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I. NEWS AND EVENTS

World information service planned

Plans for a New Computerized World Information Service to allow information to flow freely among non-governmental organizations (NGOs), from East to West and North to South, were unveiled at a meeting held in Geneva in May 1989.

The East-West Meeting was sponsored by the World Information Clearing Centre (WICC), a Geneva-based non-governmental group founded during the International Year of Peace. Attended by representatives of a number of United Nations system organizations as well as NGOs, religious groups and international communications experts, it was intended to gather support for improved East-West and North-South electronic information exchange.

Bearing the acronym NCWIS, the information service will be engaged in, among others on the work programme approved at the meeting, the following activities:

- An Early Warning or Alert System covering nuclear threats, environmental degradation, natural disasters and accidents, and human rights violations.
- An International Advisory Panel of experts, to give practical advice and guidance in WICC's efforts to provide NGOs with the kinds of services that will substantially increase their ability to respond effectively to world problems.
- A survey of office automation studies for NGOs, in conjunction with a needs assessment, to assist NGOs wishing to join the network and expand their communications capabilities.
- A study of the "village link" - that part of the communications network beyond the computer's reach.
- The "Video-Globe" project, a world-wide study of available audio-visual resources on topics related to global problems. When compiled, such a data base would be continually updated and publicized through the network. WICC plans to launch a video-cassette project designed to educate communities on the identification and resolution of problems related to the four major areas of concern listed above.

For further information, contact: WICC, P.O. Box 58, 1211 Geneva 20, Switzerland. (Source: ACCIS Newsletter, Volume 8, No. 1, May 1990)

"Telestroika" forges new East-West links

The spectacle of the USSR joining forces with eight Western and Japanese telecommunications companies to plan the world's longest optical fibre link provides fresh evidence of the existence of a phenomenon which has been called "telestroika".

Linking the USSR with Japan and the rest of Europe, the line will span 10,000 miles. It will take from three to five years, and an estimated \$US 500 million, to complete. Work on this new communication channel will be carried out by a newly-formed partnership called the Trans-Soviet Line Development Corporation. Telecommunications companies involved include OTC (Australia), Telecom Denmark and the Great Nordic Telegraph

Company (also of Denmark), Deutsche Bundespost Telekom (FRG), STET (Italy), KDD (Japan), British Telecom (UK), and US West (USA).

As well as joining three market-places, the line will provide links between major cities in the USSR. The project was initiated by US West, which brought in other principals after approaching the USSR's Ministry of Posts and Telecommunications (MPT). A start on construction is planned for 1990, once a business structure is in place and the partners have obtained the approval of their respective governments. (Information source: Telecommunications international edition, Vol. 24, No. 3) (Source: ACCIS Newsletter, Vol. 8, No. 2, July 1990)

World Bank achieves open network

The World Bank has developed a working open network for its financial systems, in which computers made by a trio of international manufacturers talk to each other.

Equipment from International Business Machines (IBM), the Digital Equipment Corporation (DEC) and the Unisys Corporation is working in harness at the Bank, using common networking protocols and a specially crafted implementation of the internationally accepted X.400 message-handling system.

Unusual methods have been used to implement the new network. Since Digital and Unisys both provide communications products which support IBM's Systems Network Architecture (SNA) and Logical Unit (LU) 6.2 protocols, the Bank is using SNA as its network foundation. X.400 provides the same basic ability to communicate among applications.

To achieve its objective, the Bank has developed two SNA-based interconnection services: firstly, file transfer, using SNA Network Job Entry protocols and, secondly, application-to-application messaging, using internally written software. (Source: ACCIS Newsletter, Vol. 8, No. 1, May 1990)

Information on TNCs

The United Nations Centre on Transnational Corporations (UNCTC) provides developing countries with a wide range of information services on transnational corporations (TNCs). A recent report by the Secretary-General provides an overview of these services and gives examples of the ways in which they are being used by Member States.

In response to outside requests, the Centre assists developing countries - by supplying information services or products - in their dealings with TNCs, as well as supporting local development of information systems on this issue. Research and evaluation services involve information and analysis on: individual companies, industries and sectors; laws, regulations and norms; contracts and agreements; individual countries' economic and political frameworks; foreign direct investment, policy issues, etc.

A second category of service helps developing countries create their own information systems. Under this heading are: information needs assessment; system design, installation and testing; evaluation and upgrading of existing systems; hardware, software and dataware evaluation and procurement; installation of information products developed by the Centre, including software applications and dataware, and training of government officials.

In addition, the Centre makes available to Member States its extensive collection of technical information related to foreign investment and transnational corporations, as well as other related publications. Finally, it provides on-line access to all of the world's major business data bases.

Some 700 government requests for information are currently received by the Centre every year. In a number of cases, some of which are documented in the report, the information has led governments to the discovery that a company has been misrepresenting itself or its affiliations.

Recently the Centre has received an increasing number of calls for assistance in the development and management of computerized information systems. These are being used in support of: policy formulation; improving the role of foreign investment and technology transfer; investment promotion; the negotiation process, and monitoring and evaluation of the performance of foreign investors.

The Centre has also started to make its own data bases available as components of information systems being implemented in developing countries. In addition, it is encouraging the exchange of bibliographic data in machine-readable form. One such exchange, with an organization of Caribbean governments, is being facilitated by the use of CDS/ISIS (Mini-Micro Version) by both parties. This includes the local installation of tailored software for documentation handling, and the training of local staff.

The report, which includes a number of detailed descriptions of the way in which the Centre has responded to Member States' requests for assistance, carries the document number E/C.10/1990/15. It is available from the United Nations Document Control Section, Room S-1552A, United Nations, New York NY 10017, USA. (Source: ACCIS Newsletter, Vol. 8, No. 2, July 1990)

United Nations prepares compendium of disability statistics

The United Nations Statistical Office is preparing the first international compendium of disability statistics. Based upon the national statistics contained in the United Nations Disability Statistics Data Base (DISTAT), the compendium is scheduled for publication in 1990.

Detailed national data on 12 major topics will be provided in the compendium. This will include information on disabled persons according to age group and sex, residence, educational attainment, economic activity, marital status, household characteristics, cause of impairment and special aids used.

DISTAT, from which a compilation of data is available on diskette, contains disability statistics from national household surveys, population censuses, and the population or civil registration systems of 55 countries. It is the first international data base of its kind. In the first several months since its official distribution on diskette, over 60 government offices and research institutions became registered DISTAT users.

For further information, please contact the Director, United Nations Statistical Office, United Nations, New York NY 10017, USA. (Source: ACCIS Newsletter, Vol. 8, No. 2, July 1990)

UNEP cleans up production

Cleaner production and technology is the goal in front of a network being established by the United Nations Environment Programme (UNEP). The network, created using guidelines laid down by UNEP's Governing Council at a Special Session in 1988, with advice from experts from various countries and international organizations, will exchange and disseminate information.

Finance is currently being provided by France, The Netherlands, UK, USA and the Commission of the Economic Community (CEC). The United Nations Industrial Development Organization (UNIDO), the United Nations Centre for Science and Technology for Development (UNCSTD) and the Organization for Economic Co-operation and Development (OECD) are members of the network. A number of industrial associations are also playing an active role.

Through the network, UNEP is serving as an information broker. It will encourage regional, national and international activities to promote cleaner technologies and cleaner production.

The network will rely largely on information collected by working parties established on the following topics: the galvanic industry; the textile industry; the leather industry; substitutes for and safer use of halogenated solvents; harmonization of data on cleaner production, and governmental policies for promoting cleaner production methods. The working parties are composed of recognized specialists from countries throughout the world.

The first issue of a newsletter, *Cleaner Production*, has just been published by UNEP to draw attention to the need - and the opportunities - for implementation of cleaner production methods. For further information, contact: Industry and Environment Office, UNEP, 39-43 Quai André Citroën, 75739 Paris Cedex 15, France (Tel.: + 33 1/40 58 88 50; TX 204997 f; Fax + 33 1/40 58 88 74). (Information source: *Cleaner Production*, No. 1, April 1990) (Source: ACCIS Newsletter, Vol. 8, No. 2, July 1990)

Crime prevention data base

An international data base containing descriptions of cultural property - such as archaeological objects or parts of historical monuments - which could be exported or imported illegally, forms part of a draft model treaty approved by the UN Committee on Crime Prevention and Control, which concluded its eleventh session on 16 February 1990.

The data base - which, under the terms of the draft resolution containing the model treaty, the Secretary-General would be asked to establish - would also include national and international legislation on the protection of such cultural property.

The treaty, intended to prevent crimes that impinge on the cultural heritage of peoples, was among 11 legal instruments approved by the Committee. The resolution is recommended for adoption by the Fifth United Nations Congress on the Prevention of Crime, to be held in Havana, Cuba from 27 August - 7 September 1990. (Information source: United Nations Press Release, DH/58b, 21 February 1990) (Source: ACCIS Newsletter, Vol. 8, No. 1, May 1990)

Global telecommunications developments

Developments in global telecommunications were discussed by Mr. Pekka J. Tarjanne, Secretary-General of the International Telecommunication Union (ITU), presenting the inaugural guest lecture to the US Centre for Strategic and International Studies in Washington, DC on 11 January 1990.

The lecture identified, in particular, some very significant developments in global communications which have occurred within both the General Agreement on Tariffs and Trade (GATT) and ITU during the past year.

Copies of the lecture are available from: the Press Office, Public Relations Division, International Telecommunication Union, place des Nations, 1211 Geneva 20, Switzerland. (Tel.: + 41 22/730 51 11; Telex: 421 000 UIT CH; Fax: + 41 22/733 72 56; Teletex: 22846815100). (Information source: Transnational data and communications report, February 1990) (Source: ACCIS Newsletter, Vol. 8, No. 1, May 1990)

Telecommunications network panel to survey organizations

The ACCIS Technical Panel on the United Nations Telecommunications Network (TP/NET) is to survey UN organizations on the present configurations of their telecommunications environments, and on which services of the United Nations leased line network they would like to use. A detailed questionnaire, currently being prepared by the UN and the International Telecommunication Union (ITU), will be sent to organizations by June 1990.

The survey, and a preliminary questionnaire which had earlier been sent to members, were discussed at a meeting of the Panel on 17 April 1990 at the Geneva headquarters of the United Nations.

It is vital that organizations complete the questionnaire as soon as possible; the United Nations has promised to produce a prospectus and a strategic plan for use of the network by specialized agencies by December 1990. (Source: ACCIS Newsletter, Vol. 8, No. 1, May 1990)

Institute focuses on intelligent systems

Artificial intelligence - a computer's ability to mimic intelligent human behaviour - is moving out of the laboratory and into the real world. A number of major companies have already put expert systems, a branch of artificial intelligence, to practical use.

In the world of libraries and information centres, artificial intelligence and expert systems are still at the experimental stage, but the signs are that large-scale implementation may not be far away. It is predicted that, by the year 2000, artificial intelligence programs will be used by businesses and government agencies everywhere.

The Special Libraries Association (SLA) has organized a State-of-the-Art Institute, which will be devoted to an exploration of artificial intelligence and related technologies likely to affect the library/information centre. Practical applications of natural language processing, knowledge representation, and decision systems will be discussed, as well as the business and strategic implications of artificial intelligence.

The Institute, entitled "Intelligent Systems: a Framework for the Future" will take place from 22 to 24 October 1990 in Washington, DC. For

further information, please contact: Special Libraries Association, 1700 Eighteenth St. NW, Washington, DC 20009, USA (Tel.: + 202/234 4700). (Information source: Specialist, May 1990) (Source: ACCIS Newsletter, Vol. 8, No. 2, July 1990)

New design research institute

Xerox Corp., Stamford, Conn., is funding the launching at Cornell University of a Design Research Institute which officials hope will become the focus of developments for improving product design, including computer-aided design for manufacturing using supercomputing facilities.

Xerox has funded a \$650,000 endowment for the institute in its first year and will boost its funding to \$1 million by next year.

Five Xerox scientists from the company's Webster Research Center in Rochester, N.Y., will be assigned full time to the institute. They will be aided by at least seven Cornell professors. Researchers will also come from the Cornell College of Engineering, the Department of Computer Science and the Center for Theory and Simulation in Science and Engineering.

Xerox plans to escalate funding for the research partnership to \$1 million by next year, and continue as long as the centre is needed, officials said. Institute directors also plan to seek federal funding for their projects. (Extracted from Metalworking News, 23 April 1990)

European museums network

Discovery - Traces of Europe's Cultural Integration is the topical theme of a pilot project linking Europe's museums, due for completion in 1992.

The European Museums Network - the project's title - which got off the ground in January 1989, combines advanced telecommunications technologies and multimedia workstations in museums. The intention is to provide the public with non-formal information and education. A crucial aim is heightened public awareness of the importance of local cultural heritage, and the relationship between artefacts from different countries.

The network uses an associative approach, geared towards helping museum visitors to see the connections linking the diverse objects and artefacts stored in the electronic archives of the various participating institutions.

Around half of the 10 million ECUs (approximately \$US 11 million) required for the pilot project has been provided by the Commission of the European Communities, through its RACE (Research on Advanced Communication Technologies in Europe) programme.

Partners in the network are museums, industries and scientific research institutes from Denmark, France, the FRG, Portugal and Spain. The museums taking part - nine at present, although more are expected to join later - cover the disciplines of art and architecture, ethnology, archaeology and technology.

The project has been organized and managed by the International Council of Museums (ICOM), which will co-ordinate the groups participating in the project and, afterwards, take charge of communications with the group of associated museums.

For further information, contact: Patrick Chardon or Corina Coman, Maison de l'Unesco,

1, rue Miollis, F-75732 Paris cedex 15, France
(Tel.: + 33 1/47 34 05 00 or 45 68 28 54;
Fax: +33 1/43 06 78 62). (Source: ACCIS
Newsletter, Vol. 8, No. 1, May 1990)

A licence for Eastern business

The decision by the US Government to rubber-stamp proposals to liberalize technology licensing laws affecting trade with the Eastern Bloc is expected to increase UK export opportunities.

A political influence can affect trade regulations but though Eastern Europe is politically unstable, Gerhard Paulus, Control Data's Soviet operations manager feels that this will not affect trade unless there is another significant political event.

Recent meetings of NATO's COCOM exports monitoring committee have resulted in a relaxation of licensing laws. This has opened the gates for exports to Eastern Europe.

The COCOM agreement changes export controls in three priority sectors: computers, telecommunications and machine tools.

Licences for all telecommunications exports, most semiconductor manufacturing equipment and computers with a processing rate of up to 275 Mbits per second (for example IBM 4300 mainframes) will be cancelled, and computers above 550 Mbits per second will require licences. (Source: *Computer Weekly*, 28 June 1990)

EC outlines plans for Eastern Europe

The European Commission has launched a programme to help develop the use of information technology in central and Eastern Europe, with special emphasis on joint projects and standards.

The move follows a visit by Commission officials and experts to Eastern Europe to assess IT needs. Commissioner Fillipo Pandolfi is proposing to the European Parliament the extension of EC programmes like the Tedis electronic data interchange support scheme and the development of pan-European administrative networks to Eastern Europe.

Pandolfi identifies transport, health and library support as specific network applications that the EC could help to introduce in Eastern Europe.

The commissioner also wants to help Eastern telecommunications authorities and network users with information on accessing and operating networks.

But Eastern European countries must develop their systems using standards. (Source: *Computer Weekly*, 21 June 1990)

International conference on computer communication

India is hosting the 10th biennial International Conference on Computer Communication - ICC 90 in New Delhi from 4 to 9 November 1990. ICC 90 is being hosted by the Departments of Electronics and Telecommunications, Government of India. The President of India will inaugurate the conference on 4 November 1990. The keynote address will be presented by Dr. P. Tarjanne, Secretary-General, International Telecommunication Union.

The theme of ICC 90, "Technology for Mass Applications", reflects the belief and hope that

benefits of information technology will reach millions of people in the 1990s.

The International Council for Computer Communication (ICCC) was founded in 1972 as a non-profit organization. The objective of ICCC is the advancement of computer communication throughout the world. Sponsorship of the well-known ICCC international conferences, held every alternate year, is one of the principal activities of the Council. The ICCC is an affiliate member of the International Federation for Information Processing (IFIP).

Recent ICCC conferences have been held in London - 1982, Sydney - 1984, Munich - 1986 and Tel Aviv - 1988.

ICCC 90 will provide an important and prestigious forum for presentation, discussion and debate. It is planning to get an audience including scientists, engineers, government officials, businessmen, managers, lawyers, doctors and other professionals. The conference will encourage delegates to share their experiences and interests in developing applications of computer communications. Topics to be discussed will include all aspects of computer communication, including technical, scientific, social, policy-making, business and legal aspects. About 1,000 delegates from India and abroad are expected to attend the conference with a major delegation not only from the developed world of Europe and America but also from various developing countries of Asia and Africa.

For further details please contact:
Ms. Saroj Chowla, Organizing Secretary,
ICCC 90 Secretariat, CMC Limited, A-5, Ring Road,
South Extension part I, New Delhi - 110 049.
Telephone: +91(11) 626807, 618189 (Source:
ICCC Press Release, 28 June 1990)

European chip makers seek safety in numbers

Over the past two weeks, Europe's three main electronics companies have been preparing the ground for a major shake-up of the semiconductor industry in Europe. It now looks increasingly likely that Siemens of the Federal Republic of Germany, and SGS-Thomson, the Franco/Italian joint venture, will work together to design and develop memory chips, as a way of fending off competition from Japan.

At the same time, Philips, the Dutch electronics giant, is reeling from the decision by its new president, Jan Timmer, to cut around 10,000 jobs and radically change the course of its loss-making information systems and components division. Timmer also intends to cut Philips' spending on R & D, which will increase the pressure on the company to collaborate with either Siemens or SGS-Thomson on the development of semiconductors.

These dramatic changes have raised fears over the status of the \$US 3 billion joint European programme of research on microprocessor and memory devices known as JESSI (the joint European Submicron Silicon Initiative).

Philips says it is too early for it to comment on how its recent restructuring will affect individual projects such as JESSI. Philips set up JESSI, and has around 250 employees and an annual budget of Dfl 130 million (about £30 million) committed to the project.

The research conducted under JESSI is fundamental to Philips' plans to develop high-definition television. Neither SGS-Thomson nor

Siemens have been told of any plans by Philips to withdraw from JESSI, although Philippe Geyres, corporate vice president of SGS-Thomson, said last week that he is willing to consider the need of any member of the programme to "redistribute" their role. (This first appeared in *New Scientist*, London, 14 July 1990, the weekly review of science and technology.)

ASICs set to storm European market

Application-specific integrated circuits (ASICs) are set to take 25 per cent of the European market for ICs by 1994, according to a report published by Frost & Sullivan.

The overall recession in the semiconductor business is unlikely to affect this booming sector, where sales are forecast to rise from \$1.23 billion in 1988 to \$4.7 billion in 1994.

Although most PCs use standard ICs, ASICs will find many applications in peripherals and specialist hardware, which are manufactured in high volume in Europe. The largest area of growth will be within the European data processing sector, with ASIC sales predicted to reach \$2.2 billion by 1994.

This strongly competitive market will result in a European battleground being fought over by US, Japanese, and a small number of European companies looking for market dominance.

The second largest market is in telecommunications, fuelled on by the implementation of ISDN, telecommunications deregulation, and wider-ranging mobile communications standards. (Source: *Electronics Weekly*, 25 July 1990)

African nations emphasize security

Many African leaders have recognized the important role an indigenous information technology industry can play in rapidly bringing their nations to the forefront of the community of industrialized countries.

The information technology industry in several nations is burgeoning. And many African governments now realize that a well-defined computer security policy is critical to protecting their information resources. Many are, therefore, considering implementing computer crime legislation.

However, concerns about computer security in most African nations have lagged behind the rapid pace of computerization largely because of the legal legacy left behind by the former colonial rulers, most notably the British.

In the UK a computer hacker, for example, may be held liable only for civil rather than criminal charges because hacking is considered no more a nuisance than trespassing on a person's private property. The only criminal charge that can be contemplated against a hacker in Britain is violation of the Theft Act of 1968, which would entail the theft of the computer owner's electricity.

Unfortunately, this British legal interpretation of computer crime also permeates the legal systems of its former African colonies. Kenya, Nigeria and Zimbabwe, for instance, have relatively advanced computer infrastructures in the press, financial sector and some government ministries. Under the laws they inherited from Britain, however, it is nearly impossible to successfully prosecute computer criminals in those nations.

But many African nations have become aware that, as their independent economies mature, their computer security procedures should also. Some nations have thrown their support behind the most recent effort to pass United Nations General Assembly Guidelines on Data Protection. These African states, most notably Benin, Ghana, Guinea, Côte d'Ivoire and Senegal, are sponsoring the current guidelines, which have been submitted to the United Nations General Assembly by a group of international data protection commissioners who met in Berlin last year. The General Assembly is expected to vote on these guidelines during its 1990 session in September.

These same five nations were also at the forefront of earlier General Assembly resolutions Nos. 164 (1985) and 162 (1987) concerning policies on the international use of information resources and the transborder flow of data important to a particular nation.

This flow of data to other countries is viewed by most of these nations as one of their most important security concerns. As far back as 1985, government officials from several African countries met in the Côte d'Ivoire city of Yamoussoukro to discuss, among other items, the "informatics assault" by technologically advanced countries on the data bases of developing countries. The resulting African Declaration of Yamoussoukro stated that information technology, when properly harnessed, creates opportunities for training and industrialization, while ensuring the sovereignty of developing countries.

Therefore, these nations do not relish the idea of having industrialized countries indiscriminately browsing through and capturing data from their government data bases. Many UN agencies, such as the International Monetary Fund, the Food and Agricultural Organization (FAO), the World Bank, the World Health Organization and the United Nations Industrial Development Organization (UNIDO) require information from these data bases on a regular basis in order to carry out their charter.

To prevent indiscriminate data base access, user identification codes (UICs) and passwords were initiated for a recent information exchange project between the United Nations and Ghana. For this project, the UN installed modems on Ghanaian government computers to upload information from Ghanaian Technology Transfer Centre (TTC) data bases to United Nations computers in New York. The data are collected by the TTC from several government ministries and agencies and include information on food and technology, as well as industrial and energy policies. UN data centres in Geneva, Vienna, New York and Washington, D.C., and not the TTC, however, determine what government data are finally released.

The Government of Ghana says it is satisfied with the security provided by the UICs and passwords. It also receives UN agency revenues, such as World Bank loans and FAO grants, as a result of providing such information. Regardless, other Ghanaians in academia, government and the press oppose any use of government data outside the country. They do not believe that the financial assistance provided by the UN justifies the loss of sovereignty posed by unregulated transborder data flow.

