

50 CODATA / NEWSLETTER

NOVEMBER 1989

"Data for Discovery"

12th International CODATA Conference

15-19 July, 1990--Columbus, Ohio, U.S.A.

A reminder:

Dr. Margaret Courain, U.S.A., Chairperson of the Scientific Program Committee for the 12th International CODATA Conference, reports that the program has been organized around invited presentations from speakers representing 12 countries on the six themes: Prediction of Global Change, Spatial Databases, Materials Data Systems, Expert Systems and Other Knowledge Tool, Trends in Integration of Information Across Biology, and Impact of New Technology on Data Handling.

The Keynote Address, "Future Directions of Science and Large Scale Scientific Computing," will be given by Professor of Physics K. G. Wilson, Ohio State University.

The members of the Scientific Program Committee are taking active roles, not only in planning, but also in leading specific sessions of the conference in their areas of expertise. These include discussions of:

- *Materials Data Management*
 - Global Trends in Materials Data Management*
 - Innovative Activities in Materials Data Management*
 - Key Issues in Materials Data*
- *Knowledge Tools*
- *The Future of Handbooks in Science*
- *Terminology and Nomenclature in Biology*
- *Collaboration and Linkage among Biology Databases*
- *Chemical Data Used in Process Control*
- *Data and New Technologies*
- *New Computer Technologies*
- *Exploratory Molecular Substructure Manipulation Using Knowledge Based Systems*
- *Geographic Information Systems*
- *Computer Aided Spectroscopy*

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The Committee on Data for Science and Technology (CODATA) was established in 1966 by the International Council of Scientific Unions.

Working on an interdisciplinary basis, CODATA seeks to improve the quality, reliability, processing, management, and accessibility of data of importance to science and technology.

CODATA Calendar

1989

December

7-8 CODATA Officers' Meeting. Paris, France

1990

March

1-3 CODATA East-Asian Data Sources Task Group. Kyoto, Japan

22-24 CODATA Executive Committee Meeting. Paris, France

July

15-19 12th International CODATA Conference, "Data for Discovery," Columbus, Ohio, U.S.A.

20-21 CODATA General Assembly, Columbus, Ohio, U.S.A.



4th International Conference on Geoscience Information

GeoInfo IV, June 24-29, 1990, will be hosted by the Geological Survey of Canada. Building on three previous conferences (London, U.K., 1978; Golden, CO, U.S.A., 1982; Adelaide, Australia, 1986), GeoInfo IV is aimed at stimulating the exchange of ideas, experiences, and data among geoscientists and other professionals involved in the collection, management and dissemination of information in the earth sciences.

The five key themes of GeoInfo IV will be:

- Placing a value on information
- Information handling with digital and analog systems
- Database construction and management
- Managing collections and archives: conservation and preservation
- Strategies for improving the flow of information: in-house, nationally, and internationally

GeoInfo IV will include plenary sessions, concurrent workshops, seminars, posters, and discussion sessions. There will also be demonstrations, hands-on sessions, exhibits, visits to local institutions working in the field of information sciences, and geological field-trips.

Co-sponsors of the conference include COGEO DATA, the International Union of Geological Sciences, the Geoscience Information Society, the Australian Geoscience Information Association, and the Geological Information Group of the Geological Society of London. Further information is available from:

David Reade, Secretary-Treasurer, GeoInfo IV, Geological Survey of Canada, 601 Booth St., Ottawa, Canada, K1A 0E8. Telephone: (613) 992-9550; Telex: 0533117 EMAR-OTT; Telefax: (613) 996-9990.

"Units and Conversion Charts"

Theodore Wilki has produced a handbook for engineers and scientists that involves conversion methodology devised by the author in the early 1970's, explained in two pioneering books now out of print and replaced by this current up-dated book. The author is a professional engineering, a Senior Member of the Institute of Electrical and Electronics Engineers, and Chairman of the Canadian Metric Practice Guide Committee. The conversion charts are universal because they enable instant conversions from one unit to any other.

