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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

19931

MICRO-ELECTRONICS MONITOR

Issue No. 38

November 1991

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I. NEWS AND EVENTS

Sixth generation computing

Officials from Japan's Ministry of International Trade and Industry (MITI) were in Washington to sound out the possibility of US participation in a major government-industry project MITI plans to launch next year: a programme to develop a new generation of computers that will mimic the human brain.

The New Information Processing Technology (NIPT) project, known informally as the sixth-generation computer project, will replace Japan's fifth-generation computer project after it ends next March.

Tension over the project first arose last year. MITI made a number of discreet overtures to US researchers and representatives of US companies about whether they would be interested in collaboration on the project.

Those negotiations could take a long time. The only other major project to come under the agreement's umbrella is MITI's proposed Intelligent Manufacturing System (IMS) project. MITI has been seeking US support for IMS for more than a year, and so far the two countries have done no more than agree on the "terms of reference" for a feasibility study that has not yet begun.

NIPT will focus on massively parallel computer processing and, in particular, neutral network computers and optical computers. MITI is expected to spend about $30-40 million a year over ten years.

Taizo Nishikawa of MITI's Industrial Electronics Division says that unlike the fifth-generation project, which concentrated on one objective, the sixth-generation project will be a research programme consisting of several projects by a number of different research groups both in Japan and overseas.

The next step in the US-Japan negotiations on the project will come in July, when the two countries meet in Tokyo for working-level talks on the science and technology agreement. No decision on US participation is expected before MITI submits a budget request for the first year of the project in late August. (Extracted from Nature, Vol. 351, 30 May 1991)

US information service assists in locating partners in developing countries

For companies seeking partners in developing countries, TIPS is the vehicle to assist them. An information service of the United Nations Development Programme designed to expand technology and trade transactions of developing countries, TIPS offers daily bulletins in different sectors, and a query service to match supply and demand.

The sectors covered are agro-industries, biotechnology, building materials, business opportunities, chemicals, electronics, energy, fisheries, food processing, machinery, mining, packaging, pharmaceuticals and textiles.

TIPS maintains a database containing more than 35,000 records of South offers and requests. Its national offices, which are in daily contact with companies, are based in countries that represent more than two thirds of the population of developing countries. Thus, TIPS opens a window to a very large market.

Firms wishing to have their requirements registered in its database and featured in the bulletins can get in touch with the nearest TIPS office or TIPS, Via Panisperna 203, Rome 00184, Italy. Tel.: 482-6967; Fax: 482-8838.

Countries/areas available through PDNs

In 1987, the ACCIS Technical Panel on Computer-supported Telecommunications Services prepared a telecommunications map, which identified countries that were accessible through Public Data Networks. In response to a large number of requests for more recent information, the ACCIS Secretariat has compiled an update, listing countries/areas in alphabetical order by geographic region.

The list represents 117 countries/areas known by the ACCIS Secretariat to have Public Data Networks (PDNs), and does not include those in which the availability of PDNs is provided by arrangement with a PDN in a neighbouring country/area.

Countries/areas accessible through public data networks

The following list of countries/areas accessible through Public Data Networks (PDN) has been compiled by the ACCIS Secretariat in response to numerous requests for up-to-date information received since the Telecommunications Map was prepared in 1987 by the Technical Panel on Computer-supported Telecommunications Services (ACCIS 87/005). Names of countries/areas are listed in alphabetical order within geographic regions.

The list represents countries/areas known to the ACCIS Secretariat to have PDNs. It does not include countries/areas whose PDN availability is provided by arrangmeent with a PDN in a neighbouring country/area. Some countries/areas accessible through PDNs may be missing from the list due to the selection of sources used in compiling the list and to the continuous expansion of telecommunications services. The ACCIS Secretariat would appreciate being notified of additional countries/areas accessible through PDNs.

Africa

Cameroon
Chad
Côte d'Ivoire
Djibouti
Egypt
Gabon
Gambia
Madagascar
Mauritus
Morocco
Mozambique
Namibia
Réunion
Rwanda
Senegal
South Africa
Sudan
Togo
Tunisia
Zimbabwe

Americas

Antigua and Barbuda
Argentina
Bahamas
Barbados
Bermuda
Brazil
Canada
Cayman Islands
Chile
Colombia
Costa Rica
Cuba
Dominican Republic
French Guiana
Greenland
Guadeloupe
Guatemala
Honduras
Jamaica
Martinique
Mexico
Netherlands Antilles
Panama
Peru
Puerto Rico
Saint Kitts and Nevis
Trinidad and Tobago
Turks and Caicos Islands
United States
Uruguay
Venezuela
Virgin Islands (British)
Virgin Islands (US)

Asia

Bahrain
China
Cyprus
Hong Kong
India
Indonesia
Iraq
Israel
Jordan
Kuwait
Lebanon
Japan
Korean, Republic of
Macau
Malaysia
Philippines
Qatar
Saudi Arabia
Singapore
Taiwan, Province of China
Thailand
Turkey
United Arab Emirates

Europe

Andorra
Austria
Belgium
Bulgaria
Czechoslovakia
Denmark
Faroe Islands
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Liechtenstein
Luxembourg
Malta
Monaco
Netherlands
Norway
Poland
Portugal
San Marino
Spain
Sweden
Switzerland
United Kingdom
Vatican City State (Holy See)
Yugoslavia

Oceania

American Samoa
Australia
French Polynesia
Guam
Micronesia
New Caledonia
New Zealand
Northern Mariana Islands
Papua New Guinea
Vanuatu

USSR

USSR

Total: 117 countries/areas. Compiled by the ACCIS Secretariat, Palais des Nations, 1211 Geneva 10 Switzerland. Tel.: +41 22/798 8591; Fax: +41 22/740 1269. (Source: ACCIS Newsletter, 9 (1), May 1991)

Computer code speaks in many tongues

A consortium of American computer companies has announced a new set of computer codes to represent every number, letter, ideograph and symbol used in the world's major languages - and most of its minor ones too. The current internationally recognized set only includes 256 characters and so cannot accommodate all the languages of Europe, let alone those of the rest of the world.

The consortium is called Unicode, as is its character set. Unicode claims that its new standard "will make multilingual software easier to write, information systems easier to manage, and international exchange of information more practical". As it is backed by some of the world's largest computer companies, the consortium hopes that its new code will become a de facto world standard.

Virtually every personal computer in the Western world now uses the ASCII character set (ASCII stands for American Standard Code for Information Interchange). It was adopted in 1967 as a 128-character set and has been doubled over the years to 256 characters.

While each ASCII character is represented by an 8-bit digital number in the computer, Unicode will represent its characters by 16-bit numbers. Rather than 256 (2^8) characters, Unicode will have 65,536 (2^{16}).

Unicode's member companies include IBM, Apple, Sun Microsystems and Microsoft, as well as Research Libraries Group, a consortium of American academic libraries. The consortium has found that 65,000 is more than enough characters: 6,000 codes suffice for all the alphabets of Europe, the Middle East and the Indian subcontinent, while the largest block of codes, those for Chinese, Japanese and Korean ideographs, require about another 18,000.

Unicode version 1.0, released December 1990, has a total of 27,000 codes, including mathematical and scientific symbols. With about half the codes still unallocated, there is room for adding runes, hieroglyphics and cuneiform script, if there is enough demand.

Unicode hopes its character set will bring order to the chaos that currently prevails. The International Standards Organization (ISO) has established separate 8-bit character sets for the Latin alphabet, Greek, Hebrew, Arabic and Cyrillic, but they are not used uniformly. China, Japan, Korea and Taiwan have each established a national standard, but these are totally incompatible, even where two languages use the same ideograph.

In most cases, Unicode uses existing standards, but for Asian languages the consortium spent years eliminating repeated characters.

The new code does come at a cost, in both speed and space. Because each new Unicode character will take twice as many data bits as an ASCII character, a modem will send half as many Unicode characters per second and discs will hold half as much text. The consortium is confident that rapid increases in processor speed and disc capacity will permit Unicode to be introduced painlessly. (This first appeared in New Scientist, London, 9 March 1991, the weekly review of science and technology)

Wizard new radio telescope

The opening late last year of a new 32 m radio telescope near Cambridge UK, marked the

completion of a whole network of linked telescopes known as Merlin.

Merlin, Multi-Element Radio-Linked Interferometer Network, is run by the Jodrell Bank University of Manchester research team and now consists of seven linked dishes.

They are linked not just by radio, but by a multiplicity o data links that not only record the received signals but also control the huge dishes so that they all point to the same place in ths sky.

Interferometry works on the principle of aperture synthesis, essentially the same way you narrow the pick-up angle of a communications antenna by stacking up the elements. In the case of Merlin, the linked dishes behave, in terms of resolution, as if they were a single dish of 230 km diameter. That will allow resolution of celestial objects down to about 0.1 arc.s, sharp enough perhaps to see surface detail on some of the largest stars.

In terms of resolution, Merlin will have about the same performance as the Hubble Space Telescope. Advances in technology have meant that Merlin telescopes can be improved in terms of sensitivity as well as resolution. High performance cryogenically cooled (14 K) receivers are now being installed on all seven dishes.

Merlin will begin its work looking in detail at some of the crucial events taking place in the far reaches of the universe; it may reveal more about the quasars.

At the other end of the energy spectrum, Merlin will be using its fine resolution to study the 3 K microwave background left behind after the Big Bang that marked the creation of the universe.