Within each African nation, experts agree, the computer-hacking problems plaguing industrialized countries will become significant unless effective computer security controls are identified and installed. The first task, however, is to educate

the various populaces about these concerns, a task that could prove time-consuming.

Ghana has taken a bold step towards meeting this requisite by considering a Computer Crime Law, the first of its kind in Africa.

The first effort to establish a national information technology management policy for Ghana was part of the 1976 Supreme Military Council Directive (SMCD) No. 19. This directive, issued by the military government of Flight Lieutenant Jerry Rawlings, stipulated that a National Data Production Control Board be established to manage information technology in Ghana. The board's primary objective has been to determine the type of government data that should be automated and what access authorizations should be granted to various users. It is, however, only an advisory body with no legal power to enforce computer security, a deficiency that will be redressed by the new Computer Crime Law.

Ghana expects the law to be enacted before the middle of this year. The Ghana Law Reform Commission proposed the law in view of the rapid increase in the use of computers in government, banking, commerce, utilities, telecommunications and law enforcement.

The proposed Ghanaian law addresses the problems of unauthorized alteration and copying of data for personal gain, theft of computer media, computer hacking, eavesdropping and sabotage, as well as the unauthorized use of computer systems. A person found guilty of a computer crime could face a jail term of up to 10 years and an unlimited fine.

Establishing a national computer security policy is critical in the light of Ghana's desire to develop a local software industry. In the absence of well-established computer security laws, Ghana's fledgling software industry would be vulnerable to rampant theft of code as well as to the introduction of destructive, malicious programmes such as computer viruses.

Recent Cairo newspaper reports about the arrival of viral-infected software at various Egyptian ministries have heightened concerns about the security surrounding Egypt's computer systems. Rightly so. A government mandate in Egypt, the 1981 Presidential Decree 627 signed by the late President Anwar Sadat, spurred computer use in both government offices and public corporations.

In some cases, the reports say, the contaminated programs have been tracked to Western Europe. To address the problem, the Government has established a special centre to check every disk sent from abroad for the presence of viruses. Private citizens who are suspicious of software are being urged by the government to have the centre check for the presence of malicious code.

Security issues are all the more important in Egypt because of the computerization of judicial records and the assignation of national identity numbers to some 30 million Egyptian citizens. Volumes of judicial records concerning current caseloads and past case files are being automated in both Cairo and Alexandria, and in the next two years Egyptian courts in other cities are expected to become automated, as well. The Government's introduction of national identity numbers is expected to take some three years.

Although other African governments are as concerned about security as their compatriots, their actions so far lag behind the private sector.

Like Ghana, Egypt and Tanzania, many African governments are beginning to realize that security must likewise be provided for IT and telecommunications to achieve both national and economic security. Evidence of this can be seen in the fact that Botswana and Namibia for the first time signed up to attend the International Federation of Information Processing Society's (IFIPS) International Conference on Information Security, held in May in Helsinki, Finland. (Reprinted with permission of DATAMATION magazine, May 1990, copyright by Technical Publishing Company. A Dunn and Bradstreet Company - all rights reserved.)

II. NEW DEVELOPMENTS

High-temperature superconductors maintain electrical currents

Obstacles to high-temperature superconductivity (HTS) are disappearing. Stanford University (California) researchers have demonstrated that thin films of yttrium barium copper oxide can maintain substantial electrical currents without any measurable degradation. This is verification that these HTS materials have the current holding capacity of low-temperature superconductors. Ted Geballe, who headed the Stanford effort, states that good superconductor performance can be achieved if a material can avoid difficulties from quantized flux prompted by magnetic fields. There is no consistency to line of flux throughout a superconductor. To achieve stable operation, it is necessary to "pin" flux lines to small flaws in the crystal structure to prevent mobility. If this is not done, creeping of the flux lines prompts electrical resistance. (Extracted from Research and Development, May 1990)

Technique to produce polycrystalline silicon particles

Researchers at Seikei University's Faculty of Engineering have developed a method of producing high-purity polysilicon (polycrystalline silicon) particles from a mixture consisting of 40 per cent monosilane gas and 60 per cent hydrogen. The process is based on chemical vapour deposition (CVD) and produces polysilicon particles that can then be used in a crucible to produce single-crystal silicon (the type required for semiconductor substrates) by the Czochralski or pull-up method.

In experiments, researchers were able to deposit polysilicon on seed crystals. The deposited polysilicon was reported to be of the same purity as the monosilane gas. (Source: Technology Update, 14 May 1990)

New optoelectronic material

Asahi Glass has developed a glass-type nonlinear optoelectronic material in co-operation with researchers at Nagoya University. The new material has 3-D susceptibility of over 0.000001 esu, or 1,000 times the 3-D nonlinear optical effects of conventional material (organic single crystals and dS powder-dispersed material). Cuprous chloride is used as semiconductor material dispersed in a glass matrix and crystallized into 50-A diameter particles. The new material functions only for light of 330 nm. (Extracted from Japan Chemistry, 12 April 1990)

Heat-sensitive memory material

Oki Electric Industry has developed a heat-sensitive colour memory material that can be processed into a sheet for printing. The sheet is made from economical wax and rubber, which the firm

plans to develop into a low-cost optical memory agent. The 20-micron thick sheet is made from a polyester film covered by a layer of stearic acid and polystyrene-polybutylene copolymer. The sheet becomes transparent when heated above 70°C and remains transparent when cooled to room temperature. When the sheet is reheated to 57-70 C, it becomes white when it cools, allowing information to be erased or added to it using a semiconductor laser. The sheet can be used more than once. (Extracted from Japan Economic Journal, 9 June 1990)

Technique to make superconducting material

A technique for making niobium three aluminium superconductive material has been developed by researchers, according to Japan's Science and Technology Agency's National Research Institute of Metals. Superconductivity is when electrical resistance disappears below a critical temperature and takes place in certain alloys, compounds and metals. An aluminium film is formed on a niobium substrate using the sputtering method and then the substrate is irradiated with an yttrium amethyst garnet (YAG) laser in the presence of argon or in a vacuum. A YAG laser can be focused to 10 microns compared to a carbon-dioxide laser, which can be focused to 100 microns. A thin carbon film is used on the substrate to enhance the material's laser absorption. (Extracted from Asian Wall Street Journal, 28 May 1990)

New X-ray source makes fine line in chips

Companies in Japan, the United Kingdom and the United States are trying to develop intense sources of X-rays, known as synchrotrons, which are necessary for chip manufacturers to develop the next generation of computer chips. But plasma physicists at Cornell University in Ithaca, New York, have demonstrated an inexpensive X-ray source that works by an entirely different method. They say their so-called "X-pinch" source could be built for about \$500,000, compared with tens to hundreds of millions of dollars for the synchrotron X-ray sources other groups are studying.

Chip manufacturers want to cram more and more components into future generations of computer chips. But they are limited by the wavelength of light. Light is used to transfer the pattern of components from a template, known as a mask, onto the surface of the chip. Light cannot transfer lines that are finer than its own wavelength onto the surface. X-rays, with much shorter wavelengths than visible or ultraviolet light, allow much smaller components to be produced.

Synchrotrons bend beams of high-speed electrons, which then emit X-rays. They are the obvious candidate for supplying X-rays for chip manufacturers - but current machines are very large and costly. The aim of the synchrotron producers is to make them smaller and cheaper. Last December, the Japanese company Sumitomo Heavy Industries announced that it had developed a synchrotron only 1 metre in diameter, but predicted it would cost about \$11 million to buy.

Other methods of producing X-rays exist, but they are not bright enough for chip production. For example, laser beams can be tightly focused onto a target material and deposit so much energy in a small region that the material is ionized to form a plasma. The plasma emits X-rays as electrons reattach themselves to the highly ionized atoms. However, these laser-produced plasmas are small, and because they emit X-rays in all directions, the intensity is low. X-ray lasers, which concentrate

their emission on a smaller area, may offer higher powers in the long term, but are not ready yet.

David Hammer, Daniel Kalantar, Nian-Sheng Qi and Kaishall Mittal of Cornell have taken a different approach. They arranged pairs of magnesium wires stretched between electrodes in the shape of an "X". They then passed a 500,000 ampere electric pulse, lasting 0.08 microseconds, through the wires, which vapourized them. The high current flow kept the plasma from dispersing, and where the current was most concentrated, at the point where the wires crossed, it generated a hot plasma which yielded 85 joules of X-rays as the magnesium ions recaptured electrons. The Cornell team is hopeful that this technique will prove cheaper and more effective than synchrotrons when applied to chip manufacture.

In the manufacturing process, the lines on the chip are made by applying a coating of a light-sensitive chemical known as photoresists on the surface. A pattern is recorded on the surface by exposing parts of the photoresist to light, which chemically changes it. The remaining parts of the photoresist can then be removed leaving the underlying surface exposed. The exposed areas can then be etched away chemically, leaving behind those parts of the surface protected by photoresist as lines or other components such as transistors.

In practice, the line width on the surface depends on how finely the lines can be recorded on the photoresist, either by drawing them with a laser or by casting shadows through a metal mask. Lines cannot be formed much smaller than the wavelength of light which exposes the photoresist. Current commercial systems use visible or ultraviolet light with wavelengths of 0.25 micrometres or more. X-ray wavelengths of 0.01 to 0.001 micrometres would allow much smaller lines.

When used in manufacturing chips, the Cornell team's X-pinch source would cast a shadow, through a mask opaque to X-rays, onto the photoresist. This would require a small, intense X-ray source. The X-pinch source emits from a region 0.5 millimetres across. Hammer, director of Cornell's Laboratory of Plasma Studies, says that with this brightness a few pulses should be sufficient to expose the photoresist, although he has yet to test it with actual photoresists. (This first appeared in New Scientist, 7 July 1990, the weekly review of science and technology, London)

Super-pure silicon

Researchers at Westinghouse Electric Corp. (Pittsburgh) say they have produced silicon crystals that are four times purer than any currently available materials. The ultrapure crystals, with impurity levels of only a few parts per 100 trillion, were grown at the company's Science and Technology Centre in Churchill, PA using a \$2-million float-zone facility. Westinghouse says the material, now being produced in 10-kilogram cylindrical forms, is intended for use in a new generation of infrared detectors for space and environmental applications. It also will be applied in semiconductor devices. A key breakthrough is the ability to make the ultrapure crystals in large sizes, which makes it more practical for manufacturing electronic devices. The current furnace is aimed at producing cylinders up to four feet long and five inches in diameter. (Source: Chemical Week, 6 June 1990)

Magnetic retaining phenomenon reported

Applying superconductivity and magnetism, researchers at Sumitomo Heavy Industries Ltd. have

succeeded in retaining a magnet in a predetermined position in the void within a cylindrical superconductor.

The newly discovered phenomenon of "magnetic retaining", as distinct from the already well-documented Meissner Effect, has been named the Yasuhara Effect after its discoverer, Seiji Yasuhara, senior researcher at Sumitomo.

The phenomenon was discovered when Sumitomo researchers were working with bismuth-based oxide and bismuth-lead-strontium-calcium-copper-oxygen superconducting materials, Mamoru Ishihara, senior researcher of Sumitomo's Hiratsuka Research Laboratory and project leader, said.

Unlike levitation or suspension, the new method makes it possible to float a magnet or magnets and "retain" them in a certain position or positions by controlling a peaking of magnetic force within a superconductor enclosure, Ishihara said.

A magnet or magnets stay in position by magnetic reaction force between the superconductor and object magnet, Ishihara explained. Normally, the magnet would attach to the wall of the superconducting cylinder because of the superconductor's attraction.

In the experiment, the cylindrical superconductor was cooled by liquefied nitrogen to 195.7°C. A magnetic force is then applied to the superconductor from the outside, magnetizing the superconducting material. A round permanent magnet placed inside the cylinder will float motionless without touching the sides.

The new phenomenon can be applied to making magnetic bearings, in the design of transport systems, three-dimensional measuring devices and positioning systems.

The sintered superconducting cylinder used in the experiment measured 40 millimeters in inner diameter, 45 mm in outer diameter and 85 mm in length. (Extracted from Technology Update, 18 June 1990)

Current developments

The commercial application of high-temperature superconductors is rapidly becoming a viable proposition. Scientists are steadily improving the current-carrying capacity of the ceramic high-temperature superconductors. A highly successful new method for the production of these materials has been developed at the University of Houston in Texas.

The Texas team has found a way of manufacturing bars of the YBaCuO material in a continuous process. By moving the sample through an oven which contains highly specific temperature zones, the material is "directionally solidified".

The scientists have succeeded in producing a bar of 5 cm long, 0.5 cm wide and about 0.3 cm deep, which can support current densities of 7,400 - 20,000 amperes/cm² depending on the strength of the magnetic field surrounding it.

ICI has already applied conventionally produced ceramic superconductors in several electronic components, in co-operation with AT&T. The Japanese Central Research Institute of the Electric Power Industry has recently come up with a superconducting wire that can carry alternating currents and Pirelli has signed a research and development agreement with the American Superconductor Corporation, recently

set up by MIT researchers. (Source: Chemistry and Industry, 4 June 1990)

Organic superconductor contains oxygen

The first ambient-pressure organic superconductor based on an oxygen-containing electron-donor molecule has been discovered by researchers at Argonne National Laboratory and North Carolina State University. Until now, all organic superconductors have been charge-transfer salts containing either selenium or sulphur-bearing electron donors such as bis(ethylenedithio)tetrathiafulvalene (BEDT-TTF). Argonne's Mark A. Beno and colleagues have found that a salt based on bis(ethylenedioxy)tetrathiafulvalene (BEDO-TTF) and a copper-containing thiocyanate anion becomes superconducting at 1.06 K. This transition temperature comes nowhere near to topping the current record for organic superconductors, which is about 10.4 K. But, the researchers note, "the discovery of superconductivity in an oxygen-containing organic system could be important for systematically expanding the range of possible organic superconductors and for potentially establishing a link between organic superconductors and the recently discovered high-temperature oxide superconductors". (Source: Chemical and Engineering News, 14 May 1990)

New technique to observe silicon species

In research that could be significant for the fabrication of semiconductor devices and optical fibres, scientists at the Georgia Institute of Technology (Atlanta) say they have used laser-induced fluorescence to detect and measure two gas-phase silicon chemical species. The scientists say such a technique could allow better observation of silicon deposition and improve manufacturing techniques. Laser-induced fluorescence allows the scientists to determine the chemicals involved, concentrations, and where the reaction is taking place during plasma-enhanced chemical vapour deposition. It ultimately could form the basis for a feedback system that would automatically adjust process variables, according to the researchers. Observations of the silicon species with laser-induced fluorescence has been difficult because of the wavelength of light that the species absorb. Using a crystal developed in China, the scientists produced wavelengths of the laser as short as 205 nanometers to study the different silicon species. (Source: Chemical Week, 25 April 1990)

Circuit boards that fix their own faults

Electroplating could prove the key to producing computer chips that repair their own faults. Chip manufacturers have already produced chips that test themselves. Scientists at IBM's Yorktown Heights research centre in New York have invented a process by which chips on a circuit board can locate and fix faults in the wiring between them. The next step may well be auto-repairs within the chips themselves.

At the moment it is difficult to pinpoint faults in the wires between chips, especially those caused by slight constrictions. The most effective way of finding these is to blast the circuits with a very high current to break the constricted wires into open circuits which can then be located. Technicians then solder up the gaps by hand, which adds to the cost of manufacturing the circuit board.

IBM's new process, developed by the researcher Julian Chen, involves immersing the circuit board in an electrolyte and passing an alternating current through each of the connecting wires between the

chip in turn, where the wire is constricted it will get thinner, so it will have more electrical resistance, causing the wire to generate extra heat at those points.

The heat initiates a process known as the thermobattery effect. This effect, which was discovered at the beginning of the century, sets up an electrical potential along the wire. The difference in the potential between the hot constriction and the cooler parts of the wire causes metal atoms to move through the electrolyte as ions, and deposit themselves on the constriction.

IBM's approach is still only a research project, but could have several advantages over existing techniques. It finds the weak spots in a wire automatically, and it regulates itself. Once the wire is sufficiently well coated, it gives out less heat and so slows down the electrolytic coating process.

Then believes he could also adapt his process to repair defects in the connections between the components of a single chip, if these links could be made out of pure copper rather than the metallic compounds used today. At the moment, if chips have faults they are usually thrown away. But this will become an unacceptable option as chips become more complex and expensive. (This first appeared in *New Scientist*, 7 July 1990, the weekly review of science and technology, London)

100 GHz MMIC amplifier developed

Scientists at Varian Associates Inc. have developed a single stage 5-100 GHz monolithic millimeter-wave integrated circuit (MMIC) having an average gain of more than 5.0 dB. This MMIC distributed amplifier has the highest frequency and bandwidth of operation (5-100 GHz) reported to date for wideband amplifiers.

The active devices in this seven section distributed amplifier are lattice-matched $\text{In}_{0.52}\text{Ga}_{0.48}\text{As}$ - $\text{In}_{0.52}\text{Al}_{0.48}\text{As}$ HEMTs, which are also lattice-matched to a semi-insulating InP substrate. Crucial to the reported high frequency performance is the HEMTs' 0.1 μm mushroom gate. The mushroom gate profile is used to reduce the series gate-metal resistance. The gate's metalization is TiPt-Au evaporated to a total thickness of 4,000 Å.

Present W-band (75-110 GHz) radar, communication and surveillance systems have several disadvantages, however. They are bulky, complex and expensive, partly due to their hybrid ICs. MMIC technology provides an alternative to conventional millimeter-wave component design and system integration in that various circuits can be monolithically integrated on a single chip.

InP MMIC distributed amplifiers are currently being produced by Varian in small quantities, using its own MBE and e-beam lithography capabilities. The company hopes to begin production-scale manufacturing of these devices in the near future. (Reprinted with permission from *Semiconductor International Magazine*, June 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Ill., USA)

Gallium arsenide integrated circuits

Advanced Micro Devices Inc. and Vitesse Semiconductor Corp. are experimenting with gallium arsenide integrated circuits, under the terms of a five-year, joint-technology agreement. The circuits are being developed for high-speed networks and point-to-point connections that operate at gigabit

speeds. Gallium arsenide processes are faster than silicon, and silicon is more expensive. Although gallium arsenide is not new, attempts to improve it have been few, costly, and often disappointing. One of the first projects the companies will try to produce is a router that will operate at 100 gigabits per second, and will be an interface to optical systems. Another goal is working with Bell Communications Research Inc., Murray Hill, N.J., to use gallium arsenide in synchronous optical network multiplexers. Snet is a set of standards that boosts transmission speeds from 21.44 megabits per second to more than 13 gigabits per second. Bellcore has a working prototype built around a chip set that operates at 2,488 gigabits per second. (Extracted from *Communications Week*, 29 May 1990)

Development of hologram array for use in optical computers

Studies at the Sowerby Research Centre of British Aerospace plc have led to the development of a hologram array that can direct interconnections between logic processors in optical computers.

In the optical computer the centre is working with, some light signals need to be fanned out from one transmitter/output to multiple receiver/inputs, and others fanned in from multiple outputs to a single input. The Sowerby centre has devised a hologram array that allows such interconnections to be made across free space, so that even if light paths cross, they will not interfere with each other.

A hologram diffracts a coherent light beam transmitted through it, diverting it along new paths. An incident coherent beam will appear as a pattern of light spots on a screen placed on the far side of a hologram. The particular design of the hologram determines the pattern produced, and use is made of this phenomenon to divide and direct a light signal along one or more desired paths.

The Sowerby optical interconnecting element consists of a number of separate holograms (subholograms) on a glass slide that is positioned across a group of parallel light-signal paths to form interconnections between two processing planes.

The design of each subhologram is selected to make specific interconnections for the light signal transmitted through it. Each of these subholograms would be capable of connecting its light signal path to any one, or all, of the others.

On the experimental arrays produced so far, the subholograms are about 0.5mm. The largest array made contains 60 subholograms.

A computer is used to design the specific subholograms needed to make the interconnections required, and also to plot the designs at large scale on photographic film. The resulting image is then reduced photographically and reproduced at the appropriate size on the holographic plates.

If electron-beam lithography was used, as many as 10,000 subholograms could be placed on a 20-mm² array. (Extracted from *Electronic Engineering Times*, 16 April 1990)

Two new small processing machines developed

Two separate research breakthroughs have raised hopes for a new generation of incredibly small machines that can process at dizzying speeds that were unthinkable just months ago. One method involves the manipulation of individual atoms, and the other uses light.

At IBM's Almaden Research Facility in San Jose, Calif., scientists say they have successfully moved atoms into different positions on a surface employing a scanning tunneling microscope (STM). At AT&T's Bell Laboratories, meanwhile, scientists announced they have shrunk the amount of space needed to create a computer that works on photonics, the use of light to convey information.

The IBM announcement is probably the furthest from any practical application, but it holds the most dramatic implications in the quest for smaller and faster computers. The STM device used to manipulate atoms was invented in the early 1980s by IBM researchers in Zurich, Switzerland. It allows scientists to drag atoms along a surface by brushing them with the STM tip. The effect is similar to moving pieces of metal with a magnet without directly touching them. In those experiments, atoms of Xenon, a heavy gas commonly used in flash bulbs, were moved together and positioned to spell out "IBM" - perhaps the ultimate example of corporate sponsorship.

AT&T's photonic device is also on the drawing board, but the company expects to put the technology to commercial use some time this decade. "We are still in the research phase; this is not a product announcement by any means," cautions an AT&T spokeswoman. Like fibre-optic technology, which transmits information over long distances in the form of light, these new devices use "microlasers" to transmit data in the short distances between microchips. (Extracted from Information Week, 23 April 1990)

Development of power storage battery

Isuzu Motors Ltd. and Fuji Electrochemical Co. have succeeded in joint development and trial production of a power storage battery that can be charged almost instantaneously and that has a storage capacity 30 to 50 times greater than that of double-layer capacitors presently available. The two companies are forming a joint project to move the new battery to commercial production in about two years, initially for application in automobiles, officials said. The capacitor-structured battery uses pollution-free activated charcoal electrodes and because of its small internal resistance, can draw out or recover electric power in less than 30 seconds from ordinary lead batteries, solar batteries, wind-mill generators or any other power sources. Officials said the batteries are expected to find applications in electric cars, appliances, in-house generators, aerospace and a variety of industrial equipment. The storage cell can be as small as 3 centimetres (1.2 inches) in diameter and 6 millimetres (0.24 inch) thick and can store the power of 1 volt and 30 watts. (Extracted from Metalworking News, 23 April 1990)

New transmitter developed

Codenoll Technology Corp. is experimenting with a red-light-emitting diode transmitter that can transmit light waves at 660 nanometers per second for a distance of 300 feet on plastic optical fibre. The transmitter emits the light from the edges rather than from the surface giving the light beam a tighter focus. Codenoll has tested the transmitter on current plastic fibre and has been able to send Fibre Distributed Data Interface packets for a distance of 300 feet.