Hardcover, 80 pages, ISBN 0-921789-9, distributed by Sperika Enterprises, Ltd., 121 South Estes Drive, Suite 203, P.O. Box 3812, Chapel Hill, NC 27515-3812. Tel: (919) 932-2454, FAX: (919) 967-0511.

New Delegates to CODATA

IUGG

The new representative of the International Union of Geodesy and Geophysics (IUGG) to CODATA is Professor C.C. Tscherning, University of Copenhagen, Institute of Geophysics, Haraldsgade 6, DK-2200 Copenhagen N, Denmark. He replaces Mr. J. Crease.

UK

The Royal Society has appointed Dr. G.B.R. Feilden as the UK delegate to CODATA to succeed Professor F.R.S. Gutfreund. Dr. Feilden's address is Verlands, Painswick, Stroud, Gloucestershire GL6 6XP, UK. Telex: 437244; Telefax: 0452-812912.

Republic of Korea Joins CODATA

The application of the Republic of Korea for membership has been resoundingly accepted by a General Assembly ballot. Dr. Ki Soo Sung, President of the Systems Engineering Research Institute of the Korea Advanced Institute of Science and Technology in Seoul has accepted the responsibility of representing their National Committee for CODATA as the National Delegate.

Professor Jiro Osugi was born October 9, 1919, in Kurashiki, a beautiful ancient town in Japan's Okayama prefecture. In 1943 he graduated from the Laboratory of Physical Chemistry at Kyoto University. At Kyoto University he became a lecturer in 1948, an associate professor in 1953, and professor in 1962. In 1983 he retired from Kyoto University and moved to Osaka Institute of Technology where he continued to foster young scientists as well as chemical engineers. At the same time he became Director of the Thermophysical & High Pressure Data Center and did much for data activities. He was Chairman of the CODATA Task Group on Survey of Data Sources in East-Asian Countries since its inception. He had been making arrangements earnestly for the third Meeting of the Task Group but--regretfully--he succumbed to cancer on August 12, 1989.

Professor Osugi had devoted himself to science and education for about 40 years, and "brought up" over one hundred students in his laboratory. His interests covered a wide range of physical chemistry--high pressure chemistry, photochemistry, reaction kinetics, and solution chemistry. He had published over two hundred original papers and about 30 books and reviews. Above all, he had played a leading role in the activation and expansion of kinetic studies on chemical reactions at high pressure. Under his guidance many active researchers in this field have been developed in Japan. He made a great contribution also to the formation of the domestic (High Pressure Conferences of Japan--which may become a Society in time) and international organizations related to high pressure research, e.g. the International Association of High Pressure Science and Technology (AIRAPT).

His first challenge as a leader of the high-pressure group in Kyoto University was the construction of an apparatus which generated 100 kilobar pressures; it was called the compact cubic anvil apparatus or "the Dia Press" (manufactured by Kobe Steel Co., Ltd.). The successful increase in number of the anvils from four in Hall's tetrahedral anvil apparatus to six in his new design increased the efficiency and enhanced hydrostatic pressure and made possible the generation of very high pressures in a solid sample of large volume by a single person. For this technical development, he received--together with the inventor of the "bullet train" (Shin-Kansen) system in Japan--the 16th Mainichi Prize for Promotion of Industrial Techniques in 1964. About ten such apparatuses are in use in high pressure laboratories in Japan and, it has recently been adopted in the Photon Factory at Tsukuba to study time-dependent structural changes accompanying transformation of solid materials under very high pressures.