Currently available resolving power shows this to be uniform throughout the universe, though if variations can be found, they might well point to the existence of "dark matter" - material that may account for most of the mass of the Universe. (Source: Electronics World and Wireless World, February 1991)

Superconductivity impacts under study

The impacts of high-temperature superconductivity on the electric power generating industry will be evaluated by Argonne National Laboratory under a three-year, multinational agreement involving 13 industrialized nations. Under the agreement, Argonne will review work on superconductivity research worldwide and report on its status, identifying areas that need more detailed investigation. Issues of interest to funding nations will be reviewed, with Argonne scientists making assessments and preparing reports on the potential of developing technologies. According to Argonne scientist Alan M. Wolsky, who heads the project, the initial effort will focus on progress in developing practical superconducting wires and fault current limiters, devices that protect electrical power grid lines against sudden high currents generated by lightning strikes or otherwise downed lines. Technical experts from each participating country will collaborate with Argonne, Wolsky says, contributing reports and summaries they have developed. Participating countries are Canada, Denmark, Finland, Germany, Italy, Japan, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, Turkey, and the United States. (Source: Chemical and Engineering News, p. 16, 11 February 1991)

US and Japan "very close" to new semiconductor accord

American and Japanese negotiators are "very close" to an agreement on a new semiconductor accord, and that the new agreement should be in place well before the current five-year agreement runs out this summer.

The agreement has been viewed as the most critical of all of the industry-specific negotiations between the two countries, largely because it is expected to serve as a model for other negotiations.

The new agreement does not guarantee US firms 20 per cent of the market, but sets the figure as one of several measures of US penetration of the Japanese market.

The two sides have also reportedly come to a compromise on how to measure market share: American makers have said they now have about 13 per cent of the Japanese market, while the Japanese have claimed figures closer to 18 per cent.

The bulk of the difference appears to consist of chips that International Business Machines Corp. and a few other manufacturers produce internally and ship to their units in Japan. (Source: International Herald Tribune, 23 May 1991)

Floppy development news

International Project News is a new electronic venture designed to keep people in touch with what is going on in development around the world. It will provide information on computer floppy disks about hundreds of development projects. It will be necessary to have access to an IBM-compatible computer to use the service.

The floppy disks, issued quarterly and each covering about 200 projects, will give brief, practical and interesting information on development projects, rather than scientific research. For instance, if someone were working on a livestock project in Africa and discovered a plant that would be extremely suitable for use as live fencing, Project News would like to hear about it. And that person would also be able to find out about other people using green or live fences in Latin America, Asia and so on.

The important thing about Project News is that it will put people with similar interests in touch with each other. They can be involved in livestock, crops, trees, fish farming, etc., provided it is a new idea. The service would like people to write down exactly what they are doing and how they are doing it.

Project News will report on things that people have found out through practical experience. Someone rearing calves, for instance, will be able to find out about designs for small calf housing for outdoor use.

The first disk is available; the cost per year for four disks is $50. For more information, contact Andrew Speedy, Agricultural Science

Building, Oxford University, Parks Road, Oxford, UK. (Source: Development Forum, January/February 1991)

Europeans extend computer R&D

A computer research centre set up to help Europe compete with the rest of the world has opened its membership to American and Japanese companies.

The decision by the European Computer Industry Research Centre (ECRC) in Munich will come as a relief to ICL, the British-based manufacturer taken over by Fujitsu of Japan last year. ICL is one of the centre's major shareholders.

Bull and Siemens, two of Europe's leading computer manufacturers, threatened to expel ICL from the centre when the takeover was announced last August. They feared that the purpose of ECRC would be undermined if a Japanese-owned company benefited from its research. But after reviewing their position for six months, the companies have concluded that ICL's contribution is too important to lose.

Furthermore, because computer companies increasingly operate in a world-wide market, they decided that they have much to gain from a more international membership. Bull, Siemens and ICL are now looking for another two or three shareholders for the centre.

Each shareholder has invested about £5 million a year in the centre, with a further £3.5 million coming from an annual grant from the European Commission. (This first appeared in New Scientist, London, 16 March 1991, the weekly review of science and technology.)

PCB makers form European body

The UK's printed circuit board manufacturers are teaming up with their European rivals to beat off Far Eastern competition.

The board makers trade association, PCIF has got together with manufacturers in Germany, France, Italy, Holland, Belgium and Spain to form a pan-European body.

The Printed Wiring Board Group is the latest section to be created within the European Electronic Component Manufacturers Association. It will lobby the European Commission to draw attention to the threat facing European board makers from overseas.

The EECA-PWB will also try and persuade the Commission of the importance of board making as part of an overall European electronics strategy. (Source: Electronics Weekly, 8 May 1991)

TI demonstrates optoelectronic interface chip

Researchers at Texas Instruments have demonstrated an optoelectronic interface chip which combines silicon CMOS logic and gallium arsenide LEDs together in a single monolithic integrated circuit.

The device was fabricated using gallium arsenide-on-silicon which TI first developed in 1988.

Optoelectronics is widely seen as a potential technology for releasing the interconnection bottlenecks that are starting to restrict the performance of the latest highspeed microprocessors. According to TI, due to the bandwidth of optical transmission, one optical interconnect could replace as many as 32 pins on a conventional electronic chip package.

The new chip, which incorporates eight LEDs and their associated CMOS drive circuitry, has proven the feasibility of the process.

James Yuan, TI researcher concerned with alternative chip interconnection techniques says there are many packaging and assembly issues still to be addressed and that it will be at least five years before optoelectronic interconnect devices are used in practical electronic systems. (Source: Electronics Weekly, 1 May 1991)

Patents classification on CD-ROM

The World Intellectual Property Organization (WIPO) plans to publish a synoptical version of its International Patent Classification (IPC) on CD-ROM, in cooperation with the German Patent Office and the Spanish Industrial Property Office.

The proposed CD-ROM would contain the English and French versions of IPC editions three to five, the fourth and fifth editions of the IPC in German and the fifth edition of the IPC in Spanish, merged and presented synoptically.

In addition, the disc would contain merged versions of official catchword indices in the various languages. Finally, concordance data relating to IPC editions three to five (giving information on how subject-matter has been transferred between various places as a result of the revision of the different editions), as well as data on the validity of IPC symbols that have been used in the past or that appear in the fith edition, would be included.

Intended for industrial property offices and other users such as patent agencies and libraries, the product will enable the user to search in the various IPC editions, to consult the other IPC material included (simple access to files if provided while working with the IPC text) and to switch at will between the four languages.

A cost estimate and feasibility study is being carried out. For further information, contact: Mr. G.A. Ledakis, Director, General Administrative Services, WIPO, 34 chemin des Colombettes, 1211 Geneva 20, Switzerland.

UNEP boosts flow of environmental information

The Global Resources Information Database (GRID) of the United Nations Environment Programme (UNEP) collates satellite- and ground-based environmental data from around the globe. Using sophisticated computers, it harmonizes these data and presents them in the form of maps.

The US Geological Survey's EROS Data Centre in South Dakota, USA has recently become the latest link in the GRID network, whose main centres are in Geneva, Switzerland and Nairobi, Kenya. Other participating institutions are in Bangkok, Thailand and Arendal, Norway.

UNEP's contribution to the global exchange of environmental data was also boosted recently when its data centre, INFOTERRA, which collects and distributes environmental data from more than 140 countries, started linking its national

contacts to each other. The first link was between the US Environmental Protection Agency (US EPA) and Botswana. The US EPA, with advice from INFOTERRA, will provide Botswana with computer and telecommunications equipment and training. The relationship should provide a better flow of environmental data both between the two countries and to INFOTERRA. (Source: Our Planet, Vol. 2, No. 4)

Latin America and the Caribbean: regional cooperation project

The Latin American Economic System (SELA) has for two years been conducting a Project on the State of Regional Cooperation (PESICRE). The aim is to collect, systematize and process information on multi- and bilateral regional cooperation activities carried out both by SELA member countries and by other bodies, both national and international.

When the information has been evaluated, SELA, which has its permanent secretariat in Caracas, Venezuela, hopes to produce an analysis of the state of regional cooperation. This would help identify areas of interest for the implementation of viable regional cooperation projects and promote the coming together of different regional economic sectors to carry out projects.

SELA's three regional offices, in Chile, Panama, and Trinidad and Tobago, are locating, collecting and processing the information. A list of focal points has been drawn up with the collaboration of public and private institutions, which make available a wide range of material for information, evaluation and distribution. Recently, SELA has started modern communication with other regional institutions working in development cooperation and information systems development. For further information, contact: SELA, Apartado 17035, Caracas 1010A, Venezuela.

UN system database of social statistics

Tabled for discussion at the February 1991 session of the UN Statistical Commission was a progress report on the development of a coordinated UN system database for selected social statistics and indicators of common interest at national and international levels. The database is intended to help monitor social goals in the 1990s, as discussed by the Commission's Working Group at its last session.

The progress report described the concept of an international database on social statistics, reviewed common requirements for social statistics - both nationally and internationall, - as well as looking at current arrangements for compilation and coordination in light of technical possibilities. It also considered the series and classifications to be included. The report also described plans for technical cooperation with developing countries to establish and maintain databases used to monitor progress in achieving social goals in the 1990s.

The Report of the Secretary-General on progress made in the development of a coordinated database for the United Nations system for selected social statistics and indicators of common interest and the development of related national databases carries the document number E/CN.3/1991/20 and is available from the Documents Control Section, S-1552 United Nations, New York, NY 10017, USA. (Source: Statistical Commission, 26th Session, 4-13 February 1991, Item 2 of the provisional agenda, Adoption of the Agenda and other Organizational Matters (E/CN.3/1991/1).

EC disagree

Disagreements are surfacing in EC policies in the areas of communications, telematics and the environment, with the European Parliament asking the Commission to revise its proposals for programmes on which member States, through the Council of Ministers, had already agreed "common positions". The arguments centre around proposals put forward by the Parliament which are not included in the final version of the EC's third Framework Programme for research and development.