Codenoll hopes to develop a commercial off-the-shelf transmitter that can be used to connect desktop computers to an FDDI network. If plastic fibre's attenuation capabilities are improved, it may become an alternative to using

multimode glass fibre which is currently specified in the FDDI standard. Plastic fibre is easier to connect than glass fibre and its use may bring FDDI one step closer to the desktop. (Extracted from Communications Week, 23 April 1990)

Polymers used in production of field effect transistors

Mitsubishi Electric's (Japan) new method for producing field effect transistors involves the use of polymers to carry electric current. A thin film of conductive polymer is sandwiched between the transistor's two electrodes. Until now it has been difficult to deposit film evenly on a substrate. Mitsubishi Electric developed a "spin coating" technique in which a layer of polymer solution is applied to the substrate while it is rotating. (Extracted from Asian Wall Street Journal, 24 April 1990)

New unit to make semiconductor chips

Lepton will introduce a unit to make semiconductor chips via direct-write electron beam lithography. Firms in the US, Europe and Japan have been trying to develop such equipment, but previously it was not able to match the production speeds of conventional chip-making machines. The EBIS-4 can work with existing optical chipmaking machines. It is 100 times more powerful than existing equipment, and it can create features 0.125 microns across. E-beam systems have been used to create custom chips, but their relatively slow speed has prevented their use. The EBIS-4, which will cost \$6 million, will offer a viable way to make 64-Mbit memory chips. (An X-ray lithography plant, by contrast, might cost \$500 million.) The EBIS technology might eventually be able to make 256-Mbit chips. The first customers for the EBIS are reportedly Japanese firms. Some US chip makers remain skeptical that the E-beam technology can work. (Extracted from New York Times, 22 May 1990)

Prototype memory chip

Hitachi (Japan) has developed a prototype of a memory chip capable of storing over 64 million bits of information. According to the firm, there are 140 million electronic devices on the experimental chip, located on a space 9.74 mm by 20.28 mm, approximately the size of a person's thumbnail. The chip was etched with electron beams, instead of visible light, as chips have traditionally been made. (Extracted from New York Times, 8 June 1990)

New chip compresses and decompresses data

A new kind of chip that compresses and decompresses data from anywhere from one-and-a-half times to 15 times or more will make possible a low-cost capacity upgrade for personal computers.

Developed by start-up InfoChip Systems Inc., the IC-105 can be designed into a CPU motherboard, on a coprocessor board or in mass storage host bus adapters, embedded controllers and file servers. According to the company, a 40-Mbyte hard disk incorporating the data compression hardware would have an average compression ratio of up to 3-to-1, making it equal to a 120-Mbyte disk drive.

The cost would be much less than purchasing an equivalent physical disk. And operation would be transparent to the user. The chip accepts continuous data for compression at up to 2-Mbytes per second and for decompression at up to 5 Mbytes

Operation of the chip is based on lossless, or noiseless, data compression technology. With such compression, the decompressed, or regenerated, data is an exact reproduction of the data originally compressed; no error is allowed. Lossless operation is required for any system where data integrity is essential, such as computer-aided design and desktop publishing. (Source: Technology Update, 4 June 1990)

New technique for data storage

Microelectronics & Computer Technology (Austin, TX) has developed a new technique to store computer data on fibres consisting of light-sensitive crystals. There are no moving parts. The data are instead changed into light signals and assembled into "pages", each containing as much as 100,000 bits of data. Specific data can be located much faster than with a disk drive. Also, the new system can send out whole pages of data at once, instead of just one bit after another. Previous attempts to develop such a system failed because the light signals used to read the stored data also wound up destroying that data. The new system solves the problem by effectively rewriting the data every time it reads it. Commercialization, however, is still years off. (Extracted from New York Times, 26 May 1990)

Interpreter-based prototype

Researchers at Simon Fraser University (Burnaby, BC) have developed a computer prototype for enhancing high-level computer language interpretation. R. Hobson, a researcher at the university, collaborated with the university's VLSI computer design group on the SAM 1 computer prototype. The interpreter-based prototype is reported to offer delivery times approaching those of compiler systems. The system, which can be used with a PC as either a plug-in or an add-on, can offer the interpreter system's ease of use while improving interpretation performance. Programmers will probably get the most use out of the system. (Extracted from Canadian Data, May 1990)

New LCD device

Kyocera (Japan) will begin making a 0.076-inch thick super twisted nematic LCD. It says the device is the thinnest LCD ever, and will be used in palm-top personal computers. The images produced by super twisted nematic LCDs are clearer than those produced by ordinary LCDs. Kyocera's product displays 640 times 480 pixels. Production will initially total 2,000 units per month. Within one year it will reach 10,000 units per month. (Extracted from Asian Wall Street Journal, 14 May 1990)

Laser provides full speed connection

Case Communications has launched what it says is the first LAN connectivity device to offer full speed operation for both Ethernet and Token Ring networks without any physical cabling.

The MegaBeam EN10, TR4 and TR16 models use invisible and highly secure lasers to connect LANs in different buildings at distances up to 1 km.

Full speed (10 mbps Ethernet, 4 or 16 mbps Token Ring) operation eliminates the potential bottleneck of telecommunications links, as well as the cost of bridges and leased lines.

The company has been conducting live trials with customers and LAN vendors and has had no problems with full speed performance.

The laser technology itself was used in the company's 2 Mbps voice/data MegaBeam system.

Full speed operation makes the system suitable for installations where the LANs are being used for interprocessor traffic. In the case of Token Ring, this is consistent with IBM's departmental computing strategy as represented by their AS/400 systems.

In such installations, the MegaBeam units take over the monitoring functions that would normally be undertaken by bridges, and, in the event of laser-link failure, each end would be looped within two seconds, before higher-level processor applications are disrupted.

In the case of Ethernet installations, the MegaBeam system functions like a fibre-optic inter-repeater link (FOIRL), with propagation characteristics as defined within the IEEE standard.

The system comprises a pair of Datalaser optical transceivers that are connected to link termination units (LTUs).

The end units themselves use DC power transferred from the LTUs via a composite cable. The laser heads are provided with telescopic sights for line-up, and both a signal meter and a plug-in phone for testing the laser link channel. (Source: Electronics Weekly, 9 May 1990)

New technology for multimedia networks

Integrated Services Ring is a new technology developed by In-Net Corp. to integrate voice, data and video in a single network. The San Diego-based company has manufactured a chip set that provides circuit and packet switch capability as well as asynchronous transfer mode protocol. ATM is the protocol on which integrated services digital networks and the synchronous optical network are based. Using ATM in the chip set makes it easy to upgrade to either of those services with just application software. ISR is modelled on the Fibre Distributed Data Interface, by using two fibre optic cables, and provides the same redundancy. But unlike FDDI, ISR operates at 34, 45 or 140 megabits per second. The technology is ideally suited for multimedia networks because it can provide the speed and bandwidth that voice, data and video demand. (Extracted from Communications Week, 7 May 1990)

Significant advances in solar cell research made

Two new developments have surfaced in solar cell research:

- The Small Business Innovation Research Programme (SBIR) is funding novel solar-cell structure research at Emcore.
- Scientists at Kopin and Boeing Aerospace & Electronics have achieved record efficiencies with thin film tandem solar cells.

Researchers at Emcore, Somerset, N.J., will be using MOCVD technology to develop a novel p-i-n zinc-telluride cadmium-telluride gallium-arsenide (ZnTe/CdTe/GaAs) solar cell. This innovative structure combines III-V and II-VI elements, leading towards the development of superlattice multijunction solar cells.

Reportedly, multijunction solar cells are of interest because of their low manufacturing cost using MOCVD technology and of their potential for high conversion efficiency. MOCVD is a "one system" approach to solar cell manufacturing, compared to

conventional use of sputtering, vapour transport and electrolysis, say Emcore officials. For solar cell fabrication, MOCVD has a production thin film growth rate over areas >150 cm².

The work from Kopin, Taunton, Mass., and Boeing, Kent, Wash., resulted in record efficiency ratings from thin film tandem solar cells. The cell consists of a 5 µm GaAs layer mounted, with a space-qualified adhesive, on a copper-indium-diselenide (CIS) thin film layer. The upper GaAs cell is grown on and then peeled from a substrate, using Kopin's CLEFT technology. The CIS cell is fabricated from five thin film layers deposited directly onto a glass substrate, with intermediate patterning steps to create the cell's circuits and electrical contacts.

Independent measurement by NASA's Lewis Research Centre showed the cells have a one-sun efficiency of 22.5 per cent under air mass zero conditions - corresponding to performance in space. This is more than a 50 per cent increase compared to efficiencies of conventional thin film cells. Measured under terrestrial conditions by the Solar Energy Research Institute, the cells demonstrated an efficiency of 26 per cent, also a record for thin film cells.

The high efficiency combined with light weight give these cells a power-to-mass ratio of 600 W/kg, compared with 100 W/kg for conventional silicon cells used in space. The thin film nature of both cells reduces by 95 per cent the amount of semiconductor material required to convert solar power to electrical power. (Reprinted with permission from Semiconductor International Magazine, June 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Ill., USA)

Wave power

A power generator powered by waves has been set up by researchers from Queen's University (Belfast) on the island of Islay in the Inner Hebrides. The generator will produce enough electricity for only 360 livingrooms, but the fact that it will be built at all is a major reversal of British energy policy. Two stations in Norway have been producing power for 4-5 p/kWh. Funding for the Islay power station was approved in 1987, and the Government has now called for another full investigation into the feasibility of wave power. The Islay power station will use a tapered channel to force water up into a reservoir, and the water will fall back into the ocean to drive a power turbine. The unit will also use an Oscillating Water Column, which forces air up and down to drive a turbine. The economics of wave power stations are not fairly estimated, according to supporters of the technology. Conventional analyses stress the large capital costs, but minimize the fact that the "fuel" is inexhaustible and free and that the power plants will last for over 100 years compared to 25-30 years for nuclear power plants. (Extracted from New Scientist, 19 May 1990)

III. MARKET TRENDS AND COMPANY NEWS

Market trends

Benefits of CAD elude users

Suppliers to the computer aided design, manufacture and engineering markets are reaping the rewards of fast growing demands, despite customers' failure to make the best use of the systems.

Research by Dataquest among 315 vendors in 14 countries shows the CAD/CAM/CAE industry grew 16 per cent from \$10.7 billion in 1988 to \$12.4 billion in 1989.

The report noted a number of trends responsible for this performance including competition in end-use markets together with market globalization, as well as the growing overlap between pcs and workstations.

Dataquest found that although some companies are realizing the potential of the tools, others are experiencing only marginal results. "The problem is that large segments of the market are ineffectively applying the tools to the design problem", said the report.

"The problems are due to inefficient organizational structures and the failure of users to update procedures to utilize fully later software releases as well as inefficiency in sharing design information between applications and work groups."

This view is reflected in a survey by the Royal Institute of British Architects. Of 3,000 practices that took part in the survey, 65 per cent have in-house computing facilities of some kind. This compares with 47 per cent in 1987 and 19 per cent in 1980. Word processing is the most common application for computers at 59 per cent, with CAD applications having a 26 per cent share. Amstrad remains the most widely owned make of computer among architects, with its presence increasing from 22 per cent in 1987 to 35 per cent. (Source: Computing, 19 July 1990)

Japanese DRAM chips

With world demand for memory chips down by a quarter this year, Japan's leading producers of DRAM (dynamic random-access memory) chips are all out to grab a large share of the market when the silicon cycle recovers. The trouble is that five big electronics companies (Toshiba, Hitachi, NEC, Fujitsu and Mitsubishi Electric) are all poised to do the same in Japan alone. Also competing for a slice of the DRAM market is a handful of American and European semiconductor firms, plus newcomers from South Korea and Taiwan. The result could well be a price war.

The last time Japanese semiconductor companies swamped the market with chipmaking capacity they almost bankrupted themselves. That was five years ago. They were bailed out by the American Government, which forced them to stop dumping and to raise their DRAM prices around the world. If the chipmakers do it again they will jeopardize their recent return to profitability - and have another big trade row with America on their hands.

Japan's leading DRAM maker, Toshiba, believes that the industry's mainstay, the 1-megabit chip that stores more than 1 million bits of computer data, is about to become obsolete. The workhorse memory device will then be the 4-megabit chip. Hitachi, NEC, Mitsubishi Electric and Fujitsu have no intention of letting Toshiba scoop the 4-megabit pool as it did the 1-megabit one.

This time round the five Japanese companies have matched each other yen for yen in developing new semiconductor know-how. Between them they spent a out ¥440 billion (\$3.2 billion) last year just working out how to make the new 4-megabit version. This year they will spend the same again on factories to mass-produce it.

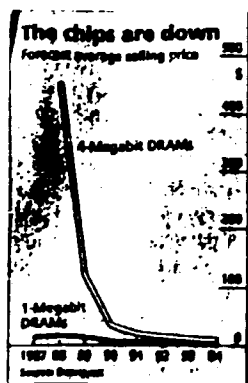
The chipmakers want to use the 4-megabit chip to spur a market recovery. The 1-megabit device now sells for only \$6.60 a chip (less than half its price last year). The new 4-megabit one, still only in limited production, has a price tag of \$40. The wholesale switch from one DRAM generation to the next usually occurs when their cost-per-bit become much the same. To get the 4-megabit chip's price

down to \$25 or so means quadrupling production - or more.

Toshiba reckons that it has cracked 4-megabit technology and is ready to press ahead with a brand-new factory at Yokkaichi, 190 miles west of Tokyo. The plant should produce 2 million 4-megabit DRAMs a month by the end of the year. With that kind of volume, pundits expect Toshiba to have driven the 4-megabit DRAM's price down to \$25 by December. Hitachi, Toshiba's closest rival, says that it, too, could be producing 2 million units a month from its various 4-megabit plants by the end of the year. If all five of Japan's leading DRAM-makers increase their 4-megabit production facilities at the rate planned, Japan will have the capacity to produce more than 70 million of the chips a year by the end of 1990.

Will the market absorb that many? Not according to Dataquest, a Californian market-research company. It expects demand for the 4-megabit chip to be 23 million units at best this year - well below total output. Privately, Japanese DRAM manufacturers fret about the health of their biggest customer, the American PC industry. They also fear that South Korean chipmakers may start cutting their 1-megabit prices aggressively, pulling the rug from under the Japanese firms' 4-megabit feet.

Salvation for the 4-megabitters may be some time coming. A new generation of software - designed for easier use, but needing much more memory than today's less sophisticated programs - is slowly winning over PC users. The growing popularity of laser printers and colour photocopiers is increasing the demand for big DRAMs as well. In the meantime the supply of 4-megabit chips is set to run well ahead of demand throughout the coming year - which means that prices will tumble faster than makers openly predict (see chart). American trade officials could have another busy 12 months ahead of them. (Source: The Economist, 14 July 1990)



West removes more bricks from the technology wall

Sales of computers, machine tools and telecommunications equipment to Eastern Europe are set to soar after a sweeping relaxation in restrictions on high technology exports. This was agreed in Paris by the 17 members of COCOM - the NATO countries (minus Iceland), Japan and Australia.

US officials described the easing of export controls as the most drastic revision since the Co-ordinating Committee for Multilateral Exports Controls was set up in 1949 to prevent Western technology that could be used for military purposes from reaching the Soviet bloc.

From 1 July 1990, 30 items are planned to be dropped from a list of 116 controlled products. By December 1990, the list will be replaced by an entirely new "core list" of a few, highly sensitive items, on which export controls will be strengthened.

This means an almost complete absence of controls for personal computers using the Intel 80386 processor chip. The only restrictions will be on sophisticated graphics workstations used in computer-aided design and manufacture.

There will also be fewer controls on more powerful machines such as the 3980 range from ICL and 3090 IBM computers, and also on the most powerful personal computers based on the Intel 80486 chip.

A group of "deserving" nations, initially including Czechoslovakia, Hungary and Poland but not the Soviet Union, may be allowed access to fibre-optic communications systems. Shortly before the COCOM revisions, the US and Britain vetoed a plan by two companies, US West and British Telecom, to build a fibre-optic cable across the Soviet Union, for "reasons of national security".

Among the 30 items to be dropped from the COCOM list next month are steel alloys, solid-state amplifiers and cathode-ray tubes. A further eight products will be removed from the list in August. Controls have also been lifted on the export of computer assembly technology in order to allow personal computer assembly plants to be set up in Eastern Europe. (This first appeared in New Scientist, London, 16 June 1990, the weekly review of science and technology)

Electronic banking trends

Banks will invest \$US 2.4 billion in information technology in 1990, rising to \$US 3.7 billion in 1994, according to Frost & Sullivan, an international research consultancy. The 477 large banks in Europe will have to fight increasing competition, particularly from US banks, after 1992. Automation of banking services will be necessary for banks to remain competitive. Banks in Scandinavia are already largely automated and France is the largest market for new banking technologies. According to Frost & Sullivan, the French market will increase from \$US 658 million in 1990 to \$US 1.5 billion in 1994, while the UK market will be worth \$US 1.1 billion in 1994. Although electronic payment methods are becoming more widespread in the UK, only one in four of the adult population currently has a bank account. The FRG market for computerized systems for bank branches will increase from \$US 351 million in 1987 to \$US 425 million in 1994, electronic transfer methods already being used for over 60 per cent of payments in the FRG. In Belgium, sales of automatic banking machines will fall from \$US 254 million in 1994 to \$US 67 million in 1997, while in Italy, sales will fall from \$US 226 million to \$US 201 million over the same period. (Extracted from Technology Update, 11 June 1990)

Information technology sales soar to \$256 billion

The outlook for the information systems industry could not be brighter on the face of it. World-wide demand for computer hardware, software, networking and services is at record levels. Revenues of the world's top suppliers reached \$255.8 billion in 1989. Users identify IS as the most important factor of production for their

enterprises in the 1990s. Every new system coming from the laboratories of IBM, Groupe Bull, NEC Corp. and the like seems to be smaller, cheaper and yet more powerful than its predecessor.

Underneath the surface, however, executives who manage the companies providing IS solutions see a darker, more treacherous side to the business - one fraught with change. The very things that dazzle the public and delight big users - standards, 12-month product cycles, mainframe power on a desk, global connectivity, etc. - cause heartburn in Armonk, Paris, Tokyo and the headquarters of countless other IS suppliers.

Satisfying customers weaned on the 1980s promise of more, more, more for less, less, less is taking its toll. And it may be even more painful as the pace of change in the industry accelerates throughout the 1990s.

The price exacted by achieving customer satisfaction is evident on the top line and the bottom line of the collective financial results posted by the world's top suppliers that constitute the DATAMATION 100. IS revenues for these companies grew just 5.2 per cent in 1989, which is less than one third of the growth rate of the last two years. Clearly, a number of companies were not delivering as many new solutions as they needed to satisfy users or to keep up with rivals.

Those suppliers that shipped hardware and software components of the client/server model of distributed computing - or serviced it by way of networking or systems integration - had no trouble growing in 1989.

Overshadowing such positive results, however, was the negative financial performance of several of the industry's leaders in 1989. Although earnings disappointments are de rigueur in information technology, the litany of companies reporting disappointing results in net income for 1989 reads like a Who's Who of the business. Only the highly diversified Japanese suppliers reported consistently good profit performance.

Where did the profits go? In part, they went into restructuring costs and stock buy-backs, which totalled some \$5 billion among US companies. But, mainly, profits just disappeared into operating margins, the difference between what it costs a supplier to create a product or service and what that product or service sells for. The systems that are spurring industry growth today - personal computers and workstations - command lower margins than other technologies. Although the economics of distributed systems was known to supplier executives for some time, the pace of this economic revolution caught most off guard.

The margin squeeze affects even those suppliers that figured out early on that users were going to demand standards-based distributed-computing platforms in the 1990s.

Even if traditional minicomputer suppliers are able to adjust to somewhat lower profit margins, it is unclear just how far they can go to compete against companies that do nothing but offer standards-based solutions on desktop platforms.

As if adapting to the new economics of distributed computing were not enough of a challenge for suppliers, they must also cope with flat US demand for new systems and services.

Divining the reasons for the slowdown in US spending on IS is a topic of conversation at virtually every industry gathering. To some, it is due to undersupply of critical technology. To others, it is a natural consequence of a market that has just run out of gas after accelerating 15 per cent annually in the late 1970s and early '80s. US spending on high technology (everything from computers to copiers) peaked in 1985 as a percentage of capital spending and will continue to be a smaller share of the overall capital investment.

One of the big culprits in the spending slowdown is the financial services industry. Investment banks, commercial banks, savings and loan institutions, insurance companies and real estate enterprises displayed an almost insatiable appetite for IS during the bull market of the 1980s. But the stock market crash of 1987, the fall in real-estate values (and hence mortgage loans) in the South-west and North-east, natural disasters and other events have sharply curbed Wall Street's and Main Street's hunger for computers. In fact, many are consolidating - not expanding - their IS operations.

Big IS customers are demanding that suppliers reduce or at least govern the total cost of using information systems - not just the hardware component. Operations support, the cost of real estate and facilities, salaries for programmers maintaining old programming code - all of that is rising, not declining. Until suppliers help cut those costs, sales of hardware to US sites will remain depressed.

Although IS suppliers have responded to the rising support costs faced by their customers with new products and services, their full effect will not be felt by vendors for some time. Improvements to large-scale computer operating systems (like automating storage management) and to programming (like computer-aided software engineering tools) will not begin to significantly raise demand for big systems until mid-decade.

Until CASE and other tools really take hold, however, suppliers are resorting to the only other alternative available for keeping the cost of computing low: heavy discounts on new systems. Users of large-scale systems, mid-range systems and workstations are typically getting 15 per cent off list price deals from suppliers. Such aggressive pricing can, in some cases, spur significantly heightened demand from users.