He applied the cubic anvil apparatus systematically to the investigation of the effect of pressure and temperature on the mechanism of transformations of inorganic and organic solids, discovered new stoichiometric and nonstoichiometric compounds as well as their new high pressure phases, and elucidated the mechanism of these elemental reactions in

terms of the diffusion processes involved in the solid state. This work was followed by more fundamental studies on the effect of pressure on the Kirkendall effect and the rate of layer growth in a diffusion couple. He clarified the mechanism of the transformation of graphite to diamond with nickel as a catalyst by focusing on the diffusion process of metallic nickel.



Solid-state organic reactions which do not occur under normal conditions were studied mainly in the cubic anvil apparatus including polymerizations of trioxane, nitriles, diacetylenes, and other unsaturated compounds. He disclosed the mechanisms of freezing polymerization of acetaldehyde by using high pressure and low temperature; the polymerization proceeds only on the phase boundary between the solid and liquid of the monomers, and the crystalline nucleus acts as a catalyst.

The first measurement of the melting point of polyethylene as a function of pressure was carried out by using the cubic anvil apparatus. The vanishing trend of the entropy changes accompanying the melting of polyethylene at a high enough pressure has led to the conclusion that the polymer melt has a liquid structure quite similar to that in the solid state at such a high pressure. He attacked many other problems and showed how powerful high pressure techniques were in solving fundamental problems which are more or less related to intermolecular distances.

He had been engaged in the collection and evaluation of physical property data at high pressure and stressed the importance of international cooperation for the exchange of such data.

Professor Jiro Osugi's activities on behalf of CODATA have been many. A member of the Japanese National Committee

(cont'd. on page 4)

Jiro Osugi (cont'd. from page 3)

since 1975 he was its Chairman and National Delegate from Japan since 1984. He served on the Scientific and Local Organizing Committees in 1980 for the 7th (Kyoto) International CODATA Conference. He was a member of Task Group on Property Data for High Pressure Phases since its inception (1989) and its Chairman 1982-88. He fought effectively for establishment of the Working Group on Data Sources in Far-Eastern Countries (since 1985) which was subsequently established as the Task Group on Survey of Data Sources in East-Asian Countries (1988), and he served as Chairman of both until his death. He was also a co-opted member of the Executive Committee of AIRAPT.

Professor Osugi put much importance on the harmony among people and especially at international conferences he made every effort to promote friendly relations among participants. He was remarkably warm hearted and was always willing to extend a helping hand to anyone who sought his help.

Dr. Guy Waddington, one of the true front runners in CODATA's infancy, is probably the only *individual* to be designated a Co-Opted Member of CODATA. He makes this tribute to our friend and colleague. "Above all Jiro Osugi was a Kyotan filled with love and respect for his city and the way of life it provided: for its natural beauty, for its architectural creations, and for the blending of work and other activities which made life so pleasant. I well remember after he had shown us the Golden Pavilion, and then passed an inconspicuous, almost hidden little crypt, he said, 'Until the beholder learns to love this little building as much or more than the Golden Pavilion he does not know the Japanese spirit.' I commented that the man of Japan (Kyoto) had much in common with the Renaissance man, that he worked hard, played hard, and loved beauty in all its forms. He seemed to like this credo and to think of himself as one who lived by the standards of the Renaissance man."

He was a person with many interests. Above all, he was fond of photography. Whenever he went out he carried his camera with him and took photographs at every opportunity. He dreamt of a private exhibition of his works representing women and flowers after retirement from his job. He was often seen driving with his wife in the country or suburbs and enjoying the poetic charm of seasonal change.

"U K Materials Information Sources"

A new book (1989) authored by Keith W. Reynard--known and appreciated within CODATA as a member of the Industrial Data Commission--and published in the U.K. by the Design Council "was compiled to reduce the labor and cost of finding where to get information about engineering materials." It is a *referral* volume that will provide a prime source--or at least a starting point that is several steps nearer the contact who will be able to provide the information required.