The Parliament has been getting increasingly difficult with the Commission as it fights to establish its rights and complains that its views have often been ignored by the Council of Ministers. The effects on research work could be serious. Taken at face value, one of the parliamentary proposals is interpreted in some quarters as appearing to exclude from research contracts, multinational firms, and their European subsidiaries and this could be very difficult where joint projects are planned. The member States turned down the view of the parliamentarians on this issue and did not include it in their "common positions" agreement. There is uncertainty about what will happen next but also concern that another 10 programmes under the third Framework might also be affected. (Source: AMI, May 1991)

International Joint Research Programme on intelligent manufacturing system

The sustained and balanced growth of the manufacturing industry, one of the important industries supporting the world economy, is necessary and indispensable to the healthy growth of that global economy. New problems have surfaced on the future. What is needed to cope with these problems is for developed industrial nations to work in cooperation and indicate a direction of action.

The first new problem is how to respond to the drastic change of the societal environment surrounding the manufacturing industry commonly visible or concerned about in all developed industrial countries. The manufacturing industry is confronted with diverse problems: for instance, the tendency of good labour to emigrate from it to other sectors of industry as represented by the phenomenon of "estrangement" of engineering students from it, the demand for a more agreeable working environment such as for a shortening of labour hours, the call for greater economy in consumption of energy and natural resources, the intensification of product liability and the need to cope with ecological problems. The concerted effort of developed industrial nations to cope with these problems is necessary in order to maintain the essential position of manufacturing in society.

As its second task is its search for a solution of various problems triggered by the excessive internalization of manufacturing technology to enterprise. In many aspects its excessive internalization to business hinders its standardization or its academic development and systemization and this because of the attendant insufficiency of information transfer causes

economic and social losses, hence hindering its long-term development. In the world market of today the fluidity of capital and goods is rising, globalization progressing and development of a borderless market advancing. The speed of technological innovation is very fast. In such a situation, what is required is to promote the transfer of the good manufacturing technology each enterprise has in order to solve problems arising from the lag of diffusion behind innovation so that the world manufacturing industry can grow further.

However, to simply diffuse technology will cause the loss of the incentive to innovation. Therefore, what is needed is to take the appropriate balance of diffusion with innovation, academically systemizing the technology of manufacturing and establishing it into the science of manufacturing in such a manner that permits it to enjoy its appropriate economic qualities while giving it a fair and just evaluation and providing it with the necessary protection extended to intellectual properties.

It is necessary to make a scheme for international joint research and development with a global range of vision in the manufacturing industry of today given the globalization of business activity and the rapid speed of technical innovation.

The IMS (Intelligent Manufacturing System) programme is the international joint research programme in the area of the manufacturing industry of Western advanced countries, which have a good record in production technology, aiming at being the first to rally to the development of new technology with the fruit of their development effort to be widely shared by the whole world. It is a programme to promote international cooperation in the field of technology. In a scheme with this kind of purpose, there is much room for Japan to make its contribution to the healthy development of the world manufacturing industry.

Necessity of being an international joint development programme

It is necessary that the IMS programme advocated to respond to these and other tasks imposed on the manufacturing industry is an international joint research programme from these three viewpoints: internationally shared ownership of production technology, avoidance of double investment of developmental resources and development of new production technology oriented to the twenty-first century.

International shared ownership of production technology

The number of cases where business activity crosses national borders to take on a global scale has increased in the manufacturing industry of developed industrial countries in recent years. On the other hand, protectionism and techno-nationalism are rising in the midst of the advance of this globalization of manufacturing. This move is nothing but something to shake the principle of free competition, which is the foundation of existence of the manufacturing industry of the Western world, including Japan.

For the healthy development of the world economy, it is necessary to reject such protectionism or techno-nationalism and seek internationally shared ownership of production technologies indispensable to the self support and development of the economy of a country by developing them, at least the basic technologies vital to production, at an internationally open place under an internationally shared acknowledgement that they are the properties to be shared by all humankind.

Avoidance of double investment of developmental resources

Automation has been sought for each separate manufacturing process while efforts are being made to overcome the lack of unity in interfacing of individual machines in such areas as machine tools and industrial robotics. As a result, isolated islands of automation have appeared on the production line. Any attempt at integrating the entire business activity ranging from planning, developing and designing to production and selling in a situation like this requires further enormous amounts of time and labour.

However, it will become possible to easily build an efficient production system integrating the entire business activity without making any wasteful investment if it is possible to standardize on an international scale the component machines of the production system.

All countries and enterprises are conducting research and development separately on various production technologies. If they can cooperate internationally in the research and development on those basic technologies that can become commonly shared properties, it will also be possible to manage limited resources effectively, to achieve, for instance, efficient utilization of human resources, while preventing double investment of developmental expenses.

Development of new production technologies oriented to the twenty-first century

North America, Europe and Japan, the three locomotives of world industry, differ each from the other in their favourite fields. Therefore, if they conduct international joint research and let their favourite technologies and research technique to merge in a pattern of reciprocal completion, it will become possible to develop more effectively new production technologies, which are hard for a single country of a single region to develop and which cannot be forecast on the basis of today's trends.

Description of the IMS program

The United States, the European Community and Japan, which are to form the central force to promote this IMS programme, are currently discussing and examing on a trilateral government basis the basic principles of the programme. Therefore, this programme is still undecided as regards its definite content. (Source: AEU No. 2/1991)

II. NEW DEVELOPMENTS

Development of 64 M-bit DRAM

Toshiba America Electronic Components (Irvine, CA) believes that the path has been paved for developing a 64 M-bit DRAM chip. The firm has developed a new memory cell structure that cuts the area of single cells to under 60 per cent of that in customary structures for 4 M-bit DRAMS.

The new Assymetrical Stacked Trench (AST) structure, with an area of 1.53 square microns, follows a 0.4 micron design rule. The structure greatly enlarges the distance between the capacitor and active area. Customary design arranges the trenches in parallel, but AST arranges them asymmetrically, in effect attaining a separation of 0.6 microns. (Extracted from Design News, 11 February 1991)

New PVD blanket deposition process

Researchers at SGS-Thomson Microelectronics (Carrollton, TX) have demonstrated a new PVD blanket deposition process by making a 1 Mb SRAM with 0.8-micron contacts. The process deposits an Al-1 per cent Si-0.5 per cent Cu film on a substrate at 400-500°C and is capable of totally filling vertical 0.35-micron contacts and vias, avoiding wafer bias or reflow techniques. It is sensitive to deposition rate and system base pressure as well as temperature. The deposited Al films have a median grain size of 4 microns after a 30-minute 400°C anneal, but good planarity and stress values about 10 per cent under the tril-dynes/sq cm of the as-deposited film. The process allows plug and interconnect lines to be put down at one work station, in the same multichamer sputtering system with Ti/TiN barrier layers, and needs only conventional equipment. (Extracted with permission from Semiconductor International Magazine, February 1991. Copyright 1991 by Cahners Publishing Co., Des Plaines, Il., USA)

SRAM cell produced with phase-shift mask technology

Work at Hitachi's VLSI Engineering Laboratory, Tokyo, Japan, shows the viability of phase-shift lithography for 16 Mb SRAM production. The Hitachi development centres on using phase shift photolithography to generate 0.25 μm space patterns with a conventional stepper.

To go along with such small linewidth capabilities, the Hitachi engineers developed a "small cell-ratio" concept. Briefly described, it is a new polysilicon PMOS load cell that overcomes unstable operation expected when reducing cell area. The new cell simultaneously achieves stable operation and extremely low stand-by power dissipation of the memory cell. (Reprinted with permission from Semiconductor International Magazine, March 1991. Copyright 1991 by Cahners Publishing Co., Des Plaines, Il., USA)

Hitachi engineers develop another deep-UV resist

Realizing that the semiconductor industry needs new resist options for deep-UV lithography, a group of Hitachi engineers has come up with another photocatalytic or "chemically amplified" resist system.

The group reported on deep-UV resists that use polyvinylphenol "protected" with tetrahydropyranyl groups (THP-M), then "deprotected" by photogenerated acid. They have also shown that sulphonic acid esters of trihydroxybenzene are superior to conventionally used onium salts for positive resists because they do not produce a negative-tone side reaction even with high overexposure.

The Hitachi engineers have reported on a three-part resist system. This "chemical amplification" uses the methanesulphonic acid triester of trihydroxybenzene (MeSB) as the acid generator, THP-M as the inhibitor and a conventional novolak matrix polymer. Tests show a high sensitivity and no negative-tone side reaction.

Describing the reaction, methanesulphonic comes from MeSB under exposure via a sensitization mechanism through the strong absorbing novolak matrix polymer. In a following post-exposure bake, the THP-compound decomposes and loses its dissolution inhibition capability.

Only 10.5 per cent of the THP-M inhibitor prevents any loss in film thickness in unexposed areas. With 4 per cent of MeSB, the engingers achieved a sensitivity well below 10 mJ/cm^2. The optical absorbance of this resist is 0.6 μm^{-1} at 248.3 nm and 0.4 μm^{-1} at 254 nm.

The Hitachi engineers produced 0.35 μm lines and spaces by exposure with a 0.42 numerical aperture KrF-excimer laser stepper. They achieved similar results with an SVG Lithography Micrascan system. (Reprinted with permission from Semiconductor International Magazine, March 1991. Copyright 1991 by Cahners Publishing Co., Des Plaines, Il., USA)

SOI made from chem-mech polishing

Engineers at IBM's T.J. Watson Research Center have combined lateral epitaxial overgrowth with chemical-mechanical polishing. This process gives them thin, planar silicon on insulator (SOI) films. Reportedly, these films are defect free, except where the two epitaxial fronts meet. The IBM team has used these SOI films to fabricate ICs using a dual polysilicon CMOS process.

To fabricate SOI films the IBM researchers start with an insulating silicon dioxide layer and a "polish-stop" layer. After defining the areas for epitaxy in the polish-stop layer, they open narrow lines through the exposed oxide. These lines are seed areas for selective epitaxial silicon; they are properly aligned with the underlying silicon crystal (100) so the epitaxial lateral overgrowth process produces a defect-free film. The process grows a few microns of selective silicon using $SiCl_4$; this silicon grows vertically and laterally over the oxide.