For most of the IS industry, the strategy for future growth is to switch to systems built around standards - whether the commonly accepted operating systems like UNIX, MS-DOS or OS/2 or industry-approved communications protocols like Open Systems Interconnect (OSI). So-called open systems will drive revenues for the majority of suppliers in the 1990s. Only IBM, Digital and some Japanese suppliers seem to have customer bases big enough to buy enough proprietary platforms to keep them growing. Anyone smaller - even those on the scale of a \$5.3 billion NCR Corp. or a \$5.6 billion Olivetti - must be committed to open platforms.

The transition to the new economics of distributed computing is affecting new product strategies in almost every corner of the industry, particularly among minicomputer makers. Most of the leading US mini producers either market UNIX-based hardware or intend to do so. The switch from proprietary products is costing them, however. In 1989, DG lost \$121 million; MAI \$40 million;

Prime \$277 million; Wang \$511 million. On the other side of the Atlantic, minicomputer makers had their woes too. Norsk Data AS of Norway lost \$69 million.

The slowdown in the US market and the squeeze on profits in 1989 led to a predictable escalation in demands for a high-tech industrial policy in the United States. Advocates of such a policy, like Intel Corp. president Andrew Grove, maintain that the US system of funding technology initiatives - via money raised from venture capitalists or public stock offerings - cannot compete with Japan's system. In Japan, individual companies either make long-term investments in new technology on their own or in groups in consultation with government planners - often because of economic incentives (e.g., lower interest rates) and government directives. They also enjoy much closer and friendlier ties to banks, which are themselves oriented towards the long term.

The two most important components of the IS industry, when judged on the basis of growth alone, are the software and services associated with systems. One has to look no further than the ranks of the DATAMATION 100 to see that the companies providing programs to run on computers and those integrating them are enjoying spectacular growth. For example, Electronic Data Systems Corp. of Dallas expanded its non-General Motors Corp. systems integration business 30 per cent to nearly \$2.5 billion in 1989. Cap Gemini Sogeti of Paris grew 21 per cent to \$1.1 billion on the strength of its IS services.

There are now at least seven software or service suppliers with annual IS revenues in excess of \$1 billion. Besides EDS and Cap Gemini, there are Andersen Consulting, Automatic Data Processing Inc., Computer Associates International Inc., Computer Sciences Corp. (CSC) and TRW Inc.

The biggest force in software flexed its muscles in 1989. The excitement and investment in software is by no means confined to the United States. In Europe, several other companies besides Cap Gemini are riding the software wave. Finsiel SpA of Rome and SO-Scicon PLC in Fleet, UK, have boasted consistently strong growth rates and profitability. Even established hardware manufacturers in Europe are depending more on software and service sales. The computer division of London-based STC PLC now draws nearly half of its \$860 million from these segments. Even Japan has caught the systems integration bug. But software and services have yet to give the industry the kick it needs to regain double-digit growth or attain higher profits.

Software and services, however, represent more than market segments. They reflect just how successful companies - particularly hardware suppliers - are at understanding customer needs and developing products to meet those needs. For a number of vendors, that means a whole new way of doing business. They have to shift the emphasis of research and development out of laboratories and into customer sites. They have to embark on new distribution strategies - establishing partnerships to open channels that can best deliver distributed-computing solutions to users. They have to develop global offerings that, nevertheless, can be customized region by region. In short, they have to listen not to their own employees as much as their customers.

One subject they had better lend an ear to is outsourcing. Increasingly, large users of information systems are asking service providers to assume control of some aspects of their IS operations.

Outsourcing, to be profitable for users and suppliers, depends on a degree of co-operation and understanding between both; such co-operation is almost unprecedented in the history of the industry. Fools who rush into the business may find themselves drowning in red ink. Those who avoid it may find themselves out of touch with users.

When suppliers are on top of changes - such as the need for users in the 1980s to express their individuality via personal computing and the technology (microprocessors) that enabled it - they flourish. When they are in the throes of change - such as the swift movement toward distributed computing confronting suppliers today - they flounder.

At the start of the 1980s, the number of people who knew how to operate a computer was small. Marketing took a back seat to engineering. Customers were fed technology by computer makers. Today, there are at least a 100 million people in the world who know how to boot up a personal computer. Marketing and engineering are almost synonymous functions at most companies. And customers only want to be fed solutions - not bits and bytes.

Profitability will undoubtedly return to the IS industry. Just as the PC spurred the growth of the 1980s, there will be a new horse, or horses, to ride in the 1990s. Desktop systems based on standard platforms, networked together in client/server relationships will be the heart of corporate information management.

There will also be a new horse to ride in higher margin software and services. But the difference - and it is a big one - is who will be holding the reins. It is not the suppliers anymore, it is the customers - you. (Reprinted with permission of DATAMATION magazine^C, 15 June 1990, copyright by Technical Publishing Company. A Dunn and Bradstreet Company - all rights reserved)

Products from superconductors

The US Department of Energy's Argonne National Laboratory (Argonne, IL) has formed a joint project with Microelectronics and Computer Technology (Austin, TX) to develop practical tapes and wires made of high-temperature superconductors. The project will use sputter deposition techniques to form high-temperature superconducting films that can be made into wires and tapes. MCT has developed a proprietary sputtering apparatus specifically for high-temperature superconductors, which the company says produces a thousand-fold increase in deposition rates. Argonne will build the necessary vacuum chamber for the sputtering apparatus and investigate microstructures and superconducting properties of the samples produced by the sputtering process. (Source: Chemical Week, 25 April 1990)

Company news

Lighter and cheaper workstations

Workstations are becoming lighter and less expensive. The \$6 billion market is expanding. Sun Microsystems has created a less expensive Sparc-station, the \$5,000 SLC, with a 17-in monochrome monitor. Hewlett-Packard has a less expensive workstation, the \$3,990 DN 2500, which runs at 40 per cent of the speed of the new Sun model. Typical workstations cost more than \$20,000. They are used by scientists and engineers, except for the personal-computer-compatible models, which have a broader range of users. Most run on a Unix operating

system, work at high speed and have graphics capabilities. Some companies have developed portable workstations, such as Toshiba's 17.7 lb model with a collapsible screen, which sells for \$12,600. Observers of the industry question the attraction of portable workstations to scientists and engineers, who may not take work outside of the laboratory because they need to work with other machinery there. Also, the PC users that are more likely to use a portable workstation typically work with programs on the MS-DOS system, not the Unix system. (Extracted from Wall Street Journal, 9 May 1990)

Trend towards PCs that read handwritten data

PCs that can read data written by hand may develop into a \$3 billion market. Companies that buy or lease PCs for their office workers are a shrinking market for PC makers. The sales growth of such equipment has declined to under 10 per cent yearly, at the domestic level. Such lagging performance is making computer producers drool over what could become a huge market. The newly developed computers can be used by workers in a wide array of businesses, from truck drivers to rack jobbers. Pioneering firms in the new technology include Grid Systems, Sony, Superscript and Data Entry Systems. (Extracted from Business Week, 14 May 1990)

Sematech rethinks clean

Sematech (Austin, TX), a consortium of US semiconductor manufacturers and the US Government, has a contract with Advantage Production Technology (Austin) to develop a gas-phase wafer cleaning system. The technology is meant to aid Sematech in its effort to make semiconductors with features 0.5 micron or smaller. Sematech says replacing current wet-chemical cleaning technologies offers such advantages as waste reduction, elimination of wafer rinsing and drying steps, and potential to work with smaller features on semiconductors. (Source: Chemical Week, 6 June 1990)

US and Europe to co-operate in DRAM development

US-based IBM signed an agreement recently with Germany's Siemens AG, to jointly develop the next generation of 64M DRAMs. The agreement also provides for further co-operation on subsequent semiconductor memory generations.

Siemens president and CEO, Karlheinz Kaske said: "The co-operation with IBM promises optimized efficiency and underlines our long-term efforts to supply state-of-the-art semiconductor IC's to the European industry. Siemens considers the co-operation a substantial support to the JESSI objectives".

Up to the beginning of this year, IBM was a leading member of the US Memories consortium, which was designed to claw back the USA's former world leadership in the production of memory chips, but which collapsed in January, after the defection of various key participants. Siemens is a founder member of JESSI, an organization comprising major European semiconductor manufacturers, one of whose objectives is to develop 64M DRAM technology. (Extracted from Semiconductor International Magazine, June 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Ill., USA)

Introduction of new microprocessors

Intel is planning to introduce the I586 micro-processor, which will have 4 million transistors,

by 1993. The I686, which will have 22 million transistors, is expected to be introduced by 1996, while the I786, which will have 100 million transistors, is expected by the year 2000. The microprocessor that Intel could produce by the year 2000 will be 2.5 x 2.5-cm in size. Called Micro 2000, the microprocessor will have 100 million transistors, including 4 CPU execution units integrated with 5 million transistors/unit operating in parallel; two vector units operating in parallel with 10 million transistors; a graphics and self-testing sector, with 5 million transistors each; and a 40 million-transistor cache storage area. (Extracted from Computerworld, 4 June 1990)

Telecoms set up

International telecommunications services company Millicom has formed an Italian subsidiary - Millicom Teleservices Italia (MTI). Based in Milan, the company's major shareholders are Millicom and Telfin, an Italian financial holding company. (Source: Electronics Weekly, 27 June 1990)

ITT work heralds single chip TV

Television chip maker ITT semiconductors plans to introduce a multi-function video processing chip next year that will form the heart of a single chip television.

Early prototypes have been developed that could replace up to four ICs in the company's current Digichip 2000 TV chip-set. The new IC has been developed in ITT's 1.2-micron NMOS process and will consume 3W of power when carrying out functions such as video processing, coding/decoding, deflection control and audio. This is half the power used by the existing TV chip-set.

The company will be producing the new device in volume within 12 months and there are already plans to offer a low power version using 0.8-micron CMOS. (Source: Electronics Weekly, 27 June 1990)

Plessey in agreement with US disk drive firm

Plessey Semiconductors has secured a long-term supply contract with America's second largest disk drive supplier Conner Peripherals.

It is thought that the deal will be worth in the region of \$20 million to Plessey Semiconductors between now and April 1991.

The deal is for mixed signal (combined linear and digital) ASIC chips used in the data path of disk drives. The mixed signal technology came with the Ferranti acquisition and the chips will be diffused in Oldham and assembled in Singapore.

The new agreement is thought to go well beyond the initial \$20 million supply contract and be part of a long-term partnership between the two companies.

Conner had disk drive sales worth \$705 million in 1989 and opened a plant in Irvine, Scotland last March. The deal is a boost for Plessey Semiconductors whose fate has been uncertain having been owned, in the last six months, by Plessey plc, half and half by GEC and Siemens and by GEC 100 per cent. (Extracted from Electronics Weekly, 9 May 1990)

AMD joins Vitesse in major GaAs project

Telecoms chip-set specialist Advanced Micro Devices (AMD) has formed a technology and product

development partnership with gallium arsenide chip-maker Vitesse Semiconductor.

Data communications chip-sets are key for the company, which was an early leader with 100 Mbit/s FDDI - fibre distributed data interface - devices. But the industry wants faster bit rates and AMD believes GaAs will provide them.

The speeds of the new devices will be ten times faster than emerging FDDI networks and 100 times the speed of LANs in common use today. And with Vitesse's GaAs technology AMD can "expand its datacomm product offerings to circuits that support tomorrow's gigabit connections".

At 1 Gbit/s the data rate over communications links is about the same as it is processed within today's high-speed microprocessors, for a 32-bit MPU operating at 25 MHz has a peak processing rate of 800 Mbit/s.

Inside sources indicated that the devices will be extensions of AMD's TAXI products, which are short-distance high-speed bipolar transmitter and receivers. The new GaAs devices are expected to be sampled to special customers late this year and be available for general sampling early in 1991. The speed will be 1.2 Gbit/s. (Source: Electronics Weekly, 9 May 1990)

HP invests in Actel

Hewlett-Packard (HP) has made an investment in Actel and signed an agreement to jointly develop and produce advanced field programmable gate arrays (FPGAs).

The two companies will together develop a new family of FPGAs and swap related technologies. Actel's FPGA technology and programming software will be integrated into HP's manufacturing processes and into its chip design system. (Extracted from Electronics Weekly, 9 May 1990)

US and China build hybrid

East and West are joining forces to build a hybrid workstation capable of running MS-DOS and Unix.

Two companies - one US, the other Chinese - are teaming up to manufacture and market the dual operating system microcomputer.

When it is launched next year, the partners are promising the platform will use the MS-DOS command environment while "transparently delivering all the speed, power and interoperability advantages of the Unix O/S". The system is to be based on Sun Microsystems Sparc technology.

The joint venture is called Shenyang Shenlong Computer Systems.

The Chinese partner comes from the North Computer Application and Development Corporation, while the US side comes from the board-making subsidiary of a Californian concern called Helionetics.

First machines are expected to be unveiled by spring next year, but the joint venture itself is still subject to the appropriate clearances from the US Department of Commerce. (Source: Computing, 5 July 1990)

IBM first in joint venture with Chinese to produce computers

IBM has set up its first joint venture in China to produce personal computers.

The venture, between the Tianjin Zhonghuan Electronic Computer Company and IBM wholly-owned subsidiary, IBM China Hong Kong Corporation, has a capacity to produce up to 100 PC-2-type personal computers a day for domestic sale.

The venture, the Tianjin Advanced Information Products Corporation, has the first IBM patent rights granted a joint venture to manufacture its computers, the spokesman said.

He did not give investment details of the venture but said the two sides have signed a five-year co-operation agreement. It will be considered for renewal after that period.

The company will also act as an IBM computer spare parts export agent. The company would have an initial working staff of 20, mostly engineers, and production will begin shortly.

IBM's ambitions in China include developing software, especially Chinese language software, and forging alliances with research centres to generate ideas. (Source: Financial Times, 30 August 1990)

NEC invests in Scotland

The Japanese semiconductor manufacturer NEC has announced a \$50 million investment at its factory in Livingston, Scotland for the production of its first 4M devices outside Japan. The investment will enable the company to produce the devices from 6-in wafers starting late this year, with volume production expected to commence early next year. NEC is to double wafer production at the plant from 9,000 to 18,000 wafer starts per month and will increase its workforce from 700 to 800. A prototype production line has already started sampling the devices using a 0.7 µm process.

The 4M DRAM devices will probably be based on trench technology, although stack technology is also being examined at the company's research laboratory. NEC has another European facility at Ballivor, County Meath, Ireland, but plans to serve the US market from Livingston.

The company also intends to start making microcontroller products at Livingston, while ASIC production there will support NEC's network of European design centres. (Reprinted with permission from Semiconductor International Magazine, June 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Ill., USA)

Siemens climbs in the ranks

Its acquisition of the FRG's financially troubled Nixdorf Computer AG, expected to take effect later this year, will significantly improve the ranking of Munich-based Siemens AG in the world's computer market. The sum of the two companies' global 1988 sales, \$6 billion, would rank the combine, Siemens-Nixdorf Information Systems AG, No. 8 world-wide (following IBM, Fujitsu, DEC, NEC, Unisys, Hitachi, and HP), up from Siemens's 13th place.

In Europe, combined 1988 sales of \$5.7 billion would make Siemens-Nixdorf No. 2, up from fourth.

following only IBM. However, with a whopping \$20.3 billion in 1988 European sales, IBM leads by a wide margin. Now that the FRG's cartel office and the Commission of the European Community have approved, the new combine should be in business by the last quarter. (Source: Electronics, July 1990)

Sony to develop fast RISC microprocessor

Sony (Japan) will try by 1992 to develop a 32-bit reduced-instruction-set-computer (RISC) microprocessor with a speed of 100-120 million instructions/sec. It will be the fastest microprocessor in the world, and will be used in Sony's NEWS workstations. The device will use CMOS and emitter-coupled logic technologies. Sony obtained RISC technology from MIPS Computer Systems (Sunnyvale, CA) in 1989. (Extracted from Asian Wall Street Journal, 14 May 1990)

Fujitsu's long march

Fujitsu, Japan's largest computer maker, is to bid for a majority shareholding in ICL, the only British company still manufacturing mainframe computers. News of the deal has sent a shockwave through the computer industry as it is seen as the most daring of a series of moves by Japanese companies determined to build global competitors to the US giant, IBM.

If successful, the bid will take Fujitsu from the number four position, in terms of global revenues, to the number two position, leapfrogging NEC of Japan and Digital Equipment corporation of the United States. But Fujitsu and ICL's combined revenues for 1989 were still less than a quarter that of IBM.

Fujitsu's takeover bid is just one of several moves by Japanese computer manufacturers intended to form alliances against IBM with European and US companies. European companies are not themselves seen as serious competitors; with the backing of the Ministry of International Trade and Industry (MITI), Japanese companies are concentrating single-mindedly on overtaking IBM.

Apart from its ICL link, Fujitsu has a major shareholding (43.6 per cent) and co-operative marketing agreement with the US computer maker Amdahl, which uses Fujitsu technology in its computers. The Japanese company also has an agreement with Siemens of FRG, whereby Siemens sells Fujitsu computers with Siemens labels on them.

Hitachi and NEC have gone into similar licensing agreements and joint ventures in Europe, producing a marketing network for Japanese companies that in total matches IBM's in scale. (Extracted from Nature, Vol. 346, 26 July 1990)

IV. APPLICATIONS

Chip reduces gate delays

Toshiba is now using its 0.8 μm silicon manufacturing process to produce semicustom ICs based on standard cells. The technology, originally developed to make 1-Mbit DRAMs, should allow it to put up to 100,000 gates on one chip and cut gate delays by 35 per cent.

The TC255C uses cells based on the Advancell ASIC library developed in conjunction with Siemens. Toshiba gave several examples of devices which can be produced using the library and the 0.8 μm process. These include a two-input NAND circuit with a typical

delay of 0.33 ns when loaded with 2 mm of metal, and a 4-kbit RAM, accessed through one asynchronous port in 7 ns.

Various packages are available, up to 256-pin plastic quad pack. PLCCs with between 44 and 98 pins can be supplied and small outline plastic packages can be provided with 24 to 28 pins. Ceramic flat packs can be supplied square (100 to 240 pins), rectangular (256 pins) or face down (100 to 232 pins).

Mass production is beginning now with orders accepted from October. Design support can be provided immediately for most commonly used CAD software running on normal workstations. (Source: Electronics Weekly 27 June 1990)

Chip has dual role

Zilog's Z85C80 combines a 10-MHz Z85C80 serial communications controller and a 3-Mbyte's Z53C80 SCSI device. The company believes it will be used in applications like Appletalk, where the SCC drives the Appletalk code and the SCSI links in external hard disks.

The two elements share an 8-bit address and data bus can be used in any computer system with a small computer system interface. The SCSI can operate as a target and an initiator. High-current open-drain outputs allow it to drive the SCSI bus. Zilog believes that the internal SCSI will speed up the system by reducing CPU interventions in DMA operations.

The SCC is a dual-channel data communications peripheral that can interface to multiplexed or single CPUs. Each channel can be programmed for common synchronous or asynchronous datacomms protocols. Synchronous data link control transfers using DMA controllers use the 10 x 19-bit FIFO and 14-bit byte counter. (Source: Electronics Weekly, 27 June 1990)

Flash ups density in challenge to DRAM

INTEL has doubled the storage capacity of its largest flash EPROM memory chips, as part of its strategy to match the price per bit value of dynamic RAMs by 1992.

Dr. Richard Pashley, general manager of Intel's Flash operation, believes that the new 2-Mbit devices are currently less than half the price per bit of static RAMs and EPROMs. He went on to say that in 1992 the price of Flash memory should fall below that of DRAMs, making it the least expensive form of high density solid state memory.

The new device is designed to meet the need for small memory sub-systems in portable equipment such as laptop computers.

An early buyer of the devices is Psion, which is using them in its MC600 laptop. The machine weighs 4.4 lb and uses Flash devices instead of a disk drive, extending battery life to 60 hours.

The devices are manufactured on a 100 mm wafer line in Santa Clara, California, having been developed on the 150 mm line in Albuquerque, New Mexico. They can be supplied with standard and reverse pin outs so that they can be connected back to back without complex interconnections.

Intel has also developed a thin small outline package (TSOP) version of the device. Measuring 1.2 mm in thickness, the package is only twice as

deep as the wafer itself. In normal plastic packages, the 2-Mbit device costs \$35 in tens of thousands and in the TSOP it costs \$47 in the same quantities. (Source: Electronics Weekly, 27 June 1990)

Maps in motion

Within two years, PC users of the "Global Change Encyclopedia" could be viewing colourful satellite data on vegetation, land masses, ocean currents, and coastlines as they shift around the world. That information is now being entered into an animated atlas, one of 10 projects sponsored by the Space Agency Forum on International Space Year (SAFISY), a group established last year to co-ordinate space agency planning for 1992, designated International Space Year by the United Nations.

The encyclopedia will allow viewers to use compact-disk read-only memory to see land and sea changes in motion over extended periods of time.

Satellites gathering the information include a US National Oceanographic and Atmospheric Administration Landsat satellite, the high-resolution French SPOT-1 satellite, and the Japanese ocean-observation MOS-1 satellite. Resolutions range from 10 to 80 m.

The first edition will be out in 1992. Future editions scheduled include data on greenhouse effect detection, sea surface temperature measurement, land cover changes, and ocean productivity.

SAFISY headquarters, now at the National Space Development Agency of Japan, in Tokyo, rotates annually among the 25 participating space agencies. Contact: ISY Information Service, 600 Maryland Ave. SW, Suite 600, Washington D.C. 20024. (Source: Spectrum, July 1990)

Possible data acquisition/analysis system

Data Acquisition's LB-32 is a laptop data acquisition and analysis system offering field portability.

The system can acquire, monitor and analyse data in the field, rather than simply acting as an on-site logging device.

The unit will fit directly into the XT slot of any compatible laptop or PC. It can perform FFT analysis, chart recording, and data logging, and will operate as a storage oscilloscope. It can operate at speeds in excess of 100 kHz in transient mode, implement digital sampling at up to 100 kHz, and perform fast, long-term function sampling, storing data in its loop storage facilities. Other features include 16 analog and 16 digital channels, 12-bit A to D converter, precision current source, programmable amplifier, timer and two counters.

The system is supplied complete with software which has been developed to analyse technical and scientific data. (Source: Electronics Weekly, 9 May 1990)

Fibre optics allow for fast assembly

Radial F-SMA Fast series of multimode fibre optic connectors combines rapid assembly - less than two minutes - and elimination of fibre pistoning problems with low insertion loss, better than 1.7 db.

The rapid assembly is achieved by using a spring loaded diamond blade to cleave the fibre, under tension in a specially designed tool.

The cleaved face of the fibre provides transmission without the need for polishing. Because the fibre is placed under a predetermined tension, prior to cleaving, it is stretched by a small but repeatable amount.