Like some of the concepts mentioned in the report on pages 5 and 6, it received its initial impetus from the CEC Workshop on Factual Materials Databases held in Petten in 1984. Although its scope is limited to sources in the United Kingdom, it does endeavor to be complete in three categories. These are:

- On-line sources of materials information and data compiled in the UK.
- Software for sale compiled in the UK.
- Hard copy data for sale from UK authors.

Some sources in the United States and overseas are included if they are in regular use in the UK and have UK offices. Other Directories for CEC and international sources (e.g., *CODATA Directory* chapters) are indicated. The author estimates that data on perhaps something approaching 400 000 engineering materials are included in the sources indicated. The single index provides representative generic entries but many fewer than cited above.

It has been beautifully produced. ISBN 0 85072 2357. Paper covers, 192 pp. The Design Council, 28 Haymarket, London UK, SW1Y 4SU.

"Data for Discovery" (cont'd. from page 1)

- *Technology Reconciliations*
- *Crystallographic Databases*
- *Spatial Data Intergration*

In addition, abstracts of 76 contributed papers have already been received from scientists representing 16 countries. About half of these contributed papers will be presented orally during the contributed sessions of the conference. The remaining half will be presented as posters, followed by workshop discussions. Although the deadline for submitting papers for oral presentation is past, it is not too late to submit an abstract for a poster paper. Send these *ca.* 500 word abstracts to: M. E. Courain, 420 Harding Drive, South Orange, NJ 07079 USA. Electronic mail may be sent on DIALCOM142: CDT0355.

To facilitate discussion and interchange of ideas, workshops will be organized from the poster sessions in which groups of related posters will be discussed with an appointed chairman after the poster sessions.

Practitioners in all scientific disciplines, especially those in the physical, biological, geological, and astronomical sciences concerned with the management of quantitative data resulting from experimental measurements or observations, will find this Conference beneficial.

Those desiring detailed information on the Conference program, the exhibits, database demonstrations, social/cultural activities, and tours, should address the:

12 International CODATA Conference
Applied Information Technologies Institute
1880 Mackenzie Drive, Suite 111
Columbus, Ohio 43200, U.S.A.

P.S. Participants may also wish to visit Columbus' unique neighborhoods such as German Village, a 19th century German community containing beautifully restored homes, shops, and restaurants, the world-renowned Columbus Zoo, the Ohio Historical Center/Ohio Village (one of America's premier historical museums), and/or the United States Air Force Museum in Dayton. They may also discover Columbus at their leisure, independently of the organized events.

MATERIALS DATABASE MANAGERS MEET IN USSR

Propose Review of Prospects for Global Data Interchanges

The CODATA Task Group on Materials Database Management (TGMDM), held its fifth meeting in Moscow and Novosibirsk on 4th to 8th September, 1989. The meeting also embraced a two-day Symposium in Novosibirsk which reviewed materials databases, systems and networks from probably a greater range of national and multinational sources than covered in any previous international meeting.

BACKGROUND

TGMDM came into existence in June 1987 following some of the recommendations made at the Schluchsee Workshop—one of a series on materials property data—cosponsored by CODATA in 1985. All made important contributions in advancing our understanding and solution of the problems attending the creation and the operation of property databases in computerized form. The Fairfield Glade Workshop, cosponsored by CODATA in 1982, concluded that there were no significant technical barriers to the development of these systems but that, without prompt co-operative action, either a large unsatisfactory system or many uncoordinated, independent databases would evolve. The workshop recommended a system concept involving a coordinated, distributed set of independent databases connected by a common gateway computer. With subsequent refinement this is in essence the concept adopted by the United States' Materials Property Data Network.

The Fairfield Glade Workshop provided a pattern and stimulus for a workshop organized by the The Commission of the European Communities (CEC), at Petten in 1984. This event confirmed many of the conclusions reached at Fairfield Glade and led to the CEC Demonstrator Programme. This concept differs from that proposed earlier in that the user is directed to individual databases, with harmonized terminologies and command languages, by a central referral interface.