The subsequent chemical-mechanical polishing process planarizes and thins the silicon layer, usually to about 0.1 μm. The polish-stop layer is a marker for stopping the polishing step and determining the SOI film thickness. The IBM researchers have obtained areas up to 10 μm wide with thickness control better than $\pm$10 nm over areas as large as a few cm^2.

Using a dual polysilicon process with a 7 nm thermal oxide and $TiSi_2$ salicide, the IBM group fabricated submicron CMOS devices on epitaxial films as thin as 100 nm. Because the epitaxial growth produces a defect line where two growth fronts meet, device design requires proper masking to place these defect lines in noncritical device areas, for example contact areas.

Reportedly, PMOS and NMOS device characteristics were compatible to similar devices fabricated in bulk silicon. More significantly, however, these low-parasitic SOI-CMOS devices showed a speed improvement of more than three, compared to the bulk silicon devices. (Reprinted with permission from Semiconductor International Magazine, April 1991. Copyright 1991 by Cahners Publishing Co., Des Plaines, Il., USA).

12 inch silicon water process

German company Leybold says it has started manufacturing equipment capable of growing 12 inch silicon wafers and has received orders for them.

This makes it likely that the world will skip a wafer size generation, moving straight from 8 inches to 12 inches without ever using 10 inches. Generally speaking, moving to a new generation of wafer halves the production cost of a chip.

Leybold believes it is the only company in the world capable to making a commercial machine that can grow 12 inch diameter silicon crystals. The Leybold machine weighs 15 metric tons.

Leybold seems to be well ahead of the game because most semiconductor companies use 6 inch wafers and there are only a handful of companies using the next generation 8 inch waters, let alone 12 inch.

IBM has been producing 4 M-bit DRAMs on 8 inch wafers in several sites for over a year and is thought to be the only company in the world in genuine production on 8 inch.

However Motorola is equipping an 8 inch plant in Phoenix, and Hitachi of Japan and Samsung of Korea are gearing up their 8 inch output but are not in mass production. (Source: Electronics Weekly, 6 March 1991)

New memory chip

Ramtron International (Colorado Springs, CO) has developed a new memory chip that will not cause amnesia in a computer suffering a loss of power. Typically, if a computer operator absent-mindedly turns off a PC, or there is a power failure, before data is saved on a disk, the computer will lose the data. However, this firm's ferroelectric random-access memory has the ability to store data for an indeterminate period of time. The capability is due to memory cells shaped from a proprietary ceramic film placed on the waters of silicon. (Extracted from Business Week, 25 February 1991)

Chip that may change drug research

Affymax Research Institute (Palo Alto, CA) has developed a silica chip that could revolutionize drug research. The company has succeeded in meshing two varying technologies. One is photolithography and the other is chemical synthesis. The process typically is involved with the production of semiconductor chips. The result is the firm's "Very Large-Scale Immobilized Polymer Synthesis", also known as VLSIPS. It creates a huge parallel process to produce and test thousands of drug compounds simultaneously on a silica chip that is only one square centimetre. Although the development's prospects appear bright, it is not apparent that a number of possible applications will generate revenue in the short run. (Extracted from Business Week, 25 February 1991)

Two new chips

Intel demonstrated the latest version of its 486 chip at a conference in San Francisco. The experimental chip contains 1.2 million transistors and runs at 100 MHz, about two to three times as fast as current versions. The technology will go into production later this year to produce a 50-MHz 486 chip. However, there are no immediate plans to offer the 100-MHz device as a commercial product. At the same show, IBM scientists announced the development of the world's fastest high-capacity memory chip that is able to transmit eight billion bits of information per second. (Extracted from Information Week, 18 February 1991)

Video camera integrated on a chip

A team under Peter Denyer of the University of Edinburgh, Scotland, has integrated an array of about 84,000 light sensors on the same chip as the CMOS amplifiers and logic devices that process the signals from these sensors. This technology allows the whole vision system to be fabricated on a single VLSI chip about 8 mm^2 containing almost 100,000 transistors: the addition of a lens and a 5 V supply can make a complete video camera.

This technology will enable the size, cost, and power consumption of video cameras and vision systems to be greatly reduced. Denyer claims that this development is a world first that is 10 years ahead of anything the Japanese are doing. He said that it will make video cameras available for only $50 and open up new markets such as security, yet the image quality is indistinguishable from CCD produced images. The group is now working towards a colour version of this monochrome system. (Reprinted with permission from Semiconductor International Magazine, April 1991. Copyright 1991 by Cahners Publishing Co., Des Plaines, IL, USA)

Tailored molecules could lead to protein chip

Proteins that conduct electricity could one day be used in computer chips, mimicking the properties of today's semiconductors and even making possible novel devices, according to Stephen Sligar of the University of Illinois. Such chips would be much more compact that those currently available. As a first step towards this ambitious goal, Sligar and his colleagues have been attempting to tailor-make proteins with specific electrical and optical properties.

In nature, there are many examples of biological molecules that conduct electricity. For example, chlorophyll, which is involved in photosynthesis, converts light energy efficiently into the motion of electrons.

The scientists have been tinkering with "haem" proteins, which contain iron. These are electrically active – that is, they are involved in the movement of electrons. They are also optically active, interacting strongly with light so that they appear brightly coloured. Both properties arise from the iron atom's ability to trap and transfer electrons. Sligar and his colleagues believe that it might be possible to mimic electronic components, such as light-emitting diodes, using proteins with the right optical and electrical properties.

The scientists attempted to manipulate the electro-optical properties of haem proteins using standard techniques of genetic engineering. They painstakingly assembled the genes that code for haemoglobin and myoglobin out of their constituent parts, then inserted them into Escherichia coli bacteria. They then mutated the genes so that the proteins turned green. This was quite a feat, because haemoglobin and myoglobin are the proteins which make blood and muscle tissue bright red.

Sligar and his colleagues have also looked at two other proteins: cytochrome b5 and cytochrome c. In the body, these enzymes are

involved in transfering electrons to molecular oxygen. They can also transfer electrons between each other, which might make them useful as components of an electrical circuit.

The scientists succeeded in mutating the genes that are responsible for distributing charges around the metal centres in the proteins. Because these charge distributions influence the way in which electrons are transferred between the proteins, the researchers were able to tailor the electrical properties of the system.

The scientists have also succeeded in attaching the proteins to a range of solid substrates, such as gold and silicon oxide. This type of bonding will be necessary in order to build a protein chip. (Extracted from New Scientist, London, 18 May 1991, the weekly review of science and technology)

Porous chips light up in colour

British researchers who last year coaxed silicon semiconductor material to emit red light by illuminating it with a green laser have now extended their technique to produce orange, yellow and green light.

They also believe that their so-called porous silicon has emitted light when an electric current was passed through it. This refinement is crucial to the development of silicon light emitters on chips which would allow fast optical communication both on and between chips, as well as new types of display, signal processors and optical computers.

The team from the electronics division of Britain's Defence Research Agency in Malvern, formerly the Royal Signals and Radar Establishment, led by Leigh Canham, announced its results at a meeting of the Materials Research Society in Anaheim, California. Two other groups, one in the US and one in France, announced that they had also succeeded in getting silicon to emit light, confirming the British results.

Silicon chips are becoming increasingly crowded, causing bottlenecks when data are transmitted along electrical connections. Optical fibres or waveguides are faster and, because optical signals do not interfere with each other, many more signals can be sent down the same path. Making the optical emitters, waveguides and detector out of silicon would be ideal because they could then be easily incorporated onto the same chip as the conventional circuits.

Researchers have made detectors and waveguides from silicon before but silicon only emits light weakly in the infrared.

The British researchers began to solve the problem last year, when they refined a technique to etch away at the surface of a silicon wafer to produce thin columns of silicon which measure just micrometres tall and are less than 5 nanometres across (about 15,000 times as thin as a human hair).

The British team now says it can convert at least 1 per cent of input laser energy into red light. The French claim their device lasted longer. The first devices produced at Malvern began to decay after a few weeks, but the French found that oxidizing the columns after etching could extend the emitter's life to over a year.

For practical use, silicon light emitters need to be powered by electrical current, but making electrical contact to the tiny columns is difficult. Both the British and French teams have seen light when they passed currents through an electrolyte solution into the silicon columns, but other researchers warn that other processes could have produced the light. (Extracted from New Scientist, London, 18 May 1991, the weekly review of science and technology)

Single chip PC likely to be sold this year

A single chip PC will go on sale by the end of summer, based on microprocessors made by Chips and Technologies.

The device will be based on the 386SX running at 15 MHz and will be made using a BiCMOS process. Its outputs will be able to drive about 25 mA, enough to control an LCD and will cost about $50.

Chips and Technologies will not manufacture the chips itself, because it has no wafer fab facilities of its own. It has been working with a Silicon Valley partner, which has spare BiCMOS capacity and the expertise in biopolar design lacked by Chips. (Extracted from Electronics Weekly, 15 May 1991)

Toshiba develops 3-D silicon chips

Japanese computer makers may soon be able to use three-dimensional integrated circuits (ICs) in their neural networks or real-time image processing systems.

Researchers at Toshiba have developed an experimental 3-D silicon IC which they claim increases packing density and offers a fivefold speed improvement over conventional chips.

The device integrates one million transistors on five layers of single crystal thin film silicon. A high-powered electron beam was used to melt polycrystalline silicon into a single crystal structure.

This increases processing speed which is further enhanced by 3-D interconnection between the transistors using tungsten wiring through holes which are etched in each of the insulated silicon layers. (Source: Electronics Weekly, 15 May 1991)

Block erase chip released by Intel

Block erasable flash has been released by Intel - a move which will boost the emerging flash market. However the extra feature puts 30 per cent on the price of a megabit chip.

The Intel 1 M-bit block erase chip has four separately erasable segments. Two of these are 32 k-bits in size, one is 64 k-bits and the other is 896 k-bits.