When cleaved, close to the face of the connector, the fibre withdraws inside the connector, due to its natural elasticity. The distance from the face of the connector to the cleaved face of the fibre is very small but is sufficient to eliminate problems due to pistoning of the fibre with changes in operating temperature.

The connectors are suitable for use over the temperature range -20°C to +70°C and comply with MIL-C83522. (Source: Electronics Weekly, 9 May 1990)

Comparator includes digital neural network

The MD1210 fuzzy-set comparator (FSC) is a low cost CMOS IC incorporating a digital hardware neural network optimized for pattern recognition, and is available from Tubb Research.

The device can be taught to recognize new patterns without the use of lengthy and expensive application specific programs.

It is intended for real-time application in vision systems; voice, radar, telecoms and sensory signal processing, robotics, security and surveillance systems.

A single chip can simultaneously compare eight unknown serial data streams with one known, or one unknown with up to eight known.

Data is learnt or compared at rates as high as 20 MHz, and results are processed by the neural network - a modified Hopfield architecture - in five clock cycles.

An in-built expansion capability allows interconnection of up to 32 chips, allowing comparison of 256 stored data patterns.

An FSC evaluation kit is available for the MD1210. It comprises a PC plug-in card, comprehensive evaluation software running under MS windows, and a users' manual with board schematics.

The board contains an MD1210, a low cost frame grabber, and all necessary PC interfaces. (Source: Electronics Weekly, 9 May 1990)

ICL powers up CPUs

The world's most powerful central processor unit (CPU) for mainframe computers has been developed by British computer maker ICL and Japanese electronics combine Fujitsu.

At twice the power of an IBM 3090 mainframe CPU, the processor forms the heart of ICL's latest top-end additions to its Series 39 mainframe range.

ICL chairman Peter Bonfield claims that the CPU, capable of 47 million instructions per second (MIPS), combines ICL design skills with Japanese chip-making expertise and "outperforms anything available elsewhere in the world". He added that the company had spent around £200 million developing the new processor technology.

The double-sided 42-layer CPU board measures around half a metre on a side and packs in some

336 Fujitsu-made ECL gate arrays. All these chips together with the printed circuit board were designed and developed by ICL engineers in Manchester, according to Tom Hinchliffe, the director of ICL's computer products division.

However, ICL chiefs pointed out that none of this Manchester-designed hardware can be made in the UK and so the boards, complete with chips, have to be brought in from Fujitsu.

Referring to the ECL gate arrays, Bonfield said: "We cannot get this technology in Europe. Such very high speed technology is only available from the US and Japan." Hinchliffe pointed out that the 42-layer PCB is four times more complex than anything available in the UK.

Each of the gate arrays consists of around 3,000 highly complex logic gates, according to Hinchliffe. "But these gates are far more complex than conventional gates with three inputs and five outputs and at least a factor four more powerful than conventional gates," he added. The gates can be switched within around 80 ps.

ICL has unveiled two mainframes based on this technology. Each machine uses two CPU boards and the most powerful delivers some 90 MIPS. Bonfield indicated that mainframes sporting six CPUs and even more advanced chip technology could deliver in excess of 300 MIPS.

Deliveries of these Series 39 SX machines will begin in September. ICL has already booked five orders worth around £20 million. (Source: Electronics Weekly, 9 May 1990)

Supercomputing for less

In a move to make the use of supercomputers less expensive, Cray Research (Minneapolis) is introducing a new system, the Cray Y-MP2E, that sells for about \$2.2 million but has computational performance comparable to the Cray Y-MP, an existing line of supercomputers with price tags ranging from \$5 million to \$23 million. Cray supercomputers have made some inroads in the chemical industry and are used by firms such as Du Pont Monsanto (St. Louis), and Sumitomo Chemical (Osaka). Cray says the new units are compatible with existing Cray Y-MPs. (Source: Chemical Week, 23 May 1990)

Laptop workstation is "first" portable Unix

Sony Microsystems has boosted its range of workstations with what it claims to be the first portable Unix-based machine and two low-end stations using reduced instruction set computing (RISC) technology.

Based on existing technology used for the Sony 4FWS-1500 workstation, the portable is being positioned as a viable power desktop model that can link into any network and liberates the user from a fixed office node. Sony sees it as a general purpose workstation that can also be used for presentations and homeworking as well as an office-based computer.

The two RISC workstations both use the R3000 processor from Californian company Mips. They fill up the lower end of Sony's range and come in diskless and hard memory formats. Both deliver 14 million instructions per second processing power and come with standard interfaces such as Ethernet, SCSI and RS232. Sony is targeting the machines at users who will want workstations to mix in easily with other vendors' products and systems.

Sony has included an audio interface with the portable and entry-level workstations, anticipating growth in multimedia and combined voice-data services in the near future.

The portable computer will probably evolve into a genuine laptop, as it currently requires a mains connection to operate. Colour displays will also become available for the machine. As in many Sony workstation products, the portable uses dual central processors. The Motorola 68030 chip runs core processing, while the 68882 co-processor manages the memory. Running at 4 MIPS, the portable offers 240-Mbytes of hard disk storage, as well as between 8 and 12-Mbytes of random access memory. (Source: Electronics Weekly, 6 June 1990)

Character recognition in hand from IBM

Researchers at IBM's New York laboratories have made an important break through in the reading of handwritten characters.

They have reported the development of technology which is able to recognize handprinted characters even when they run on, touch or overlap.

In the past, handprinted characters could only be recognized and processed in real time if they were clearly and legibly written in separate boxes.

The improved recognition technology has come about as part of a research project aimed ultimately at reading natural, cursive handwriting.

Using an interface called PaperLike, the user writes with a stylus on a transparent digitizing tablet that is placed over a flat liquid crystal display.

Because the tablet can sense the position of the stylus, it can track the handwriting and reproduce it on the screen.

As well as alphanumeric characters the process also lends itself well to other forms of notation such as music or proof readers' marks.

This raises the possibility of the computer that is able to correct its own text after an operator has marked up a proof copy.

In the traditional approach to handwriting recognition, digitized data corresponding to written strokes is stored in a buffer until a character is formed which is then compared with a library of templates.

The new IBM approach is based on breaking down characters into "stroke" templates to reduce the amount of searching the computer has to do to find a match. At the same time, the search routines themselves have been made more efficient. (Source: Computing, 28 June 1990)

Snag hits 4-Mbit DRAM

Serious potential applications problems with nearly all 4-Mbit DRAMs have been discovered by IBM and are being investigated by the users' qualification consortium STACK. The problems relate to 4-Mbits from every manufacturer in the world except one.

The problem is one of incompatibility between the 4-Mbit and the 1-Mbit. This could particularly affect users who have designed their systems in the expectation that they can be upgraded from 1-Mbit to

4-Mbit. Micron Technology is the only company to have a truly compatible 4-Mbit in addition to a second version which has the same problems as the others.

The reason why the non-compatibility extends to all 4-Mbits (except one version of Micron's) is because all 4-Mbit manufacturers agreed a standard for the on-chip test operation on the 4-Mbit DRAM set by the US chip standards body JEDEC.

However, the procedure for getting into test mode on the 4-Mbit is different to that on the 1-Mbit and it can be randomly triggered, locking the device into testing mode and preventing it from functioning as a RAM.

STACK has written to every manufacturer of 4-Mbits asking nine questions. Two of these ask whether data sheets and the companies' engineers are warning customers of non-compatibility between 1-Mbit and 4-Mbit DRAMs.

Most users want to be able to take a 4-Mbit and put it into a 1-Mbit socket - some of the PC makers have designed products for instant upgrade - these incompatibilities could provide major problems for them.

However the leaders in the 4-Mbit DRAM market, Toshiba and Hitachi, feel that the problem can be solved by customers' designers. (Source: Electronics Weekly, 20 June 1990)

Photos by phone

A new imaging device can send full colour video images down a standard telephone line for storage in a PC-based image data base.

Called Photophone, the product sends images, photographs and text between machines in seconds. Although the basic product has been available since 1987, the link to image data bases and the capacity to transmit full colour pictures are recent enhancements.

Typical applications can include: examining fabrics and textures, checking page proofs, and approving art work. Once the pictures arrive, they can be downloaded onto diskettes.

Photophone sells at the price of £8,000. Those interested should call ImageBase Technology (Tel.: +44 1/991 396). (Source: Information World Review, No. 45, February 1990)

Computer solves many-body problems

A new computer processor called GRAPE (for gravity pipe) makes it possible to construct a special-purpose computer with performance comparable to that of a Cray X-MP/1 supercomputer, but at a cost 10,000 times lower. Toshikazu Ebisuzaki of the University of Tokyo and colleagues there and at two Japanese astronomical observatories developed the processor to simulate gravitational interactions in "many-body" systems, such as stars in a galaxy, but the device is also applicable to many-body chemical problems, such as calculating Coulomb and van der Waals forces for molecular dynamics simulations. The devices process data at a rate of 120 megaflops (120 million floating-point operations per second), and they can be linked to make parallel computers with speeds in the teraflop range. However, one drawback of such a design is that special-purpose processors like GRAPE are costly to debug. "Almost any error in design or implementation means re-engineering, in expensive contrast to editing an erroneous line of software" in a programmable

parallel computer (one based on general-purpose processors). Says an observer in an accompanying commentary. (Source: Chemical and Engineering News, p. 50, 7 May 1990)

This clipping service puts the whole world in your hands

For harried managers with eyes burning from an overload of information, Western Union Corp. has a balm: the Executive Briefing Service. Each week, Western Union computers will sift through reams of information, extract articles of interest to the customer, and deliver them electronically by fax or computer on Monday morning. Most clips are synopses or short articles, but the Upper Saddle River (NJ) company also can provide paper copies of longer documents.

The service could be especially valuable for keeping tabs on developments overseas. In a recent test, about 20 per cent of the 4,000 journals and proceedings combed for one subject were published offshore. Western Union gets its information from all of the materials pouring into InfoMaster, its gateway to a large and diverse assortment of on-line data bases. InfoMaster has 18 major categories of science and technology data, plus a wide range of news relating to business. While searching these data bases can get expensive, the clipping service is a bargain: \$595 a month. (Reprinted from the 28 May 1990 issue of Business Week by special permission. (c) 1990 by McGraw-Hill, Inc.)

Spreading fertilizer will soon be less of a waste

Monitoring the amount of fertilizer in newly planted fields is a big problem for farmers. The nitrogen that is the main ingredient in most fertilizers is volatile, and if it is not injected properly, or if too much is applied, the gas will seep out of the soil. In some cases, farmers unwittingly lose as much as 70 per cent of the fertilizer they put down. That is a waste of energy and money.

To help solve this problem, researchers at the Georgia Institute of Technology have developed an optical sensor that can tell farmers how much fertilizer is being lost. When soil loses nitrogen, it emits ammonia. So the researchers coat a small piece of glass with a chemical film that reacts with ammonia. Laser light passing through the reacted film will be bent in direct relation to how much fertilizer has been lost from the soil. Farmers can then go back and try to detect what the problem is.

According to Chuck Ross, a Georgia Tech researcher, the team is still trying to improve the ammonia-sensitive coating for the sensor. A workable device, which would cost only \$100, is still several years away. (Reprinted from the 28 May 1990 issue of Business Week by special permission. (c) 1990 by McGraw-Hill, Inc.)

Colour hand-held scanner

ECA C&C Products (Lodi, NJ) will offer a hand-held colour scanner that recognizes 256 colours in just one pass. Users will see 90 dot/in resolution. The Hico A4 Colour Scanner can be used with the IBM PC XT, AT, and compatibles with 640K of RAM, DOS 2.0 or above; a hard disk; 360K 5.25-in floppy drive; 8-bit expansion slot; mouse; VGA graphics monitor; and a 512K VGA adapter. It will be sold with Image 256 colour paint software and a user-installable interface card. The software offers 640x480 image resolution. (Extracted from Information World, 9 April 1990)

Spectrum CVD announces selective tungsten process

Spectrum Co., Phoenix, Ariz., has announced what it claims is the industry's first commercially available, production-worthy selective tungsten process for CVD of high quality tungsten onto interconnects in submicro integrated circuits. R. Bruce Springer, VP of sales and marketing for Spectrum, reports that the selective process is ideally suited for critical applications such as via fills, silicon contact fills and cladding of aluminium interconnects. In addition, it can save up to 75 per cent of the process costs of competitive systems, he says. (Reprinted with permission from *Semiconductor International Magazine*, June 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Ill., USA)

Two new powerful mainframes

Hitachi Data Systems has introduced two high-end mainframes that offer more power than the biggest IBM and Amdahl systems. The 3-processor EX 310 offers a performance of about 123 Mips, while the 4-processor EX 420 offers a performance of 150 Mips, according to Mark Hess, analyst, Gartner Group (Stamford, CT). In addition to renaming its AS/EX series the EX series, HDS introduced the 56-Mips EX 85 to fill the gap between the EX 80 and EX 90. The two new high-end mainframes introduced by HDS are liquid-cooled; previous HDS systems are air-cooled. HDS will offer self-contained refrigerant-based radiator units if customers do not have plumbing in their computer rooms. The new HDS systems also feature fibre-optic channels that allow peripherals to be located 1.2 miles away and offer a 4.5-Mbyte/s rate. The new systems can support up to 24,000 peripheral devices, which represents an eightfold increase. HDS is also offering a remote operations facility that uses consoles managed by IBM Netview to offer support. HDS is setting the speed, features, price and upgrade policy that both IBM and Amdahl have to beat when they introduce new mainframes, according to analysts and users. (Extracted from *Computerworld*, 11 June 1990)

IBM's dedicated processors

IBM's future-generation mainframes will be dedicated processors. Tailored for individual customers, the dedicated processors will handle such tasks as data base management, data sorting and security. IBM will start moving towards dedicated processors during the next 12-18 months, according to analysts, citing information IBM gave them at a briefing held on 8 June 1990. The dedicated-processor line will make it difficult for plug-compatible manufacturers to compete with IBM as they will not be able to offer the breadth of product. (Extracted from *Computerworld*, 11 June 1990)

Semiconductors for HDTV

LSI Logic (US) and Japan Broadcasting (NHK) will jointly develop semiconductors for high-definition TVs. NHK will supply technical information and assistance on decoders. LSI will develop microchips for consumer TVs, medical equipment and other goods. Decoders, with applications in signal processing, contain hundreds of microchips. HDTV image systems have applications in TVs, the military and medicine. Japan's electric appliance sector has agreed to give the US semiconductor sector technical help on HDTVs. (Extracted from *Japan Economic Journal*, 9 June 1990)

Programmable single-chip video signal processor

Intermetall (Freiburg, FRG) is developing the Datawave processor, which integrates 1.2 million

transistors on a 150 mm² chip, and offers 4 billion operations/s of peak computing power. The chip features a sustained throughput of 750-Mbytes/s. The chip will be applied to a television despite offering the computing power of a supercomputer. The programmable single-chip video signal processor will also fit the needs of video systems other than TV. The device is being designed for fine-grained parallel processing of digitized video signals. The device features a 125-MHz clock rate, 0.8-micron CMOS technology and 16 pipelined reduced-instruction-set computing processor cells. Data flow principles are used in the processor, thus global clock timing does not control parallel program runs, local data streams do. (Extracted from *Electronics*, June 1990)

Fastest Macintosh PC

Apple Canada has unveiled the fastest Macintosh PC ever made. The Macintosh IIfx is about 4000 per cent quicker than the first Macintosh Plus, and about 100 per cent quicker than the Macintosh IIfx. It has a floating point co-processor, a 32-kbyte static RAM cache, 2 dedicated I/O processors, 6 NuBus slots, a dedicated SCSI/DMA controller, and maximum internal hard disk capacity of 160-Mbytes. The industries that the new PC was designed for include the following: architecture and construction; law; accounting; advertising; and high-level publishing. (Extracted from *Technology Update*, 14 May 1990)

Improved Mac-to-VAX connectivity

After two long years, Apple Computer Inc. and Digital Equipment Corp. announced the fruit of their effort to improve Mac-to-VAX connectivity. And even as they did, they formulated strategy for what promises to be an even more elusive goal: ensuring compliance with IBM's Systems Applications Architecture.

The core of the new Mac-to-VAX link is DEC LanWorks, a software solution for both vendors' platforms that enables file access and printer sharing, compound document interchange, and electronic-mail. Also announced, and available immediately, is SQL/Services for the Macintosh, which allows third-party developers to build client/server applications.

Apple has high hopes for the new Mac-to-VAX networking product. This will be able to do what OfficeVision will be able to do when fully available. OfficeVision is IBM's OS/2-based departmental computing solution.

The actual products seem to be creating less excitement than the original alliance announcement in January 1988. One reason may be that LanWorks does little more than bring the Mac up to speed on network services features that have been available on the PC for years.

The impression of a slow pace of development for LanWorks also appears to have dampened the otherwise enthusiastic potential customers. (Extracted from *Information Week*, 7 May 1990)

New prototype information service

Bellcore's prototype multimedia system allows information service providers to customize information to meet a customer's needs. Called Customized Information Delivery (CID), the system allows audio, text and video information from various sources, including journals, magazines and newspapers, to be electronically stored and

displayed on a computer or TV screen. The system will initially be used internally at Bellcore to help engineers evaluate the public network's ability to handle the huge volume and diverse types of tele-communications traffic associated with advanced information services. Bellcore is planning to transfer CID technology to regional holding companies. CID can be used by information service providers to fill up data bases with published material. This material is then personalized by customizing agents or firms to meet a customer's needs. (Extracted from Telephony, 7 May 1990)

V. COMPUTER EDUCATION

Surface mounting on video

For design and manufacturing guidelines to creating surface-mounting packages that will be inexpensive to assemble and test, engineers and designers can turn to a new videotape training programme. Its sponsor is the Society of Manufacturing Engineers (SME), Dearborn Michigan.

Titled "Surface Mount Technology: Design for Manufacturability", the programme examines the interrelationships between surface-mounting technology designs, assembly processes, cleaning, testing, and quality control. Six videotapes lasting about four hours and a 300-page reference guide are included. The videotapes, available in 1/2-inch VHS or 3/4-inch U-Matic formats, cost \$1,995 to non-members (\$1,835 to SME members). A 14-minute preview tape costs \$25 (SME members, \$21). Contact: SME, Publication Sales Department, One SME Drive, Box 930, Dearborn, Michigan 48121-0930; Tel. 313-271-1500, ext. 418 or 419. (Source: Spectrum, July 1990)

VI. SOFTWARE

Automating pharmaceuticals

Digital Equipment (Maynard, MA) and software firm Palette Systems (Nashua, NH) are offering a system that automates pharmaceutical manufacturing in a paperless environment. The companies say the system, which runs on Digital's VAX line of computers, is the first such product to become commercially available for pharmaceutical manufacturing. It is designed to ease the task of preparing and keeping the large amount of documentation that is federally required for pharmaceutical manufacturing. The system links computer-integrated manufacturing with electronic document control and management. (Source: Chemical Week, 23 May 1990)

Publishers join forces to attack software pirates

US software publishers have joined forces for a major assault on software piracy world-wide as Microsoft and Everex claim to have cracked a counterfeiting ring that produced 30,000 copies of the MS-DOS operating system.

Two trade organizations, the Business Software Alliance and the Software Publishers Association, said they will merge in order to co-ordinate their anti-piracy efforts more effectively. The BSA is an exclusive organization consisting of the top six US pc software companies, including Microsoft, Lotus Development and Word Perfect.

The BSA will retain its name and become a division of the SPA responsible for international anti-piracy activities. The BSA has been involved

in organizing raids on companies in Hong Kong, Italy, Spain and certain other countries.

While the BSA concentrates on software piracy abroad, the SPA, which represents 650 US software publishers, will fight illegal software use in the US. The BSA brings a multimillion dollar budget with it to the SPA collected from its rich software company members.

Microsoft and the microcomputer manufacturer Everex said they uncovered a widespread MS-DOS counterfeiting operation responsible for \$1.5 million in lost software sales. The two companies have filed lawsuits against 16 businesses and individuals based in Silicon Valley and New Jersey. US police took part in six raids based on the information supplied by Microsoft and Everex. (Source: Computer Weekly, 21 June 1990)

USSR bibliographic data bases

The SPA USSR Book Chamber produces two bibliographic data bases: the Data base on Books in Print (PlanDatabase) and the Data base on Books out of Print (FactDatabase).

PlanDatabase contains bibliographic descriptions of publishers' claims for book and booklet issue. Its subject coverage falls into these four broad areas: fiction; natural sciences and engineering; scientific texts and textbooks, and social sciences and politics. With bi-weekly updates, PlanDatabase is growing at the rate of 60,000 records a year.

FactDatabase contains bibliographic records on books and booklets published in the USSR in Russian, other USSR national languages, and other languages. Main subject areas covered are: fiction and humanities; social sciences and politics; and natural sciences and engineering. With updates every two weeks, an approximate total of 72,000 records are added each year.

Both data bases are in Russian. For further information, contact: SPA USSR Book Chamber, 1/9 Kremlin Embankment, Moscow 121019, USSR. (Source: ACQUIS Newsletter, Vol. 8, No. 1, May 1990)

AGRIS on CD-ROM

AGRIS, the world's largest bibliographic data base on agriculture, is now being sold on CD-ROM. Produced by the AGRIS Co-ordinating Centre of the Food and Agriculture Organization of the United Nations (FAO), the data base is being distributed on CD-ROM by SilverPlatter Information, Inc.

AGRIS covers all aspects of agriculture, including forestry, animal husbandry, the aquatic sciences and fisheries, and human nutrition, in over 110 participating countries. Literature covered includes grey literature such as scientific and technical reports, theses and conference papers.

An archival disk (1986-1988) contains over 300,000 records; the current disk (1989) contains approximately 150,000 records. An annual subscription to the complete set with quarterly updates costs \$US 1,350; the current disk alone - with quarterly updates - sells for \$US 750, and the archival disk costs \$US 700. Developing-country subscribers are eligible for a 50 per cent discount. FAO is distributing AGRIS on CD-ROM to each of its 150 member countries.

For further information, please contact: SilverPlatter Information, Inc., One Newton

Executive Park, Newton Lower Falls, MA 020162-1449.
USA or SilverPlatter Information, Ltd., 10 Barley
Mow Passage, Chiswick, London W4 4PH, UK.
(Source: ACCIS Newsletter, Vol. 8, No. 2, July 1990)

Malaria data base

A data base on malaria is now available free of charge on diskette from the Walter and Eliza Hall Institute of Medical Research in Melbourne, Australia. Funded by the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR), the data base is part of an ongoing project aimed at disseminating information on the availability of reagents for use in malaria research.