At the Schluchsee Workshop, it was recognized that the systems then evolving were largely avoiding the proliferation of uncoordinated, independent databases which had been feared at the time of the Fairfield Glade Workshop. However, this evolution was still uncoordinated at the international level. Further, there was seen to be an urgent need to build bridges between users and databases managers and to establish a mechanism for collaboration between database managers on an international scale.

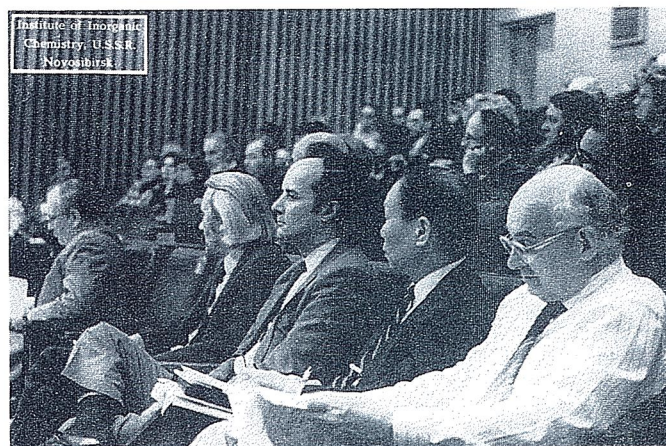
CODATA responded to the recommendations of the Schluchsee Workshop by forming the Task Group on Materials Database Management.

OBJECTIVES AND CONSTITUTION OF THE TASK GROUP

TGMDM first met just over two years ago and adopted the objectives of providing an international vehicle for communication between and coordination of, the activities of builders, managers, and users of machine readable, engineering materials databases. Areas of action include:

- promotion of communication and awareness
- influence in the preparation of standards, guidelines, and terminology
- promotion of knowledge and practices to improve the bridges between users and managers of materials databases

The constitution of the group needed to embrace a wide range of national interests and also establish positive connections with major national and community initiatives in materials database systems, standardization, and related activities. This had to be done by a core group of experts small enough to ensure positive commitment and participation in the group's actions and within the limits of the reasonable resources available for their support.



Participants and presenters at the Novosibirsk Symposium.

The Members and Corresponding Members appointed are based in eleven of the CODATA nations and also provide links at a suitably high level of influence with:

ASTM Committee E-49, Chinese National Program, COMECON Standard Reference Data System, CEC Materials Databank Demonstration Program, Japanese National Program, USSR State Standard Reference Data Service, USA National Materials Property Data Network, and Versailles Project on Advanced Materials and Standards.

MANAGEMENT SERVICES ESTABLISHED

The Task Group works on a continuous basis by correspondence, phone, and FAX. Our meetings try to define well-focused projects, review progress on them, discuss any refinements necessary, and aim to ensure timely completions. At the most recent meeting we were able to note the completion of:

- An international register of materials database managers, in its initial form for the use of CODATA in establishing communication.

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- The eighth issue of *The Materials Database Newsletter*, edited by Bill Jackson. This *Newsletter* has proved to be an effective, concise medium of information interchange on standards, network development, new databases, and on issues which need to be drawn to the attention of database managers and users.

- A concise set of guidelines, having substantial international accreditation, on the construction and operation of materials property databases. These were edited by Gil Kaufman and first published late in 1988 as *CODATA Bulletin No. 69*. Almost immediately a subsequent re-printing was required. CODATA has recently agreed to make this *Bulletin* available for the foundation of a new *ASTM Standard*.

- *Annual Reviews* of national and community activities distributed as a compendium of reports prepared by TGMDM Members and Corresponding Members.

- A *CODATA Special Report* on the Novosibirsk Symposium edited by Alexander Kozlov will be issued shortly in place of the *Annual Review for 1989*.