Intel calls the chip the 28F001BX. It is designed for updatable BIOS (basic input/output system) in personal computers and updatable firmware.

The idea behind the chip is to allow several functions to be stored and changed on one chip. For instance the 64 k-bit block could be used for the boot code, the 896 k-bit block for main program code and the two 32 k-bit blocks for

parametric data storage, diagnostic messages and data or extensions of the boot code or program code. (Source: Electronics Weekly, 15 May 1991)

Hitachi puts chip logic in gear

Systems builders will be able to program the logic functions of chips by the end of this year. A new range of devices, called I-ZIAT, has been developed by Hitachi to allow engineers to configure programmable devices more easily than the gate-level devices available today.

The chips are designed to be able to emulate devices such as timers, counters and communications interfaces and controllers.

Hitachi has already produced samples of the chips and shipped them to beta site customers. It believes they will allow system makers to build one motherboard for a range of products consisting of the main processor, the I-ZIATs and memory.

The customer can then use software to program in the differences between the various products at the end of the production line. (Source: Electronics Weekly, 15 May 1991)

GaAs chips developed for AT&T

A pair of gallium arsenide communication chips with a data rate of 2.5 G-bits/s have been developed for AT&T-Bell Laboratories by Vitesse Semiconductor.

The devices are multiple chip modules implementing digital 16-channel multiplex/ demultiplex functions. They are intended for use by AT&T in high-speed transmission systems, according to Vitesse sources.

The devices are packaged in a multi-chip module developed by AT&T for high-speed fibre-optic applications, and each chip dissipates less than 1.5 W typically. A Vitesse spokesperson would not describe the specifications or functions further.

The devices have an unusual combination of source-coupled FET logic (SCFL) and low power direct-coupled FET logic (DCFL). They are designed to interface with slower CMOS devices in a system partitioned so that the high-speed portions could be implemented in GaAs. (Source: Electronics Weekly, 6 March 1991)

Low-power chip

US chip companies are designing special low-power semiconductors for use in portable computers. One of the first companies to market with very low-power chips is Catalyst Semiconductor which has begun sampling 1 k-bit serial EEPROMs that need just a 2 V supply.

The chip uses just 1 milliamp during write operations and 50 microamps during read operations. Catalyst says it is also working on a 1.2 V EEPROM. (Source: Electronics Weekly, 13 March 1991)

Superconducting chip arrives

Silicon Valley-based company Corductus says that it has developed the most complex semiconductor device ever made from high-temperature superconducting materials.

In cooperation with Lawrence Livermore Laboratory, Conductus has developed a highly sensitive magnetometer. The device uses multiple layers of superconducting materials. The company says that the magnetometer is extremely sensitive and can measure minute magnetic fields. The device will be used in commerical products in medical systems for measuring magnetic fields generated by the human heart and brain.

The magnetometer is based on a chip containing multiple Josephson junctions which are the fastest possible computer logic switching devices. The company says that a special photolithographic process is used to manufacture the chip. (Source: Electronics Weekly, 27 March 1991)

Fast image-processing chip

Matsushita has made an opto-electronic chip, which can do image processing much faster than existing circuits. It processes one frame of 256 pixels at a time, rather than one pixel at a time.

The chip has 512 logic units connected in parallel, which can handle 256-bit pairs simultaneously, one for each pixel of a frame. It uses exclusive-OR (XOR) operations to compare two input frames. Its output is a third frame. Matsushita says an XOR operation takes about 10 ns, compared with 10 ns per pixel or 2,560 ns for conventional circuit. (Source: Electronics Weekly, 27 March 1991)

Chip researchers put fine wires on wafer

Wires as fine as 0.05-micron across have been made on a semiconductor wafer by a research team from Tokyo

Integrated circuits are made on wafers by transferring patterns to the wafer's surface. Conventionally this is done by a photographic process: ultraviolet light is shone through a mask which contains the pattern, onto a light-sensitive layer called photoresist. Photoresist is a bit like varnish, and tends to spread, so it cannot be used to define features less than about 0.2-micron across.

The team from Tokyo University of Agriculture and Technology used amorphous molybdenum oxide instead of photoresist. Instead of ultraviolet, a focused beam of ions was directed at the oxide layer. Where it hit the wafer, the oxide was crystallized. Then the wafer was rinsed in an alkaline solution and all the uncrystallized oxide dissolved, leaving patterns just 0.05-micron wide.

Then the researchers heated the patterns to drive off the oxygen atoms in the oxide, leaving molybdenum wires. Molybdenum has a much higher melting point than the aluminium usually used as the metal in chips, and can withstand much more aggressive subsequent processing. (Source: Electronics Weekly, 27 March 1991)

Designer chips with built-in brain power

As neural networks are computationally intensive, conventional computers can sometimes take days or even weeks to complete neural network operations. In order to overcome these limitations, a new generation of special parallel computer - the neurocomputer - is being designed and developed.

The European Community Galatea project is one of the most ambitious efforts in this area. It is a collaboration between many institutions,

including University College London, Thomson, Siemens and Philips. It aims to build a complete neurocomputing system with comprehensive software and hardware environments. This work is likely to form the basis for future European standards in these technologies.

Neural networks are computing structures inspired by the arrangement and function of real neurons in the brain. They are composed of many parallel, interconnected computing units. Each of these performs a few simple operations and communicates the results to its neighbouring units.

The current practice in implementing neural networks is to simulate the parallelism on common serial computers. This typically means using the elements of an array to correspond to the units of a neural network. As operations on a single unit have to be performed many thousands of times, it takes a long time to train these networks, hence the need for parallel hardware.

When using neural networks to solve problems, programming in the conventional sense is minimal. Only the configuring of the network requires programming, which itself can be quite simple. Once a network is set up, it learns how to do the required computations after being presented with a number of examples of the task to be performed. This contrasts with the tedious task of programming parallel multiple instruction multiple data machines where specific instructions for different tasks must be specified in detail.

The processing strategies of neural networks mirror the operation of the ultimate parallel computer, the brain.

The primary aim of the Galatea project is to build truly parallel computers geared towards brain-like operations. It is a three-year project, due to finish in 1993 and aims to produce software and hardware to help in the whole neural network life cycle, starting from the design of networks, through training and debugging, to the construction of special silicon chips.

In building these new parallel computers, the designers exploit the fact that neurons only have to perform a limited number of operations. The final neurocomputers will not be general purpose as are other conventional parallel computers but, nevertheless, they should excel in a variety of pattern recognition tasks.

There are three main streams of the Galatea project: software environments, hardware environments and applications. The software environment is a successor to a previous EC neural computing project known as Pygmalion.

One of the main components of the software environment is a library of neural network algorithms. This library contains most of the commonly used algorithms including back-propagation, Kohonen nets and Boltzmann machines.

The software environment also contains a high-level language called N, an object-oriented language based on C++. Networks which are specified in N are then compiled into another intermediate language. It is the primitives of this intermediate language that are executed by the parallel hardware. The software environment also provides a comprehensive set of graphical tools to aid the debugging and control of neural networks. This system, which is X/Windows-based, allows the manager to zoom into units and display their values and inner functioning.

Configuring neural networks is still very much a black art. There are still no clear criteria to decide the number of units and functions required for a particular task. These graphical interfaces are designed to help a user experiment with configurations until a successful arrangement is found.

The overall hardware architecture of Galatea is composed of many virtual machines connected by a common communications interface. The IEEE standard, Futurebus, is a possible candidate.

The implementation of this hardware as an open system also allows the easy integration of non-neural hardware.

Within each subsystem there will be many chips that perform the numerous computations in parallel.

The Galatea team is considering using a variety of chips in the final system. Candidates include Siemens' and Philips' neural processors which perform fast matrix calculations.

Another type of chip being considered is the neural RISC processor. This chip, developed at UCL, has a limited instruction set which can carry out the typical operations of an artificial neuron.

The final route to neural chips is more exotic. This involves the production of real silicon analogues of neural networks. That is, after a neural network has been designed and it functions properly, it will be transformed into a silicon chip.

After a neural network is specified in N, it will be trained and tested with the help of graphical tools. The specification of the network in N is then compiled to an intermediate language, which is then compiled to a hardware description language such as VHDL, another IEEE standard. This hardware description is then optimized and finally a silicon chip containing the neural network is produced.

This silicon compilation process is expected not only to produce special neurochips for large neurocomputers, but will also allow the possibility of producing custom-designed neural systems for a variety of industrial tasks.

The applications stream of the Galatea project is focusing on the area of visual pattern recognition. One main application being developed is optical character recognition. It is hoped that fast neural networks implemented in hardware will overcome the limitations of current systems which perform poorly when dealing with handwritten characters. Other application areas being considered include the automatic inspection of printed circuit boards and the grading of oranges depending on their surface characteristics.

Once the Galatea system is in full operation, the cost of producing dedicated neurochips for a particular task may be quite low. It is a strong possibility that many such chips may find their way into consumer products. (Source: Computing, 9 May 1991)

Programmable slave card

NASA says it has developed a bus-programmable slave card (BSC) that can be reprogrammed to carry out various bus functions and could be useful in commercial applications.

The BSC uses tristate, high density circuits and EEP ROMs to configure its functions for a variety of operations. Use of the BSC may do away with certain add-on cards in personal computers and other systems products.

For example, the BSC can be programmed to run analogue-to-digital conversion and also RS232 communication. The host computer can reprogram the BSC for different functions. NASA is willing to license its technology to other companies. (Source: Electronics Weekly, 6 March 1991)

New barcode

There are moves to develop the barcode so that it can carry much more information. Symbol Technologies, of Bohemia, New York, is hoping to get its two-dimensional barcode - which is read up and down as well as from side to side - accepted as an international standard. One advantage of the Symbol code is that it can be read using the scanning equipment already in use - only the de-coding software has to be changed. The new symbology, dubbed PDF 417, could carry more than 1,000 characters per square inch - compared with today's barcodes which contain less than 20 characters.