The data base, which is intended to be a complete listing of all known malaria nucleotide and protein sequences, is updated two or three times per year. Versions are available for PC compatible microcomputers in 3 1/2" or 5 1/4" formats, or for Apple Macintosh computers. It can also be installed on a minicomputer, by transferring the files from a microcomputer using an appropriate terminal emulation program.

For further information, or to obtain the data base, contact: Dr. Ross Coppel, The Walter and Eliza Hall Institute of Medical Research, PO Royal Melbourne Hospital, Victoria 3050, Australia.
(Source: TDR News, No. 31, March 1990)

Viruses - how to tell if your computer is infected

Around 200 computer viruses are currently known to exist, and their symptoms vary greatly. However, 95 per cent of all "infections" are caused by 12 known viruses. The most common symptoms are:

- Data loss;
- Slower than usual program load;
- Warnings, or unusual messages or characters on the screen;
- Unaccountable hardware malfunctions;
- Files disappear, or strange files appear;
- Memory and disk space drop markedly;
- Disk access is slower than normal;
- Unusual screen or printer activity;
- Drive lights come on without apparent reason;
- Changes in the size of executable files.

This last symptom is a clue to the way in which the majority of viruses work: they attach themselves to executable files, such as those with the extensions EXE, COM, SYS, PRG, OVL, or BAT. If your executable files appear to be slightly larger than they should (most viruses add 800-2000 bytes), it probably means that they are infected.
(Source: LOGON (UNDP), 16 April 1990)

Californian coup in data rates

A Californian research laboratory says it has achieved a communications breakthrough with a high-speed network that dramatically boosts data transfer rates.

The Lawrence Livermore National Laboratory says its high-speed data network improves its

researchers' access to data processed by supercomputers and could lead to widespread commercial uses.

Lawrence Livermore is planning to link over 1,700 of its scientists and engineers working on classified programs.

The laboratory says its current network transmits data at 10 million bits per second. The new version can move data at 1 billion bits per second. A representative of Lawrence Livermore said the difference in data transfer rates is the equivalent of sending 100 novels rather than two novels per second.

The computer industry is currently working on 100 mbps networks.

Ancor Communications is developing a prototype of the high speed network. If it performs according to its design, it will be expanded to link most of Lawrence Livermore's researchers.

The US Government is discussing plans to build a nation-wide high-speed network operating as high as 3 bbps to link supercomputers around the nation.
(Source: Computing, 12 July 1990)

Information retrieval

Information search and retrieval of electronic text is the next big challenge for computer software developers. Existing computer technology is well able to process data to fit into lists of structured records. Each piece of data can be stored with an index for easy retrieval and linking to other information. The situation for unorganized text is different. Computers can do little more than scan individual words, often turning up unimportant documents or passing over desired data. Despite these shortcomings, text retrieval is a \$98 million business that will grow to \$261 million by 1993, according to International Data. The area is one of intense research because a solution to the text problem will represent a major advance towards the development of computers that understand human speech. (Extracted from Business Week, 18 June 1990)

Knowledge-based software technology group

Digital Equipment has jointly formed a group to develop a new generation of knowledge-based software technology with Texas Instruments, Ford Motor, US West and Carnegie Group. The group, which is called the Initiative for Managing Knowledge Assets (IMKA), is open to other members. An investment is expected of interested organizations that want to join the group. The group says that a knowledge-based system must be able to powerfully capture and present knowledge, have high performance and be able to handle large systems, be able to be embedded into existing technology, and be capable of being distributed and accessed across multiple platforms. The group has already started developing a standards-based system that can work in heterogeneous environments. (Extracted from Computerworld, 7 May 1990)

PC-based translation system

A PC-based translation system, said to be the market's first, has been unveiled by Nestor Ltd., of Newbury, UK. The personal computer software is able to produce accurate translated text at a rate of 350 words a minute or higher, its developers said. The Globalink system is said to provide a less expensive alternative to mainframe computer-based translation systems, while still providing high

translation rates. English translations from French, German, Spanish and Russian are available. Italian and Chinese versions will be released soon. (Extracted from Communications Week, 23 April 1990)

IBM's management system

The much-anticipated integrated network management data base, or repository, for IBM's NetView management system will appear gradually over several years, but the first announcement of a stripped-down version is likely before the end of this year. IBM previously has said it intends to use the Repository Manager of its AD/Cycle development platform in conjunction with NetView. But adding the AD/Cycle Repository Manager to its NetView data base could take several years of development work. Rather than taking years to introduce a fully-fledged network management repository, IBM is more likely to roll out the integrated data base first, probably this year, and then add AD/Cycle as well as distributed data base capabilities over several years.

Customers have also looked to IBM's upcoming repository as a better vehicle for integrating and controlling non-IBM equipment on their IBM networks. Many analysts expect to see the bulk of IBM's network management repository elements delivered in 1992 or later, but many users want to wait until then to manage multi-vendor equipment through NetView. (Extracted from Communications Week, 7 May 1990)

ASIC software

CAE startup ExperTest Inc. is claiming a breakthrough in ASIC design tools with software that automatically generates test programs from behavioural and structural circuit descriptions. Cailed Test Design Expert (TDX), the new tool is aimed at breaking the ASIC test-program-generation bottleneck and shortening design turnaround time by offering an alternative to manual test-vector generation and a host of design-for-testability (DFT) strategies.

According to ExperTest, the new tool "eliminates the need to sacrifice test coverage for faster time-to-market. In addition, users are free to adopt any or no DTF strategy and still obtain quality test programs for sequential or asynchronous ASIC designs".

ExperTest is claiming fault coverage ranging from 93 to 100 per cent, depending on the complexity and type of circuit. The company has classified circuits into six types depending on the difficulty of test-vector generation. Where complexity compromises the system's coverage, the company recommends the use of design-for-test techniques to improve coverage.

Interactive versions for various design environments are in the works, beginning with those from Viewlogic Systems Inc. and the CAD/CAM Group Inc. ExperTest engineers will work with EDA system vendors to develop the procedure calls for interfacing the tools to different environments, a process that will be eased by the fact that all ATV/G tools are hard-coded in C.

The company said that marketing plans include the formation of strategic alliances with CAD vendors, ASIC manufacturers and test companies to provide customers with fully integrated solutions. ExperTest is expected to disclose alliances with several-schematic capture vendors and ATE vendors

later this year. (Extracted from Electronic Engineering Times, 30 April 1990)

Multimedia software prototype created

Researchers at Bell Communications Research Inc., experimenting with multimedia delivery of information, have created a software prototype that could revolutionize such industries as publishing and education. Tom Judd and Gil Cruz, both members of Bellcore's technical staff, have been working on the customized information delivery (CID) project for 18 months to find a way for people to deal with the flood of information bombarding them.

The new software prototype is designed to deliver text, graphics, and video or audio clips to customers through "customizing agents" that would tailor the information to suit an individual user.

Currently, Bellcore is using high-end engineering workstations to test the CID software prototype. Eventually the software will be tailored to work with personal computers and high definition television sets. (Extracted from Communications Week, 14 May 1990)

VII. COUNTRY REPORTS

Brazil

Brazilian "chip set"

Tecnologia Circuitos Integrados (Tecisa) (Brazil), a technology information concern formed by 30 companies, will invest \$1 million to have a "chip set" with Brazilian technology developed by Sid Microelectronica and Itau Componentes. The "chip set" is an integrated circuit conjunct which constitutes the miniaturization of electronic components into a small silicio pastille. For the first years of the 1990s a demand of 20k/y conjuncts is predicted. (Source: Technology Update, 21 May 1990)

Canada

Business information data base

The Canadian Chamber of Commerce has introduced a business information data base. The Chambernet data base, available through the iNet system from Telecom Canada, may eventually provide information on free trade, office technology, environmental problems, and other areas. It is based on a Canadian Bar Association data base, and lets users get hold of press releases, policy resolutions, and other documents developed by the Canadian Chamber. An E-mail service is also offered with Chambernet. Future plans include connecting the new data base with those from other government agencies. (Source: Technology Update, 14 May 1990)

China

Brief update

Significant impetus is being given to the development of Intelligent Computer Systems with hierarchical structure and knowledge processing capability. Introduction of man-machine interfaces in natural languages and software automation technology are also being taken up on priority. Application of information technology in resource exploration, weather forecast, marine monitoring, quality control in agriculture, forestry and industrial products is being taken up shortly. (Source: CCDC Newsletter, No. 2, 1 June 1990)

Costa Rica

Computer networks

The implementation of the National Academic Computer Network has been slightly delayed and is expected to be commissioned soon. The local link between Tropical Agricultural and Training Centre and University of Costa Rica is operational.

To seek further information on the development of Computer Networking in Costa Rica, please write to:

Lic. Max Cerdas
Tefe. Direccion de Informacion
CONICIT Apartado 10318
San Jose, Costa Rica

(Source: CCDC Newsletter, No. 2, 1 June 1990)

CSFR

Czech venture

The Czech and Slovak Federated Republic Ministry of Posts and Telecommunications has formed a joint venture company with Dell Atlantic and US West to build a public switched packet data network in Czechoslovakia. It will initially connect Prague, Bratislava and Brno. (Source: Computer Weekly, 28 June 1990)

European Community

EC promotes Euromethod systems design

The EC has thrown its weight behind the cause of the proposed common European methodology for systems design.

The so-called Euromethod is intended to create a common terminology and structural model with a view to harmonizing existing European methodologies such as the UK's SSADM, the French Merise and the Italian Dafne.

Support and funding for the project are coming from the EC and the Public Procurement Group, a group of senior officials from EC member states in charge of IT procurement.

A consortium of 11 European companies has been set up by the EC, all with experience of implementing, using, developing and promoting methods. The UK representative is British Telecom with the French Sema Group as the prime contractor.

Hubert Tardieu, corporate technical director for the Sema Group, said there had been initial problems in getting some European countries to accept the principle of a Euromethod as desirable, but that all were now committed to the ideal.

This phase of the project, due to be completed by the end of 1990, is intended to define the scope of the Euromethod and prepare a management plan for its development.

Meanwhile, a survey from Peat Marwick McLintock has called for UK companies to make better use of methods after it found the only significant use so far was in conventional IT systems projects.

The survey was conducted as part of the ESPRIT programme's Hector project. One of Hector's objectives was to foster interest to enable European industry to develop and then use harmonized, more advanced methods and tools.

The market for methods is set to enjoy strong growth over the next three years. Nearly 80 per cent of respondents said they planned to use methods against the 64 per cent using them now.

The survey also found people thought methods were most useful in software design and implementation. (Source: Computing, 5 July 1990)

JESSI brings forward 64-Mbit DRAM date

The JESSI consortium has brought forward its target date for producing a 64-Mbit DRAM by a year to 1994. The decision has been precipitated by a similar announcement from Siemens and IBM, two other 64-Mbit DRAM collaborators.

Just to cloud the issue, Hitachi says it has a 64-Mbit device designed in its central research laboratories. It is not exactly clear whether this is a complete device or a memory cell.

The Hitachi announcement describes a device operating off a 1.5 V internal power supply. Using what it describes as "novel low-voltage circuitry" Hitachi says the prototype device has been simulated to run at 50 ns with a power dissipation as low as 44 mW. Typical application could be a notebook size laptop computer.

The IBM/Siemens announcement of a 1994 target date has, according to JESSI president Raimondo Paletto, "given the whole JESSI timeframe a push forward." (Source: Electronics Weekly, 13 June 1990)

European R & D data bases

Data bases available through the CEC ECHO-HOST Service are:

BIOREP - Biotechnological projects carried out in the EC members (about 7,000 records).

DIANEGUIDE - Information on data bases, databanks, data base producers, and host organizations available on Direct Information Access Network for Europe (DIANE), the only on-line databank that gives the users immediate access to a wide range of information about on-line services in Europe.

Directory of Materials Data Information Sources (DOMIS) - On-line directory of information source materials and services in Europe (e.g., data banks and data bases, technical centres, scientific and technical laboratories, experts in the areas of metals, alloys and steel, ceramics and glass, composite materials, coatings and joints, plastics and rubber).

EABS - On-line version of the monthly journal Euro-Abstracts that references the published results of scientific and technical programmes wholly or partially CEC-sponsored. The data base has more than 5.0E + 4 citations dating from 1966 to the present.

ENREP - On-line directory of environmental research projects (more than 50,000 entries from over 5,000 organizations).

European Research Co-ordination Agency (EUREKA) - Detailed information on projects carried within the aegis of EUREKA.

EURISTOTE - Directory of more than 10,000 theses and studies dealing with EC policies. Information on more than 5,000 professors who are

studying the construction of Europe (coverage since 1952).

Information Exchange System-Data Collections (IES-DC) - Directory and reference service to the European information technology (IT) community. Data base comprises 2,000 projects, 1,000 resources and facilities, and 4,200 addresses. Three domains include data on:

- Publicly funded IT research;
- Network resources available to researchers in the IT domain;
- Electronic mail addresses of researchers in the IT field.

Tenders Electronics Daily (TED) - Electronic form of Series S - the supplement to the EC official journal that carries public calls for tenders from more than 80 countries, including calls for proposals for EC research projects.

Common Research and Development Information Service (CORDIS) - will take under one roof all relevant information in R & D fields from a variety of data bases; data base is expected to be operational in mid-1990.

Information on access to these data bases is available from:

ECHO Customer Service
177 Route d'Esch
L-1023 Luxembourg
Phone xx-352-488041 (ECHO Help Desk)
FAX xx-352-488040
NUA 270 44 81 12

(Source: European Science News, March 1990)

New Microfabrication Centre for JESSI

As part of its contribution to the Joint European Submicron Silicon Initiative (JESSI), the Federal Republic of Germany (FRG) Government has approved the formation of a new research institute for silicon technology. The new institute will focus on developing photo-lithographic and processing techniques necessary to fabricate silicon memory chips, with feature sizes smaller than 0.5 micrometres.

The companies currently participating in the JESSI consortium are Philips, the Netherlands; SGS-Thomson, Italy and France; and Siemens, FRG. They will provide one-half the cost of JESSI over an 8-year period ending in 1994; the remainder will be supplied by the European Community (EC) and the Governments of France, Italy, the Netherlands, and the FRG. Initial funding, set at the Stockholm conference of ministers, was 550 million European Currency Units (ECU) (\$650 million); the total cost is expected to exceed 3,500 million ECU (\$4,200 million). The objective of JESSI is to generate the fabrication technologies and production facilities that would allow Europe to be a major supplier of memory chips by 1994. The technical targets are 10-100 transistors/chip with 5 Gbits/sec.

The new institute will be located at Itzhoe in Schleswig-Holstein and will most likely be sponsored by the Fraunhofer Gesellschaft, the public corporation for support of applied research in the FRG. The Fraunhofer Gesellschaft also sponsors the existing Institute for Microstructure Techniques (IMT), which was established in Berlin with similar research objectives. Funds will be provided by the Federal and Schleswig-Holstein state Governments with FRG

industry, primarily Siemens, providing a share. Construction and major equipment costs will total DM 400 million (\$200 million) with completion of the building phase expected in 1991. Industry is expected to contribute 20 per cent in the staff and will share in salaries and costs. (Source: European Science News, March 1990)

France

Minitel

Minitel has not yet reaped bottom-line success although its telephone-data base network has been attaining popularity. The French Government has put nearly \$2 billion into the network, providing the terminals and compiling the electronic phone book. However, because subscribers just pay for time spent on the line as there is no charge for the equipment and services, France Telecom recently started mounting modernized terminals and charging a monthly rental fee. Demand for the new models, carrying various sophisticated data services, is seen as producing \$61 million/yr in revenues. Also, the recent opening of the electronic phone book and commercial-service lines to advertising is generating another \$21 million/yr. France Telecom by 1992 desires to make Minitel the data link among the single market in Europe by creating access links with Belgium, FRG and Italy. Accords are also being worked out with the Netherlands, Denmark and Ireland. Minitel has also been looking at the US, although antitrust laws and fierce competition from AT & T and seven regional telephone companies would inhibit a French-style national network. (Extracted from US NEWS, 7 May 1990)

Italy

Information systems and parallel computing programme in Italy

Under the sponsorship of the Centre for National Research (CNR), and chairmanship of Professor C. Cilberto, Chairman of CNR's Mathematical Science Committee, a proposal for a programme on "Information Systems and Parallel Computing" was written and presented for government approval in early 1989. The programme was approved and work began in June 1989 and will run for five years at an approximate cost of 9.8 billion lire/year (about \$7.5 million). The goal is to perform research in information systems and parallel computing by consortia of industrial and academic partners. Other related expenses will be about 0.4 billion lire. The industrial partners, the academic community, and CNR will supply 44.71, 37.93, and 17.37 per cent of the cost, respectively. A summary of the work plan for the areas of the programme is given in the following paragraphs.

Parallel scientific computing

In the parallel scientific computing area, three fields will be considered:

1. Research on the application of large computer systems to general interest scientific problems; e.g., structural analysis and image processing to acquire better knowledge of some natural phenomena and to improve design of high-technology products;
2. Research in fundamental parallel algorithms;
3. Provide access to mainframes in Italy, Europe, and the US, using high-speed connections and special workstations.

Special purpose processors

Co-processors and modules for image and signal processing, and co-processors and modules for artificial intelligence will include research and development of traditional chips, boards and algorithms to implement the most common functions of image and signal processing and artificial intelligence. Co-processors and systolic modules will involve developing programmable systolic systems under certain constraints; e.g., temporization and cost.

Parallel architectures

Computing systems seem to be moving towards more intensive use of parallelism, with architectures like single instruction stream, multiple data stream (SIMD), and multiple instruction stream multiple data stream (MIMD). These architectures can support the logical and functional languages of artificial intelligence. A variety of matters must be considered, including evaluating performance of a parallel computing system, interconnecting the processors, and developing fault-tolerant strategies. The research will include multiprocessors, non-von Neumann architectures, and valuation and complexity.

Future generation languages

Developing new programming languages enhances support for new methods for data processing, including concurrency, distributed computing, and new data types. Also, the increased level of abstraction has made this field interesting from a logical viewpoint. In this area, research will cover: logical, functional and algebraic languages; concurrent and object-oriented languages; and interpreters, compilers and run-time utilities.

Data base systems

The main goal is to develop advanced, user-oriented data base management systems. The required functions will include:

- Describe knowledge bases using advanced data models such as frames and rules;
- Interact with the data base using logical languages;
- Interact with multimedia data bases, with information, including text, voice and images;
- Interact with heterogeneous data bases, with different data bases connected via a network.

Fields that will be investigated include: intelligent data base systems, logical query languages, multimedia data base interaction, heterogeneous data base interaction, user-oriented methods and tools.

Methods and tools for system design

Although the design phase of a project is less automated since it is based on empirical methods, it is the most delicate and important phase in a project. The aim of this research area is to develop specification systems and automatic tools to support the analysis and the design phase and to translate the specifications into code directly executable by the computer. The fields of investigation are cognitive engineering, specification systems, and prototypes.

Systems in support of intellectual activities

The diffusion of the personal computer has led to the development of a large class of software packages for individual applications. This area of research will cover decision support systems, expert systems, and advanced individual productivity systems. The decision support systems can be useful in all the situations where the estimation of the consequences of a certain decision are to be determined. The aim of the support systems is to develop tools that allow the user to construct his own decision support system. The research in the expert systems will lead to new languages for the design of expert systems and new methods for the representation of knowledge. In advanced individual productivity systems, new methods for the development of individual productivity tools are being sought.

Support initiatives

In support of the research personnel, two initiatives will be taken: (1) support for parallel computing for organizing courses and state-of-the-art conferences in parallel computing, and conducting performance analysis of commercial parallel and vector computers; and (2) support in software engineering to build a library of standardized and unified tools for designing and producing software. (Source: European Science News, March 1990)

Trento institute seeks to produce artificial intelligence system

Trento Institute for Scientific and Technological Research (IRST) is trying to assemble the best of Italian research in artificial intelligence (IA) and to integrate the various study sectors such as artificial vision, identification of voice and language, expert systems, automated reasoning, and advanced microelectronics into a single project capable of producing the first intelligent systems. So far, a little robot is circulating in a corridor of IRST and is capable of rudimentary actions like recognizing and avoiding obstacles, performing turns, and obeying some elementary voice commands. To accelerate the pace of the project, IRST is recruiting the best researchers available and hopes to increase the number of scientists from the present 170 to 200 which is considered optimum for the operation. The IRST spent 21 billion lire (about \$16 million) in 1989. Seventy and 30 per cent was spent for research inside and outside, respectively. In 1989, IRST had 120 scientific publications in international science magazines and had co-operation projects with Xerox, Hewlett-Packard, SGS-Thomson, and Italian companies like Ansaldo, Selenia, and Aeritalia. The sale of IRST's technology brought in 1 billion lire in 1990. In 1991, IRST will open a silicon foundry complete with the most advanced equipment to develop high-integration experimental chips, a circuit integrating a telecamera and a microprocessor, neuronal networks, and voice identifiers. The object is to have a robot capable of operating in a casual environment, with a reasonable behaviour, sufficiently developed to accomplish some practical tasks. (Source: European Science News, March 1990)

India

Packet switching for data services

After debating for a long time on ISDN or Packet Switching, the Department of Telecom (DOT) has decided to go for the Packet Switching option for offering the data services in the country with proper compatibility to the emerging ISDN standards.

Also DOT is very concerned on the indigenous development of the packetswitches, PADS, network management software, etc. While intensified developments of the packet switching network components is on, the DOT is planning to initiate data services in India in a limited way at the earliest. This small country-wide network will interconnect eight major centres in the country accommodating about 1,000 users. The inter-city links will operate at 64 KBPS while the intra-city communications will support data speeds from 1,200 BPS to 9.6 KBPS. Current indications are that this network will be operational before the end of 1990. (Source: CCDC Newsletter, No. 2, 1 June 1990)

Ireland

Intel readies its Dublin silicon wafer fabrication plans

Intel is on the point of announcing when building will start on its silicon wafer fabrication plant in Dublin, Southern Ireland.

Bernard Giroud, president of Intel Europe, is expected to unveil an acceleration of the company's plans for its Irish site which were first revealed last September. Those plans are for a three phase development: the first phase is the establishment of a board assembly plant, the second is to build a wafer fabrication, and the third is to set up assembly and test facilities.

The wafer plant will take 18 months to get into production and is expected to be employing between 400 and 500 people in three years' time. When the plant is fully developed and operational it is expected to employ 1,000 people.