Task Group and related participants at Novosibirsk. Left to right: (M. = T.G. member) Prof. A.D. Kozlov (M. Host at meetings in Moscow); Mr. K.W. Reynard (Member CODATA Commission on Industrial Data); Mr. J.G. Kaufman (M.); Mr. D. Vinard (M.); Acad. F.A. Kuznetsov (Director, Inst. Inorg. Chemistry. Host at Novosibirsk); Timonova Irina (President, Young Scientists Committee, Novosibirsk); Dr. N. Swindells (M.); Dr. A.J. Barrett (M. Chairman TGMDM); Mr. W.G. Jackson (M. Editor of MDM Newsletter); Dr. S. Nishimima (M.).

MANAGEMENT SERVICES UNDER CONSTRUCTION

Perhaps most difficult among the projects which TGMDM currently has in hand is one to define the benefits of materials database systems and their economic consequences. Most materials database managers are well able to catalog the *functions* and *features* of their systems; few seem as able to identify *benefits* in terms which might impress their users or funding authorities supporting their development. So we are currently drawing up structured lists of benefits in qualitative terms and relating them to database functions, user type, and need. This is a first step in constructing a package of assistance

to materials database managers in the presentation of their systems to potential patrons, in the evolution of real user needs and--eventually--in the preparation of a rational basis for the quantification of favorable economic consequences. This work, when completed, may offer insight to other technological disciplines especially in terms of methodology.

Following the Novosibirsk Symposium, TGMDM concluded that it had demonstrated as never before the wealth of high quality materials property data becoming available in national and community resources. This is seen to justify the organization, under CODATA auspices, of a major workshop meeting having a bold objective, namely:

- to study the rapidly changing technical, political, and economic aspects of the cross-border flow of materials property data on a global scale,
- to identify and characterize the benefits and problems involved, and
- to propose solutions--or routes to such solutions--as will enable this flow of data to take place. Alexander Kozlov was invited to chair a program sub-committee for this workshop. It is believed that CODATA is uniquely internationally sited to address this important task.

Both the Symposium and Task Group meeting were hosted by the USSR Academy of Sciences and the Siberian Division. Excellent local arrangements for the meetings were provided by Academician F. A. Kuznetsov, Director of the Institute of Inorganic Chemistry, his staff, and the Committee of Young Scientists.

--Anthony Barrett, Chairman,
CODATA Task Group on Materials Database Management

"Data Activities and Database Developments in China, Japan, and Korea"

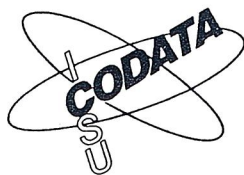
This volume incorporates the text of a score of oral presentations on the development of databases in the three countries. The lectures were delivered by invited speakers during the November 1988 Task Group sessions in Beijing and highlighted future plans and directions of database evolution. Although intended for distribution within the CODATA family, this timely 128 page *CODATA Special Report No. 12* has been made available to the international scientific community for a nominal price of (postpaid) only \$32(US) (or 200 French francs, or 120 Chinese yuan). It may be obtained on three continents:

CODATA Secretariat, 51 bd. de Montmorency, 75016 Paris, France;

CODATA Editorial Office, c/o Department of Chemistry, University of Michigan, Ann Arbor, MI 48109, USA; and

Chinese National Committee for CODATA, Attn: Associate Professor Hu Yaru, P. O. Box 2745, Zhongguancun, Beijing, P.R. China.

Remittance with order will expedite dispatch of this volume.



Task Group on Materials Database Management

Materials Database Newsletter

November 1989, Number 8

The CODATA Task Group on Materials Database Management held its 5th meeting on the 4th and 5th of September in Moscow and Novosibirsk at the invitation of the USSR Academy of Sciences and the Soviet National CODATA Committee. This was followed on the 6th and 7th of September by a seminar/workshop which included a number of presentations on database activities in the USSR as well as reviews of international developments. A more detailed report will appear in the next issue of the Newsletter.