This would make the new code ideal in transportation and shipping, where one symbol could contain information on the contents, source and destination of a product. (Extracted from Financial Times, 15 February 1991)

Diodes are forever

Materials scientists in the US have recently reported a promising step towards using thin diamond films to make faster and more durable electronic chips.

Thin films of diamond are mostly made by vaporizing hydrocarbons to leave their constituent carbon atoms on heated surfaces - a process called chemical vapour deposition. But, having grown from several initial cyrstallites, the films produced are not continuous crystals. The resulting discontinuities mean the films cannot hold charge-carrying ions in an electronically useful way.

However, a new way to make defect-free films has now been reported by Jagdish Narayan and Vijay Godbole at North Carolina State University and Clark White at Oak Ridge National Laboratory. They bombarded copper with carbon ions and then used laser pulses to melt and resolidify the surface. The implanted carbon ions collected in the liquid metal layer during the melting phase, and formed a continuous crystalline film 500 A thick on the surface when it resolidified.

The method is not yet applicable on a commercial scale, but it opens up the way for making hardier transistors, more compact electronic chips, and faster computers. (Source: Chemistry and Industry, 6 May 1991)

New diode

Fujitsu (Tokyo, Japan) has produced a diode using a tunnel junction effect, operating on a current of a few mV, less than 10 per cent of conventional diode requirements. The device has a substrate of strontium titanate doped with niobium, an insulating silicon layer and a niobium film. The diode can be connected to a high-speed Josephson junction and will function in a range of a few mV to several tenths of mV, with a current-voltage characteristic 10 times more effective than p-n type junction devices. The new diode works at 4.2 K (-269°C), with another version using yttrium operable at 77K (-196°C). (Extracted from New Technology Japan, February 1991)

New class of transistor

International Business Machines and the Massachusetts Institute of Technology are jointly developing a new class of transistor that turns on or off using the power of a single electron. The new transistors are made in layers of gallium arsenide, aluminium arsenide and gallium arsenide with a conductive metallic layer on top. Impurities in the gallium layers provide a source of electrons. The new transistors presently operate only at temperatures approaching absolute 0. In order to create the binary messages of computing, conventional transistors require currents that are many times more massive. (Extracted from New York Times, 17 February 1991)

Bundle of tubes brings X-rays into focus

Two physicists, one American and one Soviet, have developed a revolutionary technology for focusing X-rays, which could have spectacular applications in medicine, computer chip manufacture, materials analysis and astronomy.

The new "lens" is actually a bundle of up to several million hollow glass capillary tubes that guide the X-rays and focus them to a converging beam or parallel beams. The technique is the result of 20 years of collaboration between Walter Gibson of the State University of New York at Albany, and Muradin Kumakhov of the Kurchatov Institute of Atomic Energy in Moscow. The two have formed a partnership to continue research and have also created a company to commercialize the lens.

Scientists have long known, says Gibson, that X-rays can be reflected off solid, smooth surfaces if they strike them at a very low angle. An X-ray can thus be guided down a hollow glass tube. But Kumakhov, Gibson says, was the first to suggest shrinking the size of the capillaries - from 0.2 millimetres to 70 nanometres - and bundling them together to produce beams.

The "Kumakhov lens", as Gibson has dubbed the device, can focus extremely high densities of X-rays onto small spots. Gibson predicts that this will make it possible for radiologists to direct radiation precisely onto tumours, while avoiding healthy tissue. The new lenses have already "achieved spot sizes as small as 30 micrometres, with X-ray intensities in the spot up to 10,000 times as high as can be obtained without the lens", Gibson says.

Tightly focused beams of X-rays may also change the chip-making business. All present-day chips are made using optical lithography, in which visible light is beamed onto silicon through holes in masks. Since X-rays have a much shorter wavelength than light, they are theoretically capable of creating much smaller features on chips. X-ray lithography could pack many more circuits on each silicon wafer, meaning smaller, more powerful chips. Up until now, however, dispersion has made it impossible to get enough X-rays to the chip without using a synchrotron. Synchrotrons produce intense beams, but cost as much as $50 million each. The new lenses ought to make X-ray lithography possible with conventional sources, Gibson says. (This first appeared in New Scientist, London, 20 April 1991, the weekly review of science and technology.)

Transistor speeds through vacuum

The principles of the vacuum tube have been borrowed by Mitsubishi for a transistor whose switching time is 0.5 ps, or half a million-millionth of a second.

The transistor has a needle-shaped field-emission type emitter (the cathode). The electrons it generates pass to a collector (the anode) and their flow is controlled by a gate.

Mitsubishi says the high speed is due to the electrons travelling through a vacuum instead of a semiconductor.

A superconductor/insulator/superconductor tunnel junction is used as the cathode. Metal/insulator/metal cathodes can be damaged by current heating, but superconductors have no resistance so are immune from this.

So far Mitsubishi has only simulated its design, predicting that an emitter voltage of 1V would allow 0.3 mA to pass through the collector. (Source: Electronics Weekly, 3 April 1991)

US 'memory cube' stores data in 3D

Two groups of US scientists have revealed new types of materials that will allow future computer systems to store data in three dimensions.

Scientists at the University of California at Irvine, say they have developed a prototype 'memory cube' that could store as much as one trillion bits of data or about the same as 3,000 40 Mbyte hard drives. The memory cube relies on the properties of a new type of plastic which changes state when illuminated by two intersecting lasers.

IBM scientists say they have discovered a polymer that has promising data storage properties and can store 100 million bits of data in a spot the size of a pin head. The polymer, made of epoxy and an organic material used in copiers, has properties normally associated with expensive crystal materials.

Technique to store data on a crystal

A technique to store data on the surface of a crystal has been developed by Harald Fuchs of BASF's Polymer Research Laboratory and Thomas Schimmel of the University of Beirut. The tip of a scanning tunneling microscope (STM) is positioned about one millionth of a millimetre away from the surface of tungsten diselenide. A voltage across the gap in alternating bursts can rearrange the atoms on the crystal surface. The triangles created in this way on the surface remained intact for at least two days. Each trimer can be produced in a few milli-seconds, and each can be erased. (Source: Electronics Weekly, 8 May 1991)

By contrast, a technique to use STM at IBM by moving xenon atoms on the surface of a nickel crystal requires a great deal of time. (Extracted from New Scientist, 16 February 1991)

New process for laser production

IBM's research laboratory in Zurich, Switzerland, has developed a low-cost, mass-production process for producing up to 20,000 diode lasers on a 5 cm diameter semiconductor wafer. The breakthrough will allow electronics manufacturers to mass-produce inexpensive lasers for CD players, laser printers, fibre-optic data transmission systems, etc., for the first time. It could also make absorption- and fluorescence-based chemical detection instruments cheaper. The technology to produce diode lasers similar to the way that chips are made might dramatically lower the costs of lasers. The researchers formed the direct band-gap junctions and optical resonators of the lasers by depositing layers of aluminum gallium arsenide epitaxially onto gallium arsenide wafers. Reactive ion-beam etching was used to cut trenches 400-800 microns long and 5-6 microns deep through lithographic resists, which were coated with a semitransparent reflective material to create a mirrored surface. The technique might eventually be used to link lasers with other components on optoelectronic chips to transmit and process data. (Extracted from Chemical and Engineering News, pp. 5 and 6, 11 February 1991)

Toshiba laser has the power

Researchers in Japan claim to have made a diode laser with the most powerful beam in the world. The devire, made at Toshiba's R&D laboratories, emits 106 mW of 690 nm red light at room temperature.

Last year, Toshiba's engineers developed a technique for stopping energy leaking out of the active part of the diode into the surrounding material. They have already started to make commercial devices using the technology to reduce the wavelength of the light emitted.

The new device, made using the same techniques, should eventually be used in optical storage systems like CD-ROMs. As well as being more powerful than normal diode lasers, it has a shorter wavelength than those now used in CD players. This helps to pack data more densely onto disks. (Source: Electronics Weekly, 10 April 1991)

Mitsubishi claims "biggest storage"

The industry's biggest storage card yet - 12 Mbyte - which is getting near to the storage capabilities of the average PC's hard disk is being sampled by Mitsubishi.

The card is made using 24 4 Mbit DRAM chips using a TSOP package. A battery is packaged with

the chips to keep the memories intact and refreshed.

The company has also developed a 2 Mbyte card made up of 16 1 Mbit flash EEP ROMs which are non-volatile so do not need a battery to retain their data storage.

Mitsubishi's aggressive moves in memory cards are opening up a market dominated by Intel and its partner Fujitsu. Mitsubishi has not discussed pricing but it is believed to be considering bringing down the apparently excessive ratio of chip cost to card cost which is currently running at a factor of 5. (Source: Electronics Weekly, 27 March 1991)

Gate array first

Mitsubishi claims that it will start producing the world's largest gate arrays in the next few months. Its M60080 devices have 400,000 gates in a 576-pin package.

Chips are made using a 0.8 μm CMOS process with three layers of metal interconnections. The company, which has patented the gate isolation technology used in the device, believes the gate delay will be as low as 125 picoseconds.

Mitsubishi's arrays will be sold in tape carrier packages (TCP) that allow the lead pitch to be cut to 0.25 mm, half the length used with tape automated bonding housing. (Source: Electronics Weekly, 13 March 1991)

First in voice traffic

A Californian company has claimed a world first in being able to provide up to eight high-quality voice, data or fax channels on a single 64 Kbit per second circuit.

Pacific Communication Sciences of San Diego says the ability to send faxes transparently across compressed voice channels will stimulate demand for the relatively low cost 64 Kbit lines.

The company has launched its Clarity Series CS8000 voice/data multiplexer based on a new compression algorithm developed and patented by PCSI.

PCSI incorporates an adaptive transform coding (ATC) technique that digitizes and compresses voice traffic.