It is anticipated that the plant will be equipped to take the half-micron CMOS process being developed by the US chip technology consortium Sematech.

The fabrication will be Intel's second to be built outside the US. The first was its 6in. wafer plant in Jerusalem, Israel. Intel's arch-rival in the microprocessor market - Motorola - has had a wafer fabrication in East Kilbride, Scotland for over 15 years.

Intel, founded in 1968, and a \$3 billion company last year, invented the microprocessor along with many of the standard products of today including the DRAM, SRAM, EPROM and EEPROM. (Source: Electronics Weekly, 6 June 1990)

Japan

Genome use for computer

Japan's fifth-generation computer project has found its first international application in an agreement to work with the US Argonne National Laboratory to help analyse the flood of data generated in the human genome project. Under the agreement, Japanese and US scientists will jointly use computer systems from the fifth-generation project to develop techniques for handling human genome data.

The fifth-generation project is due to end next year, a decade and Yen 50,000 million (\$325 million) after its promises of a computing revolution shook foreign governments into starting artificial intelligence programs of their own. The revolution never arrived, but Japan was left with new

international standing in computer science - and in impressive set of hardware and software for parallel computing.

Two of the latest personal sequential inference machines, the PSI-II, will be delivered from the fifth-generation project's Institute of New Generation Computer Technology (ICOT) to Argonne along with supporting software and a data base management system, called Kappa. The PSI-II machines, worth about Yen 10 million (\$65,000) each, will be loaned to Argonne free of charge.

Using a high-capacity computer network link via Hawaii, Argonne researchers will be able to access ICOT's huge parallel computer, the Multi-PSI, in Tokyo to run programs. Similarly, ICOT researchers will be able to access parallel processors at Argonne's Advanced Computer Research Facility. US researchers elsewhere will be able to gain access to ICOT's machines by setting up an account with Argonne.

Apart from using the Japanese computers, the US-Japanese team will investigate the use of other computer systems to handle genome data, including shared-memory processors (such as the Sequent, Encore and BBN machines at Argonne), multicomputers like that developed by Intel, and networks of workstations. (Source: Nature, Vol. 345, 7 June 1990)

Kenya

Two new data communication projects

The Kenya Computer Institute plans to initiate two data communication projects during 1990 as follows:

Management of emergency relief services. Under this prototype project, a number of institutions involved in providing relief have been approached to participate in a network which gives access to emergency resources within Nairobi. The prototype will allow authorized institutions to broadcast messages, update resource availability, etc. This will be a basis for a more comprehensive system in the future in the area of disaster management. Organizations that so far have expressed interest are: African Medical Foundation, The Red Cross, St. John's Ambulance, Nairobi Hospital.

Another project is being initiated in agricultural computer networking, lead by Costa Rica. It is expected that this will be a joint effort between KCI, IDRC and international centre for research in agroforestry. The main objective is to connect into the CATIE system in Costa Rica. (Source: CCDC Newsletter, No. 2, 1 June 1990)

Mongolia

Communications networks

The Centre for Scientific and Technological Information provides access to international data networks in four COCOM member countries through its X.25 packet switching network. Access to data bases and electronic mail facilities are also provided. The State Bank Committee of the Mongolia People's Republic has ambitious plans to establish country-wide computer communications network. Before December 1990, a national-wide banking network is expected to become operational. Geodesy, meteorology and jurisprudence are being identified as thrust areas for immediate computer networking. (Source: CCDC Newsletter, No. 2, 1 June 1990)

Switzerland

IT expenditure

Expenditure in information technology (IT) rose 9.6 per cent to Sfr 6.57 billion in 1989 from nearly Sfr 6 billion in 1988, according to the International Data Corp (IDC), IT market research group. There was a marked trend from hardware towards software, with investment in the latter rising 17.4 per cent to Sfr 3.07 billion from Sfr 2.62 billion, and increasing its market share to 46.7 per cent. Hardware expenditure meanwhile rose just 3.7 per cent to Sfr 2.92 billion from Sfr 2.82 billion previously, taking 44.4 per cent of the market. The remaining 8.9 per cent of the market was taken up by hardware maintenance, which rose 2.9 per cent to Sfr 582 million from Sfr 566 million. Expenditure in 1990 will rise a further 13 per cent to around Sfr 7.44 billion, according to the IDC, with software investment increasing 20 per cent and hardware 10 per cent. (Extracted from *Neue Züricher Zeitung*, 4 May 1990)

USA

Network planned

A US group of companies, universities, research laboratories and Government agencies said it would develop an advanced computer network in which data would be transmitted at speeds 700 times faster than possible now. The network will start up with \$15 million from the National Science Foundation and the Defense Advanced Research Projects Agency plus over \$100 million from private companies. (Source: *Spectrum*, July 1990)

US agencies act together over viruses

Mounting concern over the proliferation of computer virus programs has united US Government agencies and large computer and software suppliers in a consortium that will develop anti-virus technology.

The consortium will involve the National Institute of Standards and Technology along with IBM, Microsoft, Lotus Development and other companies.

The consortium will co-ordinate and centralize efforts to produce anti-virus technology. Large corporations are increasingly concerned about the damage caused by virus programs.

Virus programs range from the relatively benign, which flash messages on users' screens, to malicious ones which wipe out all data on a hard disk. Anti-virus programs are available but must be continuously updated since virus creators produce new strains that are more difficult to detect.

MrAffee Associates, a company which tracks virus programs, said there is an epidemic of new types of virus programs. There are 98 different virus programs compared with 37 a year ago.

They are becoming more sophisticated and some virus strains can temporarily remove themselves when anti-virus programs search for them.

However, Microsoft and other companies will not talk officially about their involvement with the impending NIST consortium. (Source: *Computing*, 19 July 1990)

Superconducting Supercollider project

The \$8 billion Superconducting Supercollider (SSC) is coming under increasing attack as a huge drain on science resources. The 54-mile long tunnel to house the SSC would be built near Waxahachi, TX. The 40 trillion electron-volt collisions would be 20 times more energetic than those produced in any existing particle accelerator. In a poll in 1988, Sigma Xi scientific honour society found that only 2 per cent of 3,332 scientists polled favoured building SSC. By contrast, the Strategic Defense Initiative had 4 per cent approval. Preliminary plans indicated that SSC would cost \$5.9 billion, but design changes have raised the cost to \$8 billion. There are already 500 workers on the SSC staff. An environmental impact statement is due for completion soon. Congress could still cancel the project or delay it.

In addition to the objections about cost, some critics say that the SSC will be obsolete by the time it is built, since linear accelerators can be more powerful than the ring-shaped SSC. Some physicists argue that the SSC will still not have enough power to accomplish its goal of recreating conditions that exist only in black holes or in the instant after the Big Bang. Although supporters have on occasion argued that the SSC will have practical spin-offs, especially in weapons and SDI, such arguments are tenuous at best. In addition to the technical arguments against SSC, the chief arguments remain economic. Nobel Prize-winning physicist Arno Penzias says that if we take money away from university physics programmes to build the SSC, there will not be sufficient money to educate new physicists. (Extracted from *New York Times*, 29 May 1990)

USSR

Charting new territory

A 15-member delegation of Soviet science officials met members of the US high-technology industry in Silicon Valley as part of the first Soviet Silicon Summit, a conference held to establish science agreements between the two countries.

For US participants, the message from the Soviet delegation was simple: Soviet science is better than its reputation suggests but Soviet scientists need help to commercialize their inventions.

Unfortunately, Soviet scientists do not have the hard currency to pay for the help they need. They are, however, willing to sign barter agreements.

As part of planned Soviet free-market reforms, 1,000-3,000 technical co-operatives, or small laboratories, will become part of the private sector in July. That means that government subsidies are likely to be reduced or abandoned and the centres will have to earn their own keep, either by licensing their technology or by using it to create products. To succeed, the laboratories need Western technology, especially computers and semiconductor production tools. But without hard cash, they can offer only basic research, collaborations and commodities that are not in short supply.

For US companies, the idea of barter is new. Goodwill towards the Soviet Union is in good supply, but concern for the bottom line makes

"non-traditional payment" difficult. Adept Technology, a Silicon Valley robotics company, recently turned down an offer to trade 500 robots for a shipment of caviare and vodka.

Nevertheless, by the end of the summit, Soviet scientists had claimed some trading successes, albeit in more traditional veins.

A unique deal was signed with Cypress Semiconductor Corporation to manufacture Soviet-designed high-definition television and signal-processing chips in the United States. Cypress will pay fees to the Soviet Union on sales of the chips, which the company says could amount to \$60 million per year.

Other agreements are expected. Although the commercial microelectronics industry in the Soviet Union is far behind that in the West, some basic semiconductor research supported by military funds has kept pace. Soviet laboratories had 1-megabit DRAM chips in limited production before US companies first produced their initial runs of the chips in 1986. Soviet scientists claim to be ahead in certain cyclotron techniques for the fabrication of submicrometre semiconductors, some laser technologies, X-ray optics, ion sources and laser interferometry.

There are between 600,000 and 800,000 IBM-compatible personal computers in the Soviet Union, well behind the 1.1 million that the Soviet five-year plan says should be installed by now.

Atari Corporation is negotiating an arrangement to ship home computers to the Soviet Union in exchange for Soviet-made 2.6K memory chips. And Soviet officials suggested that US companies could capitalize on the Soviet Union's traditional strengths in mathematical and theoretical sciences. When supplied with modern computers, Soviet scientists have produced impressive software. (Source: *Nature*, Vol. 345, 14 June 1990)

VIII. FACTORY AUTOMATION

Proposal to integrate plant automation technologies

The proposed \$1 billion, 10-year Intelligent Manufacturing System project of Japan to integrate plant automation technologies worldwide is being criticized by US and European government officials who fear that it would merely be a "Trojan horse" for Japan to achieve global economic domination. The project was first proposed in January 1990. A consortium would supposedly be launched including companies, universities and governments. The partners would pool their resources to create a single standard for next-generation plant automation systems. Japan's Ministry of International Trade and Industry (MITI) and the Japanese private sector would provide \$600 million over the next 10 years, Europe \$200 million and the United States \$200 million. A research centre would be established either in North America or Europe. Some US companies have expressed interest, pointing out that the Administration would never provide such assistance because it is fundamentally opposed to the concept of "industrial policy". However, Rockwell International and United Technologies (both US) have already signed up for the project.

Some officials at the US Commerce Department have noted that in proposing the Intelligent Manufacturing System project, Japanese government officials and researchers for the most part

approached foreign companies directly, instead of using government-to-government channels. Some think the Japanese are deliberately avoiding government-to-government contacts because the project is structured to siphon off advanced Western technology. They point out that although Japan leads the West in overall use of industrial robots, the West is more advanced in computer software and systems integration. (Extracted from *Asian Wall Street Journal*, 7 May 1990)

A workplace wired for robots

Impact Corporation has five factories around the world, employing 5,000 people. Its business is building arms for robots, with sales of 15,000 arms, worth about £50 million, a year. Last week it had a special job: to order, design and manufacture a new type of chuck. It did this 18 times a day for three days without producing a single piece of paper.

Impact Corporation does not really exist: it was created to demonstrate the possibilities of computer-integrated manufacturing at a trade show in Tokyo, CIM Japan 90. The "factory" on show combined computers and robots from 10 different companies, to demonstrate that it is possible to run an entire business, from head office to design studio to shop floor, on a network of computers.

Companies have been working towards this goal, called computer-integrated manufacturing (CIM) for years. American companies such as the aircraft manufacturer McDonnell Douglas have demonstrated individual manufacturing "cells" that link design terminals with robots. However the organizers of the Impact demonstration claim it was the first time that anyone has integrated all the functions of a manufacturing corporation with computers.

The project involved some 15 companies, including the computer makers IBM, Inisys, Fujitsu and Hewlett-Packard and the robot and machine-tool makers Omron, Hirata and Toyoda. Different pieces of equipment talked to each other in several computer languages, through an Ethernet link connecting offices and factories, and local area networks in design studios and sales offices. A set of codes called Manufacturing Automation Protocol, which most of the world's machine-tool makers follow, controlled the robots.

The company behind the whole project, Toyo Engineering, says it took 18 months to set up the Impact display. If the IMS project succeeds, organizing a similar display in future will be as easy as plugging a few domestic lamps into the mains. (This first appeared in "New Scientist", London, 28 July 1990, the weekly review of science and technology)

Robots bone up on operating techniques

A surgical robot, "Robodoc", carried out its first operation in the US this month when it was used to grind a leg bone very precisely to replace the hip of a dog with severe arthritis. The robotic arm, developed by scientists at the University of California and IBM, should be ready to conduct surgery on humans after another year of development, the scientists say.

Robotic devices have been used for some time to position tools for surgeons, but this is the first time one has been programmed to actually do the cutting, according to Hap Paul, a researcher at the University of California's Davis School of Medicine and the veterinarian doing the surgery.

Under an agreement between Paul and IBM, all dogs that are used to develop the machine are in need of surgery. In the first stage of the operation the doctors inserted steel reference pins into the dog's leg to help the robot to position itself for cutting. Paul then studied scans produced by computer tomography so that he could feed this information into a program called "Orthodock", which will tell him the best position for the artificial joint. He then programmed the computer controlling the robot with this optimum orientation for the joint. The robotic arm, guided by its computer, then cut a hole in the bone using a sharp, rotary tool.

"The robot is very steady and we are able to program the robot with the exact dimensions of the prosthesis so that we get a perfect match to the bone impossible to do manually", Paul says. A tight fit with the bone should improve the stability of the implant, reduce pain after surgery, and encourage the bone to grow round the implant more quickly, he adds.

Paul estimates that surgeons carry out more than 160,000 total-hip replacements on humans each year in the US, and that a comparable number take place in Europe. About 1,000 conventional hip operations are carried out each year on dogs with hip problems, he estimates.

Paul believes many other operations could benefit from the surgical precision of the robot.

A group of companies planning to build a robot to perform brain surgery looks set to receive funding from Britain's Department of Trade and Industry. The robot would be controlled by an expert system, software programmed to draw on the knowledge of surgeons. The expert system would plan the operation from a series of scanned images of the brain, although a surgeon would oversee the operation itself.

The robot could operate close to vital areas of the brain where a human surgeon may not be prepared to take the risk, its developers claim. Also, it need cut a hole only a few millimetres in diameter to conduct its operation, whereas a human surgeon would need to remove several square centimetres of skull.

The group includes Fulmer Research, an automation company called SAC Hitec, Imperial College and the London Human Computer Interaction Centre. (This first appeared in New Scientist, London, 23 June 1990, the weekly review of science and technology)

IX. STANDARDIZATION AND LEGISLATION

Standardization

"Houston 30" to act on standards

A group of top US corporations and Government agencies have banded together in response to dissatisfaction with the computer industry's standards-setting process.

The group is called the "Houston 30" after a recent meeting of 30 top US corporations and Government organizations in Houston, Texas. The group issued a statement saying that its aim is to "identify user requirements that are common across multiple industries, so the requirements can be fed into the standards process".

The Houston 30 could have a significant effect on which technologies and products become computer industry standards. Its members include Eastman Kodak, Nasa, McDonnell Douglas, Du Pont, General Motors and General Electric. These companies are major buyers of computer products and could collectively influence the direction of the world's computer industry. Their representatives have in the past expressed disappointment about the large number of computer companies involved in setting computer standards.

The Open Software Foundation says it welcomes the formation of the Houston 30. Chuck Reilly, vice-president of operations at OSF, said: "The critical factor in open systems computing is not technology for the sake of technology. Nor is it competition among standards organizations. It is meeting the needs of users. That is the basis of OSF's mission as an organization".

OSF is developing a competing version of AT&T's Unix operating system called OSF/1. But OSF has been criticized for being dominated by large computer manufacturers, many of them, such as IBM and DEC, with big investments in proprietary operating systems. (Source: Computing, 5 July 1990)

Push for data services standard

Pressure for new broad-band data communications services on public networks is expected to lead to a draft European protocol and services standard by the end of the year.

ETSI, the European Telecommunications Standards Body, is studying the interconnection of private local area data networks over wide area public networks called metropolitan area networks (MANs).

The aim of the work is to produce a protocol and services standard in time for Europe's public telephone operators who plan to build networks next year.

This follows work in the United States that has produced proposals for a networking protocol and a services and tariffing format for the new services that will offer users high capacity (150-Mbit/s) LAN interconnections over the public telephone network. The first MAN products will be available in the US this year and European manufacturers Siemens and Alcatel plan to offer MANs in Europe next year.

The pressure is now on ETSI to draw up a European standard before operators start building networks using the US specification.

The networking protocol ETSI is expected to opt for the US IEEE 802.6 standard based on an architecture developed by the University of Western Australia.

This system is preferred to the alternative fibre distributed data interface (FDDI) implemented in private networks, but is less suitable to public fibre networks, which will eventually evolve into broadband ISDN - integrated services digital networks.

According to one ETSI member, the interconnection protocol is likely to be less of a problem than agreeing a standard for services and tariffs along the lines of the switched megabit data service (SMDS) developed by Bellcore for the US "baby" Bells. (Source: Electronics Weekly, 20 June 1990)

Definitions of electrical standards

More precise definitions of electrical standards is needed. The ampere is defined as the constant current that in two parallel conductors of infinite length and negligible cross-section, would produce a force of 0.0000002 newtons/m. Although current balances can measure current to an accuracy of 6 ppm, measurements better than 1 ppm are now needed. More precision can be obtained by taking advantage of the Josephson effect and the quantum Hall effect. These effects allow measurement of electrical properties in terms of the elementary electrical charge and Planck's constant. Josephson junctions allow for better measurement of voltage. The Hall effect allows for precise measurement of voltage with semiconductor, rather than super-conductor devices. With lasers and optical interference techniques, capacitance can be measured with an accuracy of one part in a billion. A moving coil apparatus has now been developed to derive measures of the watt from mass, length and time. Current, voltage, velocity and force can all be measured to a few parts in 100 mil with the moving coil apparatus. This is a hundred times better than was possible with the old current balance device. All electrical calibrations by national laboratories will now be made on the same basis, as of January 1990. (Extracted from *New Scientist*, 5 May 1990)

Standards bodies look East

Eastern European countries are expected to play a new role in the formulation of pan-European standards including the work of ETSI, the European telecommunications standards body.

The European Commission will make proposals in a Green Paper to open the way for greater participation by East European countries such as Poland and Hungary in the setting of European standards.

A member of the EC confirmed that there was a general feeling that opening up the standards process and changing from the current position of complete exclusion was inevitable. All that must now be decided is the degree of involvement for Eastern Bloc countries, i.e. whether they are given full membership in standards bodies, such as ETSI or as seems more likely, participation as observers leading to full membership in the future.

With the building of modern digital telecommunications networks considered vital for the future economic development of Eastern European countries, ETSI's work in drawing up standards for mobile communications and high-speed data networks is prompting considerable interest from administrations and companies in the Eastern Bloc.

Michel Carpentier, director general of DG XIII, the EC's telecoms directorate has indicated that he favoured greater East European involvement in the standards process and that the matter was now receiving serious consideration.

The EC proposals will involve all European standards processes including CENELEC, the electrotechnical committee, CECC for electronic components and ECMA for computers and networking.

The issue of how far East European membership should go will take into account the diverse needs of the countries involved and the effect these needs will have on already heavily over-worked standards bodies.

The European Commission will make its recommendations, which must then be considered by ministers before action can be taken. This process is unlikely to be completed before the autumn. (Source: *Electronics Weekly*, 13 June 1990)

Legislation

EC compromises on copyright

Two years of discussions looked set to end in compromise when the delayed report on software copyright protection finally reached the European Parliament.

The report details 18 amendments to the proposed legislation on the legal protection of computer programs in an attempt to reconcile the opposing views on the issue.

The moves received a lukewarm welcome from the Business Software Alliance, one of the driving forces behind the Software Action Group for Europe which has bitterly opposed any relaxation of the copyright laws.

A representative of SAGE in Brussels admitted the end result was unlikely to completely satisfy the arguments of either side in the debate.

It is now over two years since the drafting of the directive in its original form began, with the twin areas of decompilation and reverse engineering emerging as the main stumbling blocks.

The majority of EC countries have called for stricter rules on access to source code, although the UK has argued for a so-called fair use principle under which reverse engineering would be allowed provided it did not affect the owner's normal exploitation of a program.

The amendments proposed by the legal affairs committee take a less restrictive line on interoperability and reverse engineering, but with certain specific constraints. Any information obtained could not, for example, be used to market a substantially similar computer program.

The BSA fears the amendments would allow companies to ignore agreements not to duplicate work. (Source: *Computing*, 12 July 1990)

X. RECENT PUBLICATIONS

Macrothesaurus - work to start on fourth edition?

Recent discussions between the Executive Secretary of ACCIS and officials of the Organization for Economic Co-operation and Development (OECD) hold out hope of a late-1990 start for work on a fourth edition of the Macrothesaurus for information processing in the field of economic and social development.

Readers will remember that the third edition of the Macrothesaurus was published in 1985 by the United Nations, with the stipulation that OECD would retain the copyright. The fourth edition would be prepared and published by OECD, which would also be responsible for maintenance and management of the data base from which the Macrothesaurus is published.

A steering committee, yet to be appointed but to include members from outside as well as within OFCD, will help the Organization formulate plans for

the fourth edition. (Source: ACCIS Newsletter, Vol. 8, No. 1, May 1990)

ACCIS on ERIC

The ACCIS guide to United Nations information sources on the environment is the latest in a series of ACCIS publications to be made available on microfiche by the US-based Educational Resources Information Center (ERIC).

ERIC is an information network that provides access to education-related literature, and documentary information it considers to be of potential use in the development of more effective education programmes. ERIC services include the ERIC Document Reproduction Service (EDRS), which sells non-copyrighted ERIC documents in both microfiche and paper form, and 16 specialized clearing houses located in universities and professional societies.

The environment guide is being handled by the ERIC Clearinghouse for Science, Mathematics and Environmental Education (ERIC/SMEC), which is based at Ohio State University. In addition to making the full text of the guide available in microfiche form, the clearing house is also responsible for acquiring, evaluating, cataloguing, abstracting and indexing the information it contains. ERIC information is published in the network's journals of abstracts, Resources in Education (RIE), and Current Index to Journals in Education (CIJ). It may also be accessed through the ERIC data base, available on-line through a number of vendors and also on CD-ROM.

