11 nov. 1918, F-69622 Villeurbanne Cedex tel: 7244-8000-34, fax: 72 44 0573, email: AIDRI @CISM.Univ-Lyon1.France <No. 31>
STIQE'94: 2nd Int. Meeting on Systems Thinking, Innovation, Quality and Entrepreneurship	Dec. 1994, Maribor, Slovenia	M. Rebernik, EPF, Univerza di Mariboru -62000 Maribor, Slovenia, tel.: 062-28-261, fax 062-27056