The two major benefits are said to be providing voice quality equal to that found on long distance calls and enabling the compressed voice channel to be used for fax and data transmission. It is the latter point that is claimed to be unique to the industry. (Source: Computer Weekly, 21 March 1991)

Superconductor-based magnetic detector

A magnetometer based on high-temperature superconductors has been developed by researchers at Lawrence Berkeley Laboratory; the University of California, Berkeley; and Conductus Inc., Sunnyvale, California. Potential applications for the device include laboratory instrumentation, geophysical surveying, non-destructive testing, and non-invasive detection of magnetic signals from the human heart and brain. The magnetometer contains a superconducting quantum interference device (SQUID) and a superconducting flux transformer chip. The SQUID, a thin-film loop of yttrium-barium-copper oxide (YBCO) high-temperature superconductor, produces voltage signals in response to magnetic fields. The transformer chip, consisting of an insulating layer of strontium titanate between two YBCO layers, boosts these voltage signals by a factor of 80, increasing the sensitivity of the magnetometer. (Source: Chemical and Engineering News, p. 45, 8 April 1991)

Bell research

Researchers at Bell Communications Research say that they have made a breakthrough in superconducting materials that will lead to more reliable superconductor-based semiconductors.

The researchers say that they have made high-temperature superconductors in which the atoms of the conductor are aligned to make it easier for electricity to flow without heating up the material too much. This new process makes it easier to use high-temperature superconductors in integrated circuits since the flow of electrons can be better controlled. (Source: Electronics Weekly, 15 May 1991)

Superconductor uses near commercialization

Various uses for high-temperature superconductors are nearing commercialization. Several entities have been developing uses for the present generation of high-temperature superconductors, instead of focusing on developing higher-capacity materials. Uses for the present generation offer benefits that are seen as being put to use in the next few years. Superconducting devices for communications, radar, guidance and control have possibilities to enhance efficiency and performance, while cutting size. Giant magnets and motors produced from high-temperature superconductors are not expected to be available for some time, but some simpler products have been developed and show commercial possibilities. (Extracted from Material Engineering, February 1991)

Superconductor lattice carries current at right angles

A layered superconductor lattice that carries current at right angles to the film has been developed in research by Theodore H. Geballe, Chang-Beom Eom and others at Stanford University. The lattice consists of 400 alternating layers, each 12-A thick, of the insulator praseodymium analog, $PrBa_2Cu_3O_7$, and the superconductor yttrium-barrium-copper oxide, $YBa_2Cu_3O_7$. A sputtering process was used to alternate the layers of material on a substrate. The copper-oxygen complexes in the layers orient on the a-axis, allowing current to move to the film surface. Standard superconductive lattices move current along the c-axis, or to the film edges. The a-axis orientation of the Stanford superconductor lattice permits electrical connections to be made to the film surface. Bell Communications Research (Red Bank, NJ) is also working on a right-angle oriented superconductor film via laser disposition technology rather than the sputtering process. (Extracted from Chemical and Engineering News, p. 6, 18 February 1991).

Aluminium solves gate delay snag

Hitachi claims to have solved the major problems associated with making the thin film

transistors (TFTs) which control the pixels in large liquid crystal display (LCD) panels.

Instead of using chromium for the TFT gate contacts and wiring on the panel, Hitachi has used aluminium. This has reduced one problem, the gate delay. It is caused by the gate taking a finite time to switch. The delay of the new gate is a third of that of a conventional TFT, allowing larger panel displays to be made.

The gate is covered by a double insulating film of alumina and silicon nitride, which the company claims has a sixth of the number of defects suffered by single films, and a fifth as many short circuits - solving another major problem of LCD panels.

Hitachi plans to use this technology in a 30 in. high definition TV screen and a 40 in. normal TV screen. (Source: Electronics Weekly, 3 April 1991)

New material with improved transmission properties

Matsushita Electric Industrial and Miyazaki Matsushita Electric have jointly produced an advanced dielectric ceramic material with improved microwave transmission properties. The material was made by a nanopowder process for homogeneous mixing and a liquid phase sintering process for fine structure control. It displays a Q-value of 35,000 at 11 GHz and almost 20,000 at 20 GHz, about 2 times better than conventional dielectric ceramics. The material will be used to make resonators for transmitting and receiving systems for microwave satellite communications. The improved properties of the ceramic will allow better transmission quality and use of a larger number of channels in the limited bandwidth. (Extracted from New Technology Japan, February 1991)

Fastest laser light pulses

Scientists at AT&T Bell Laboratories Inc. have set semiconductor laser records by generating the world's shortest and fastest light pulses with a monolithic semiconductor laser. The colliding-pulse mode-locked laser generates 350 billion light pulses a second, each shorter than a trillionth of a second. By comparison, the fastest commercial lightwave system available today launches pulses down a fibre at about two-and-a-half billion pulses a second. The new laser is said to be the world's fastest laser of its type and is the first step in creating a system that can send data at 350 gigabits per second. If this new laser were used in a comparably fast communications system or fibre optic network, the text of a library of 1.2 million books could be transmitted in one minute. (Extracted from Communication Week, 4 February 1991)

"No threshold" laser

NEC has developed a laser that uses a low threshold of power, according to NEC. The "no threshold" laser could be used for high-grade optical communications equipment and optical computers. The laser emits yellow-green light with a 560 nanometre-long oscillation wave. As the light source becomes stronger, the laser oscillates stronger beams. Even when no threshold level exists, the laser generates a beam due to its microscopic resonators. (Extracted from Japan Economic Journal, 9 February 1991)

Transputer learns to speak to industry

The second generation of the innovative British-designed computer microprocesssor known as the transputer with improvements which its makers hope will make it more popular with industry has been produced. One of the transputer's main advantages is that it has in-built communications so that the chips can be easily bolted together for parallel processing. Parallel computers rely on a number of processors working on tasks simultaneously rather than a single fast processor.

The new generation, called T9000, is faster, has better communications and is also accessible to a greater range of languages. Earlier versions relied on a specialist computer language, Occam, which tended to make them unpopular with industry.

These improvements come from investment by the French/Italian computer company SGS-Thomson Microelectronics. The company stepped in to buy up the transputer's manufacturer Inmos in 1989. SGS-Thomson is Europe's second largest and the world's twelfth largest chip manufacturer.

Further support has come from the European Commission's ESPRIT project for basic research in information technology, which supports work in 55 universities on parallel processing that focuses on the transputer. Parts of the new T9000 and its associated C104 communications chip have come directly out of ESPRIT projects. (This first appeared in New Scientist, London, 27 April 1991, the weekly review of science and technology.)

Ring-bound computer will take down a note

A tiny computer that understands handwriting has been developed. The computer masquerades as a personal organizer, complete with leather case and binder rings, which can still carry paper diaries, maps, address books and all the usual necessities.

The Refalo computer, from the Japanese company Kyocera, has a new kind of keyboard which simply clips into the binder with no electrical connection to the computer and also has a display screen you can write on. Data is stored on solid-state memory cards.

The software is compatible with MS-DOS, so data can be taken from the Refalo into a larger personal computer at home or in the office. The design of the Refalo includes 32 patented concepts.

The computer's liquid crystal screen measures 7 by 9.5 centimetres and is coated with a pressure-sensitive layer. This layer is made using a technique known as chip-on-glass, where the layers of silicon needed to make an integrated circuit are deposited on a sheet of glass rather than a metal substrate, producing a transparent chip. In this case the technique is used to deposit a pressure-sensitive chip on the surface of the screen, giving much higher resolution than conventional touch-sensitive screens.

With a small blunt stylus, which incorporates a spring to ensure that the plastic coating on the screen is not damaged, the user can control the functions of the computer and call up a scheduler or telephone directory. The resolution of the touch-sensitive surface is fine enough for it to map movement of the stylus directly onto each of the 76,800 dots in the display.

When characters are handwritten at the bottom of the screen, the computer displays its

interpretation of them at the top. The company will produce different versions for different European markets as handwriting differs from country to country.

Characters have to be drawn one at a time for the computer to recognize them as letters, but short handwritten notes can be stored as graphic images and printed later.

The removable keyboard - which is 4 millimetres thick - clips into the binder just like a sheet of paper. There is no direct contact with the "cover" which holds all the electronics. The keyboard sends signals to the computer by electromagnetic induction, with the two central binder rings acting as detectors. The Refalo will be on sale later this year costing under $1000. (This first appeared in New Scientist, London, 4 May 1991, the weekly review of science and technology.)

Fast logic

Toshiba says it has developed the world's fastest BiCMOS logic devices. The chips have a propagation delay of 3 ns and can drive 64 mA of output current. The 74 ABT chips use CMOS transistors for input and logic control and bipolar elements in the output sections. (Source: Electronics Weekly, 24 April 1991)

Two supercomputers linked

The Pittsburgh Supercomputing Center has created the first high-speed data link between a Cray Y-MP and a massively parallel Connection Machine (CM-2), supercomputers of radically different design. The link, which can transfer data at rates approaching 1 gigabit per second, makes it possible to distribute tasks between the two supercomputers according to what each does best. Other problems that could benefit from the high-speed link include air pollution modelling, DNA and protein-sequence analysis, and molecular dynamics calculations. (Extracted from Chemical and Engineering News, p. 20, 25 February 1991)

High-temperature superconducting transistor

A superconducting transistor developed by scientists and engineers at Sandia National Laboratories and the University of Wisconsin, Madison, is currently being used to create a whole new family of electronics, which has the potential for integration with existing semiconductor and low-temperature superconductor electronics.

Devices based on high-temperature superconducting materials hold promise for higher speeds, reduced noise, low loss and high efficiency for a whole variety of applications in communication and signal processing.

The transistor has been named the superconducting flux flow transistor (SFFT) and Sandia scientists say it is the superconducting analogue of the field effect transistor (fet). It is also claimed to be the first transistor made entirely from the new high-temperature superconducting material. (Passive devices - inductors and some microwave components such as filters and delay lines - have recently been made elsewhere from the new materials and are now commercially available.)