For further information on the microfiche version of the guide, or other ACCIS publications available through ERIC, contact: ERIC Document Reproduction Service, 3900 Wheeler Avenue, Alexandria, VA 22304-6409, USA. (Source: ACCIS Newsletter, Vol. 8, No. 1, May 1990)

ADONIS to start commercial operations in 1991

The ADONIS electronic document delivery system has successfully passed through a two-year trial period and, it is hoped, will start commercial operations in 1991.

Results from the trial, according to the consortium of major publishers, of which ADONIS is composed, cut document delivery costs in participating libraries in half. Of this, most was accounted for by savings in staff time. Perhaps not surprisingly, accessing and printing out articles on CD-ROM was found to be more efficient - and less fatiguing - than finding printed journals on the library shelves and physically carrying them to the photocopier. Storage requirements were dramatically reduced.

Encouraged by the trial's positive results, the ADONIS board plans to introduce a commercial service starting with journals published in 1991. The publishers of 400 journals are now being approached to allow their titles to be included.

Libraries will need ADONIS workstations, which in the trial phase consisted of a PC with 40Mb hard disk, high resolution monitor, CD-ROM drive and laser printer. As a result of suggestions made by staff who participated in the trial, certain refinements will have been made to this configuration by the time commercial operations get under way.

Participating libraries will agree to operate under specific site licences, rather than on the

basis of copyright law. They will pay what is described as a modest annual subscription. Royalties will be paid on use of the service at two levels - lower for libraries subscribing to the print version of the title, higher for those that do not. They will be based on the automatic recording of the ADONIS number for articles printed or transmitted over a network; simply viewing articles on a screen will not attract royalties.

Publishers will each set their own fee, which ADONIS will collect on the publisher's behalf. The intention is to deliver disks within two weeks of the appearance of the printed issue. (Information source: Information Media and Technology, Vol. 23, No. 2, March 1990.) (Source: ACCIS Newsletter, Vol. 8, No. 1, May 1990)

World Media Handbook

The United Nations Department of Public Information (DPI) is launching a directory of selected media and related data covering almost 70 countries.

Intended as a handy reference tool for United Nations information officials and other media-related specialists, the World Media Handbook, as the publication is entitled, integrates a wealth of data not previously available from any other single source.

The 300-page Handbook contains demographic data and communication statistics, laid out in a concise format. It provides a list of more than 650 newspapers, 700 magazines and other periodicals, 100 news agencies, some 350 broadcasting organizations, and 150 journalists' associations, as well as more than 150 educational institutions that teach communications. Each entry incorporates: the names of leading editorial personnel; mailing addresses; telephone, telex and fax numbers, circulation figures and frequency of publication.

Limited space meant that a maximum of 15 newspapers and 20 magazines and other periodicals could be included per country. The Handbook will be updated every two years; it is expected that the 1992 edition will contain entries on an additional 96 countries.

The World Media Handbook, price \$US 38, will be on sale at the United Nations Bookstore.

IFLA Newsletter for Latin America and the Caribbean

A Newsletter whose first issue has just been published by the Regional Office for Latin America and the Caribbean of the International Federation of Library Associations and Institutions (IFLA/LAC) aims to provide a channel of information and communication for information professionals in the area. It will also keep them informed on IFLA activities.

The bilingual (Spanish/English) periodical was launched at a meeting of IFLA/LAC's Permanent Committee in Sao Paulo, Brazil, in March 1989. Contributions from information professionals are being sought, in the form of news on libraries and information services.

Further information on the Newsletter can be obtained from the IFLA Regional Office for Latin America and the Caribbean, c/o FEBAB, Rua Avanhandava 40 - cj. 110, 01305 Sao Paulo SP, Brazil.

DUNDIS - new edition published

ACCIS has just published the fourth edition of the Directory of United Nations Data Bases and Information Services. The new, updated edition contains information on 872 computerized data bases and information services managed by 39 United Nations bodies and organizations. This represents an increase in coverage of more than one third over its predecessor, published by ACCIS in 1984. While some of the data bases and information services listed have existed for a number of years, many are new; the majority of the new entries are data bases.

The Directory explains which data bases and information services are available, what kinds of information they contain, and how to find out more about them. Entries are arranged in alphabetical lists, under broad subject categories. This new arrangement responds to a need, frequently expressed to ACCIS, for an easy-to-use list of United Nations system data bases and information systems/services. Subject indexes in French and Spanish, as well as English, are included.

The Directory of United Nations Data Bases and Information Services (ISBN 92-1-100349-0) costs US\$ 40 and is available from United Nations Sales Sections in Geneva and New York.

Mobile Information Systems

A new book published by Artech House looks at the latest innovations in information technology which promise to prevent traffic jams, make air travel more efficient, and make the commuting or travelling executive more productive while on the move.

Mobile Information Systems investigates the technology behind the satellite data link for trans-oceanic communication during air travel, as well as the "intelligent car", whose electronic co-pilot can give travel directions and warn the driver of impending collisions.

As well as covering current systems, the book includes case studies which give details of mobile information systems in the pipeline. These include Prometheus - an effort by European car manufacturers to standardize the interfaces of various automobile information systems - as well as CARIN (Philips' compact disk navigator - featured in the ACCIS Newsletter in May 1988). A 498-page hardcover, the book (ISBN 0-89006-340-0) costs £55.

Online Information in Europe

Published by the European Association of Information Services (EUSIDIC), this book aims to give a comprehensive description of the electronic information community, its preoccupations, its background and its areas of controversy.

Topics addressed by author Baudouin Durieux in the course of the 176-page "flexicover" include the on-line market, the data base industry, demand for information, information personnel and intermediaries. Also covered are topical issues such as artificial intelligence, national information policies, CD-ROMs, and legal aspects of information.

Aimed at those who need an introduction to the electronic information scene, as well as the more knowledgeable reader, Online Information in Europe (ISBN 0-906518-01-6) was published in October 1989 and costs £35. EUSIDIC members qualify for a reduced price of £20. For further information or orders, contact EUSIDIC, 9A High Street, Calne, Wiltshire, UK, SN11 0BS.

Telecommunication disasters, and how to recover from them

The last decade has seen a number of major disasters in the field of telecommunications. Disaster Recovery Planning for Telecommunications is a new book aimed at managers who are now asking how they can safeguard their companies' telecommunication and computer networks against natural disaster, sabotage and human error. Leo A. Wrobel, the author, draws on his experience as founder of the USA's first telecommunication recovery service company to advise on identification of a system's vulnerabilities and prescribe risk avoidance measures.

Published in hardcover by Artech House, Disaster Recovery Planning for Telecommunications (ISBN 0-89006-460-1) is scheduled for publication in July 1990, at a price of £39.

World Bank educational materials catalogue

The storehouse of economic and social information amassed by the World Bank in its 45 years of development work has formed the source material for a range of educational materials, produced by the Bank's Development Education Programme. Details are now available in a 1990 Catalogue of Educational Materials.

Designed for use in teaching economics, geography, global issues, international affairs, social studies, and world history, the materials have been researched and written by education specialists. Tests and evaluations have been carried out in classrooms in a number of countries.

The materials include the Development Data Book, an overview of the developing world which uses maps, charts, tables and text to help students master five important statistical concepts used to measure economic and social development. Multimedia kits and poster kits use case studies to provide a realistic look at economic development; they cover such subjects as a canal project in India, small-scale industries in Kenya, and the effects of rapid urbanization on the culture, economy and resources of a country such as Indonesia.

Containing further details on these and other World Bank educational materials, the catalogue can be obtained from: World Bank Publications, P.O. Box 7247-8619, Philadelphia, PA 19170-8619, USA.

How to Prepare, Edit and Produce Documents

Anyone who is ever called upon to write articles, prepare reports, present conference papers, edit journals, organize seminars or publish proceedings will be interested in a new book by Dorothy Anderson.

A guide to information sources for the preparation, editing and production of documents directs the reader to published sources on document preparation and provides a practical framework for authors and editors who are planning publications.

At £22, the guide is available from: Gower Publishing Company Ltd., Gower House, Croft Road, Aldershot, Hampshire GU11 3HR, UK (Tel.: +44 252/331 551; Fax: +44 252/344 405).

INMARSAT proceedings

Proceedings of the International Conference on Mobile Satellite Communications, which was held in June 1989, have been published by Blenheim Online Publications. These compiled presentations from the 10th INMARSAT Conference explore the latest

technical developments and applications and also consider trends which may develop in the future.

Intended for use by oil companies, avionics companies, PTTs, regulatory agencies and equipment manufacturers, the publication (reference 89cmc00) costs £95 or \$US 170. It can be ordered from the publisher at either of the following addresses: Blenheim House, Ash Hill Drive, Pinner, Middlesex HA5 2AE, UK; or Old Post Road, Brookfield, VT 05036, USA.

Data security measures

Many computer systems are less secure than they should be, because the suppliers of data processing products have not made available to their customers those functional characteristics needed for adequate security at reasonable cost.

This alarming claim opens an article by Robert H. Courtney, Jr., which outlines measures to help organizations whose very survival depends upon their data being accurate, timely, complete, available - and in some cases confidential - to improve their data security.

"Factors affecting the availability of security measures in data processing system components" looks at the security products market, relationships with vendors, and the support of US Government agencies and boards in computer security. Copies can be requested from the author: Robert H. Courtney, Inc., Box 836, Port Ewen, NY 12466, USA (tel.: +1 212/914 338 2525).

VDUs and health

"The visual discomfort experienced by many VDU users must be recognized as a health problem", states the World Health Organization (WHO) in a report on VDUs and workers' health.

Staff at the Organization's Geneva headquarters were the guinea-pigs in a two-year study, the results of which were the basis for the report's comments on the health risks of visual display unit (VDU) use.

The report makes a number of recommendations - mainly ergonomic - concerned with posture, rest breaks, training, lighting, etc. It is available from: Distribution and Sales, World Health Organization, 1211 Geneva 27, Switzerland.

Security of information data by T. Daler, et al.

Intended to increase awareness about the need for information security in a highly computerized society. Written for managers and others with an interest in information technology. The authors present a brief survey of fields relevant to information security. Topics included range from computer crime, privacy and "hacking" to industrial espionage. Examines security measures which may be employed, and contains advice for those new to computer security. For computer and management related collections.

Contents, abridged: Why do we need computer security? Threats and hazards. Responsibility. Risk assessment. Training and motivation. Selective protection and classification. Supporting utilities and computer operation security. Logical access control. Other areas for computer security. Legislation on computer security. Index. New York: Halsted Press, 1989, 133 p, \$47.95, ISBN 0-470-21381-7.

Systems software: an introduction to language processors and operating systems by Frank Maddix and Gareth Morgan.

Note: An introductory text focusing on assemblers, compilers, interpreters and operating systems. Emphasizes applications of systems software and its relevance for users and software developers. Geared to those in computer science and information technology, the book bridges the gap between introductory computer texts and more advanced texts on compiler and operating system design. Contents, abridged: Why study systems software? Principles of programming languages. Compilers: function and purpose. Linkers and loaders. Interpreters and fourth-generation languages. Introduction to operating systems. Controlling the machine. Some real systems. System services. System utilities. Current and future developments. Index. New York: Halsted Press, 1989, 234 p. \$49.95. ISBN 0-470-21422-8.

Using Microcomputers: A Complete Introduction by H. L. Capron and Ralph E. Duffy.

Note: An introductory text that covers micro-computer literacy topics. Offers hands-on instruction in three popular commercial software packages: Lotus 1-2-3, WordPerfect, and dBASE III Plus. Also covers advanced topics including desktop publishing and data communications. For public and college libraries.

Contents, abridged: The microcomputer revolution. The disk operating system. Introducing word processing. Introducing spreadsheets. Data base management systems. Business graphics. Data communications. Other important software packages. Index. New York: Benjamin-Cummings, 1989, 548 p. \$25.56, ISBN 0-8053-0461-4.

Data Base Systems Engineering by R. P. Whittington.

Note: An introductory text for undergraduate students, postgraduate conversion-course students, and information systems professionals. Explores the principles and practice of data base systems development and management as well as providing a coherent presentation of data base concepts within the broad framework of information systems engineering. Includes topics such as relational models of data bases, DBMS principles and implementation, and the practicalities of selecting the logical, structural, and physical design of data base systems. For computer science collections. Contents, abridged: A history of data base technology. Data base management systems. The relational model of data bases. The navigational model of data bases. Data base system development. Logical design. Physical design. Summary and predictions. Index. Oxford: Clarendon Press, 1988, 430 p. \$32. ISBN 0-19-859672-3 (paperback).

Security Mechanisms for Computer Networks by Sead Muftic.

Note: Represents the findings of the European Communities project "Security Mechanisms for Computer Networks" (1985-1988). The investigations include design of network security architecture in the open systems interconnection (OSI) environment, network protection systems, protocols, rating and verification of security mechanisms. Includes an 8-page reference list. A good addition to computer science collections. For large public, government and academic libraries.

Contents: Introduction - an overview of security architecture for OSI model networks.

Applications of cryptography and key management techniques. Entity identification and authentication mechanisms. Entity authorization and access control mechanisms. Mechanisms for protection of data in transfer. Data base security in computer networks. Protection for distributed systems management in the OSI environment. References and literature. Future directions. Index. New York: Halsted Press, 1987. 195 p. \$47.95. ISBN 0-470-21397-6.

Van Nostrand Reinhold Dictionary of Information Technology by Dennis Longley and Michael Shain.

Note: Third edition has been expanded to include coverage of important new fields like desktop publishing, computer security, increased adherence to standards (particularly in telecommunications), banking networks, expert systems, open systems interconnections, cellular radios, etc. This reasonably priced dictionary is recommended for public libraries, college, and research library reference collections. New York: 3rd edition, Van Nos Reinhold, 1989, 566 p. \$22.95, ISBN 0-44-223685-9.

XI. SPECIAL ARTICLE

R&D programmes for information technology

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Countless national and international programmes aimed at mobilizing researchers and engineers in all information technology activities were drawn up in the 1980s (table). The "Fifth Computer Generation" programme set up by Japan in 1981 was followed by about 20 other national programmes. In the United States, the Strategic Defense Initiative (SDI) and in Europe, the EUREKA programme, although not specifically concerned with information technology, include major sections referring to it.

This has led to a certain amount of confusion. By participating in several programmes, one "actor" (firm, university, agency, etc.) can be involved in several different forms of co-operation, each involved with its own cluster of partners, which often overlap. For instance, a United Kingdom firm might well be simultaneously involved in the national Alvey programme, the European ESPRIT, RACE or EUREKA programmes and the United States SDI programme. Meanwhile, it may well have concluded bilateral agreements with other firms, whether European, American or Japanese. In each case, different procedures will be followed to deal with such important fields as intellectual property.

The absence of common rules has serious implications, since the outcome of the co-operation - the exploitation of potentially crucial research findings - must be shared on an equitable basis. When the project is concluded, it must be possible to measure individual inputs and benefits: for instance, a line must be drawn between the knowledge and expertise initially supplied by each participant (the "background") and the results of the shared work (the "foreground").

This distinction becomes even more blurred when the partners are reluctant to disclose the extent of their skills in detail for the simple reason that they do not want to reveal too much to potential competitors. In Japan, firms taking part in R&D projects have been known to keep information about

their background knowledge in sealed envelopes to be opened only in the event of disagreement over the allocation of results.

Research and results

The procedures used for sharing out the results are of vital importance for determining the patent rights or potential licensing rights of each party concerned. The range of approaches used in different national and international programmes is therefore likely to lead to conflict.

This is compounded by the fact that programmes are still evolving. At the start, most were part of a strategic plan for advanced research. Knowledge and research means were pooled among teams of researchers from private firms, university or public laboratories in order to acquire basic skills in a new technological field. The aim was to move ahead in a generic technology (micro-electronics, for example) without any specific commercial outlets in mind at the start. Research was "pre-competitive".

In the past four or five years, co-operation has been increasingly directed towards closely market-related results. The EUREKA programme is one example, as is the new stage in the Alvey programme. Consequently, the economic stakes are much more visible. And so are the difficulties in sharing out research findings.

Convergence and differentiation

At first sight, many of the major research programmes in the information technology field seem to have very similar objectives. But this should come as no surprise. Their main lines are defined by the principal technology trends or "technological landscape", in which each programme is attempting to find its place.

But in reality things are more complex. In the four main fields of information technology - micro-electronics, data processing, telecommunications, computer-integrated manufacturing - and from one programme to the next, there is indeed a common core: the importance of mastering a basic technology. Once that is acquired, different degrees of autonomy and specialization can be exploited.

Microelectronics

Microelectronics is a good example of this duality. There are currently three main features common to all programmes: steadily smaller, and thus denser, chips - which, thirdly, are becoming less costly to buy but more expensive to manufacture since the capital investment required is constantly increasing. The targets, such as more advanced circuit integration, technological improvements in semiconductor design and fabrication and in silicon and gallium arsenide applications, remain unchanged although they may be affected by the means used to achieve them. The choice of technological strategies is therefore fully governed by the weight of techno-economic factors.

In this context, the different countries have a certain amount of leeway on the type of product they wish to develop. Japan has opted for the production and marketing of mass-manufactured standardized components for the consumer goods industry. The United States has entered the field of sophisticated components with special applications (weapons, space, etc.). On the other hand, the range of objectives aimed at under the ESPRIT programme

from microelectronics to advanced data processing and knowledge (artificial intelligence) - suggest that it is still too early for such sophisticated choices to be made in Europe.

Data processing

Organization methods, rules and data processing software are changing from one day to the next. Attempts are being made to increase overall computer performance by taking advantage of the improvements in unit components. Applications offered by artificial intelligence are also promising. As a result, potential data-processing applications are taking an entirely new turn with expert systems (intelligent machines), intelligent robots and speech recognition. Each of these must be mastered by anyone wishing to remain competitive in future, if only to be able to take full advantage of the diffusion of new products as soon as they come on the market.

Japan was the first country to enter these activities. Whereas the United States is forging ahead in defence (with the SDI programme), Europe is trying to cover artificial intelligence applications through the research projects connected with ESPRIT and EUREKA.

Telecommunications

The current tendency is for the digitisation of transmission systems and time-switching and the development of opto-electronics as a new transmission process. Whether in Japan's INS programme or the European RACE programme, the major objective seems to be the establishment of integrated services digital networks (ISDN) that will in future meet the requirements of all users (firms, services, administrations and consumers) by carrying sound images and texts at very high speed and very low cost.

Europe is making a special effort in this direction since its ambition to acquire and introduce new technology is set against the prospect of the Single Market in 1992. Alongside research it aims to develop standardization and harmonization procedures, which are likely to pose difficult problems at the end of the current period of transition. Indeed, certain countries, such as Germany and France, have already launched the first stages in their ISDN networks.

Computer-integrated manufacturing

Automation and industrial computing are paving the way towards a two-fold change: a marked increase in production capacity, and a broader variety of products. They are based on numerical control machines, industrial robots, computer-assisted design and manufacturing systems and visual tactile recognition devices. In short, they are vital for the future of industry and structural adjustment of the economy.

The number of programmes using these technological developments reflects this trend: the Japanese JUPITER programme, the United States ICAM (Integrated Computer-Aided Manufacturing) under the Defense Department or the MAP project (launched by General Motors), the German programme *Fertigungstechnik*, completed in 1987, various sub-projects under EUREKA, BRITE and ESPRIT, and so on. Most of these aim to improve the diffusion of new applications while developing a specific national asset. The technological lead of the United States and Japan is being matched by the European strategy of alliances and groupings with a view to preventing technological dependence. In most European countries (Germany, France and the United Kingdom in particular) research is being supplemented by programmes aimed at promoting the diffusion of the new technology).

The old and the new

Information technology programmes are helping to finance and organize research and development but, as a rule, they are not confined to R&D. Most include sections on the diffusion and exploitation of results.

That the "old" can hamper the dissemination of the "new" in technological systems largely explains why this aspect is a cause for concern. In telecommunications, the co-existence of different generations of equipment presents acute difficulties in using them together, especially since the equipment has a long service life: by the year 2000, 50 per cent of switches will still be electro-mechanical. In software, it is very difficult to make the computer "architectures" of the 1960s and 1970s compatible with those of today. In robotics, 90 per cent of the systems now sold must be specially designed so that they can be used with equipment made 10 or 20 years ago.

An active policy of standardization must therefore be pursued, especially as it largely concerns network technology. In telecommunications, therefore, programmes such as RACE focus heavily on this aspect.

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The co-existence of old and new raises problems of staff training and patterns, thinking and behaviour. Over and above the training of skilled personnel - obviously a vital element in future progress - society as a whole must be prepared to meet the challenges and constraints of an increasingly computerized civilization by closing the gaps that would create further obstacles, by enabling each person to take advantage of new possibilities at work and at home as well as in his or her leisure pursuits and by making sure that the price paid for the inevitable adjustments does not penalise some groups more than others. (This article is reprinted from *The OECD OBSERVER*, 159, August-September 1989)

Table TECHNOLOGICAL OBJECTIVES OF SOME LARGE PROJECTS				
Country	Programme	Financing	Targets	Dates
EEC	ESPRIT	50% EEC	Micro-electronics Software Advanced Information Processing CAD/CAM ¹	1984-94
	RACE	50% EEC	ISDN ²	1987
Europe ³	EUREKA	<i>ad hoc</i>	Robotics Telecommunications Micro-electronics	1985-
France	PAFE	Variable	Semi-conductors CAD/ISDN	1983-87
Germany	MP	40% government	Sensors Components	1985-89
Japan	ICOT	100% government	Artificial intelligence ISDN	1981-91
	INS	100% government	ISDN	1982-
	JUPITER SIGMA	Variable 100% government	Robotics Software	1983-91 1985-
	VLSI	Government/ industry	ISDN	1976-79
	SUPER-COMPUTER	100% government	Semi-conductors Software Architectures	1981-85
Netherlands	INSP	100% government	Office automation CAD/CAM Micro-electronics Telecommunications Software	1984-88
Norway	ACTION PLAN	Variable	General development	1987
Sweden	TI	Variable	General development	1987-
United Kingdom	ALVEY	50% government	Semi-conductors ISDN	1983-88
United States	ICAM	100% government	CAD/CAM	1977-85
	MCC	100% industry	Software ISDN/CAD Data-bases	1982-
	SCP	100% government	Semi-conductors	1985-93
	SDI	100% government	Artificial intelligence Software Sensors	1985
	SEMATECH	Government/ industry	Semi-conductors	
	SRC	100% industry	Micro-electronics	1982

¹Computer Assisted Design and Manufacturing.
²Integrated Systems Data Network.
³The EUREKA programme involves both EEC and other European countries.