During the Task Group meeting, members expressed their concern that the Materials Database Newsletter should provide wider coverage of national and international activities; all readers are therefore urged to send any news they may have about database development and use in their own countries, and details of relevant forthcoming events.

STANDARDS

ASTM Committee E49, **Computerization of Materials Property Data**, has completed committee balloting on several standards which have been advanced to society ballot. One is a "Standard Generic Guidelines for Reporting Materials Test Data," which includes two addenda illustrating the standards, viz plane-strain fracture toughness test data per ASTM E-399, and bearing test data per ASTM E-328. FURTHER INFORMATION: J. Rumble, Chairman (USA, 301-975-2203) or D. Viall, ASTM Staff Manager (215-299-5546).

NETWORKS

A number of additional databases will be available on the MPD Network upon its initial release on STN **International** scheduled for the fourth quarter of 1990: PLASPEC - properties of 10,000 plastics; METALS DATAFILE - over 40,000 records from the metallurgical literature; ALFRAC - plane-strain fracture toughness of high-strength aluminum alloys; and AAASD - property data from the Aluminum Association's Aluminum Standards and Data. FURTHER INFORMATION: J. G. Kaufman (USA, 614-447-3706; FAX 614-447-3713).

DATABASES

Several new numeric databases covering thermophysical properties of substances have or will shortly become available on STN **International**, including HODOC - Handbook of Data on Organic Materials, from Chemical Rubber Products Company. FURTHER INFORMATION: Kethy Duffy, Chemical Abstracts Service (USA, 614-447-3728).

ESDU **International** has announced the extension of its pressure vessel design program, PV Designer. Calculations may now be made to BS 5500, to ASME VIII or to both of these codes. All curves and tables are embodied in the program together with a database of shell, bolt and gasket materials properties. This database can be modified by users to include their own materials selections. Output of the design calculations is formatted to full insurance and certification body standards. Program diskettes are recalled and replaced whenever either code is amended. FURTHER INFORMATION: ESDU International, 27 Corsham Street, London UK N1 6AU. Tel: +44 1 490 5151; or, in North America, Tel: 703-631-4187.

DIRECTORIES

GUIDE DES BANQUES DE DONNEES FACTUELLES FRANCAISES SUR LES MATERIAUX 1989 (DIRECTORY OF FRENCH FACTUAL DATABANKS ON MATERIALS). Edited by CODATA France, DBMIST/MENJS, and FLA Consultants. This Directory provides details of around 40 databases, including coverage, availability, and search examples. The Directory is priced at 225 FF and is available from FLA Consultants, 27 rue de la Vistule, 75013 Paris, France; Tel: (1) 45 82 75 75.

CALENDAR

11 October 1989, Douai, FRANCE

BANQUES DE DONNES INFORMATISEES; POLYMERES ET COMPOSITES (MACHINE READABLE DATABANKS ON POLYMERS AND COMPOSITES). CONTACT: Mm. Lorthioir, Ecoles des Mines de Douai, 941 rue Charles Bourseul, BP 838, F-59508 Douai Cedex, FRANCE.

27-29 November 1989, Orlando, FL, USA

Technical Committee Meetings of ASTM E49 on **COMPUTERIZATION OF MATERIALS PROPERTY DATA.**

29 November - 1 December 1989, Orlando, FL, USA

Second International Symposium on **COMPUTERIZATION OF MATERIALS PROPERTY DATA.** CONTACT: Dorothy Savini or Don Viall, ASTM, 1916 Race Street, Philadelphia, PA, USA. Tel: 215-299-5546.

19 July 1990, Columbus, OH, USA

Twelfth (Biennial) CODATA International Conference, **DATA FOR DISCOVERY.** CONTACT: 12th CODATA Conference DATA FOR DISCOVERY, Applied Information Technologies Institute, 1880 Mackenzie Drive, Suite 111, Columbus, OH 43220, USA.

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CODATA / NEWSLETTER

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