The SFFTs consist of parallel weak superconducting links about 10 μm long (about a tenth the thickness of a sheet of paper) separating two pieces of superconductor, and a control line to provide a local magnetic field. (Extracted from Electronics World and Wireless World, February 1991)

How optical discs feel the squeeze

Sony, the Japanese electronics company, appears to have found a way to squeeze more information onto an optical disc than is possible with optics alone. Sony acknowledges that its technique can be used to enhance the performance of a new recording system, called Mini Disc, that it has been showing to prospective licensees for the past year.

Mini Disc is a magneto-optical disc, different from conventional optical CDs, and users can make and erase their own recordings on it. In its first version, Mini Disc achieved a long playing time from a small disc by compromising sound quality. The new technique enables Sony to offer Mini Disc for a wide range of applications such as recording computer data, video pictures and either professional or domestic-quality sound.

Sony's new technique, called thermal eclipse reading but referred to as IRISTER, increases the storage capacity of an optical disc by six times using a conventional solid-state infrared laser and miniature focusing lens. When solid-state blue lasers become commercially available, it is estimated that IRISTER will increase the storage density by up to 20 times what it is today. (Extracted from New Scientist, London, 9 March 1991, the weekly review of science and technology)

Hybrid switch speeds data on its way ...

A switch for fibre-optic communications networks which switches data in optical form may soon let optical fibres come nearer to fulfilling their potential for carrying huge amounts of data over great distances at lightning speed.

A single optical fibre has the potential to transfer an amount of information equivalent to the contents of a medium-sized city library in one second, says Rod Tucker, head of the Photonics Research Laboratory at the University of Melbourne, where the hybrid switch was developed. This potential has remained untapped because the optical information had to be converted to electrical information and processed electrically at many places along the way.

Tucker's team claims that their development is the first switch to allow packets of data to remain in optical form all through a switched communication network.

The team announced improvements that allowed them to handle data travelling down a fibre at a rate of 1.2 gigabits/s, the equivalent of 120,000 typewritten pages every second.

The switch relies on a technique known as packet switching. Information is split into individual packets of data for transmission and each packet carries an address to identify its destination. All the packets are then sent

independently through the communications network to their destination, where the original information is reassembled as the packets arrive.

Switches are necessary at each branch point in the network. At present, the only available switches are electronic. In order to use packet switching technology in a fibre-optic network, the light pulses have to be transformed into an electrical signal at each switch so that the address can be read.

The data is then converted back into optical form using a laser and continues its journey. The rate at which the electronics can carry out switching operations is much slower than the rate data can pass through the fibres, so the switches slow transmission.

In the new switch only the address information is converted to electronic form. As the signal reaches the switch a passive optical splitter separates off 10 per cent of the "brightness" of the signal to an optical detector which converts it into an electrical signal. The address of the signal is then decoded and the rest of the data is ignored.

The address information is then used to set the state of a lithium niobate optical switch. This switch sends the remaining 90 per cent of the optical signal in the fibre in the correct direction without having to convert it to electrical form.

The prototype has two states: either the light signals can pass directly through the crystal or their path can be switched across the crystal to a second output.

But as the speed of the electronics is slower than that of the optical signal, the latter must be delayed to give the electronics time to read the address and set the switch. The team uses a coil of optical fibre to delay the signal for the necessary few nanoseconds. At the speed of light, 0.25 metres of fibre are needed to delay the optical signal for one nanosecond.

Although the address of the packet must be at a rate the electronics can handle, the useful information in the packet, known as the payload, is not processed electronically, so it can be at a much higher data rate than the address.

In the Melbourne team's prototype system, each bit in the address is represented by eight bits at the data rate of the payload. This allows them to send the payload at the data rate of 1.2 gigabits/s while the address remains at 155 megabits/s, a rate the electronics can easily handle.

Despite its advantages, the new switch is still only a half-way house to an all-optical system. Such a system would use optical switches to form optical logic devices which carry out the computing functions necessary to read the address and direct the signal using only light. These logic devices are exceptionally fast and are expected to be able to switch signals in picoseconds rather than the nanoseconds of the Melbourne switch. (This first appeared in New Scientist, London, 16 March 19 . the weekly review of science and technology.)

III. MARKET TRENDS AND COMPANY NEWS

Market trends

What the 1990s will look like

The Economist Intelligence Unit of London, in a study of strategies of 30 major international companies, has come up with 12 major trends affecting the electronics industry's development in the 1990s. They are:

- Computers and peripherals will continue to account for a third of the output.
- Demand for software and systems engineering skills will grow.
- Demand for telecom equipment will grow steadily.
- World semiconductor markets will increase fourfold. Key areas: memory, ASICs.
- Component sizes will continue to shrink.
- HDTV will arrive by 1995 - but with three different standards.
- Optoelectronics will see major advances.
- Government R&D support will move to non-military or dual-purpose areas.
- Governments will become more sensitive to foreign acquisitions of high-tech companies.
- Electronic component counts in autos will double.
- The trend towards strategic alliances will continue.
- Growing overseas production by Japanese companies will reduce Japan's trade surplus with the United States and Western Europe.

(Source: Electronics, March 1991)

Future trends in computing

This report is a slightly modified excerpt from an article by Geoff Manning which recently appeared in JFIT News, No. 16, September 1990. The JFIT News is the official newsletter of Joint Framework for Information Technology, and is published by the Institution of Electrical Engineers, a British equivalent of IEEE. The Joint Framework for Information Technology is a collaborative effort between the Department of Trade and Industry and the Science and Engineering Research Council in the United Kingdom.

Geoff Manning, who has been a physicist for 40 years, a computer user for 35 years, and a businessman at Active Memory Technology for the last four years, has the following observations on future trends in computing:

- Future high-performance computer systems will use large numbers of processors (up to a million can be seriously contemplated) working efficiently on a single problem.

- Development of state-of-the-art computer hardware is dominated by two technologies - VLSI and packaging. (I also believe that the feasibility of wafer-scale integration technologies for massively parallel systems will be demonstrated in this decade.)

- VLSI's great strength is the replication of simple units in large numbers at low cost and high reliability.

- Packaging developments will decrease the volume of computer systems by one or two orders of magnitude. Progress in multichip module packaging and CMOS technologies will soon result in the following remarkable figures: 30 MFLOPs per cubic inch or 2 GFLOPs per litre. 7 MFLOPs per watt, $350 per MFLOP (32 bit), $10 per MIP (8 bit) (the last figure is already lower according to my estimates).

- A high range of tasks needs the highest possible compute power, but the systems used must be deployable and affordable.

- Most computer-intensive problems are inherently parallel, and a large subset is data parallel.

- Dominant problem in the use of parallel systems is the production of software; ease of use will determine which systems sell. (I might add a modifier: production of reliable software.)

- Development of algorithms and application techniques for parallel systems is a crucial research task. We must undo 35 years of forcing parallel problems onto serial hardware.

- Future general-purpose computer systems will be heteroarchitectures with specialist units for different tasks.

In a nutshell, hardware will progress and technology-driven advances will continue. The world needs a breakthrough in software. Some credible efforts are under way. (Source: European Science News, January 1991)

Software firms cash in on downsizing trend

Software development product suppliers are booming despite the recession because of a user trend towards downsizing mainframe applications.

Cognos, Information Builders and Micro Focus have all reported growth rates of over 20 per cent in their last financial year. The growth rates contrast with software and services companies, such as Logica and SD-Scicon, which have published disappointing profits or large losses.

Users are downsizing mainframe applications to PCs or workstations or local area network; and a similar trend towards Unix is expected this year. DP managers can invest in PCs and see cost savings quicker than investment in new mainframes.

The trend is a warning for software suppliers not adapting to user interest in downsizing. (Source: Computer Weekly, 18 April 1991)

The gallium arsenide forecast: it is still a mixed bag

Gallium arsenide may someday become a mainstream semiconductor material. However, signals from the industry indicate otherwise, confirming that most industry analysts are right when they maintain that GaAs, like silicon emitter-coupled logic, will always be limited to a high-performance niche.

The latest signals are mixed. Even as one manufacturer reported its first profitable year, two others decided to merge. TriQuint Semiconductor Inc. of Beaverton, Ore., and GigaBit Logic Inc. of Newbury Park, Calif., have merged under the TriQuint name. The new company becomes the biggest in the GaAs business. (Source: Electronics, March 1991)

Report forecasts £6 billion IT market in East Europe

Eastern Europe could offer a £6 billion market for computers and associated equipment in 1993, but firms hoping to cash in on the bonanza may face a long haul, according to a report by Frost and Sullivan.

The report says the information technology market in former Comecon countries will be worth between $3.8 billion and $5.9 billion in two years' time, up from around $1.68 billion in 1990.

Personal computers are forecast to be the most sought after items initially, but later Unix systems will do well.

Only in east Germany will there be a substantial market for mainframes, the report predicts.

East Germany is expected to account for almost half of all shipments during the new few years, but markets in Poland and Czechoslovakia are also forecast to be strong, with sales in 1993 of $719 million and $569 million respectively. (Source: Electronics Weekly, 15 May 1991)

Printed circuit boards to boom

The world-wide market for printed circuit boards will reach $13.5 billion in 1990 and grow to $31.9 billion by the year 2000, according to Business Communications Co. (BCC; Norwalk, CT). Multilayered printed circuit boards will grow particularly fast, says BCC, expanding at 11 per cent per year, to a $6.1 billion per year market by the year 2000. BCC points to increased interest in new plastic high-density materials for use in circuit boards. BCC also says that while epoxy remains dominant as a substrate material, a variety of other materials, including polymers, are being developed in efforts to improve electrical, mechanical, and thermal properties. (Source: Chemical Week, 2/9 January 1991)

US spending on software to increase

US users are spending more on software and less on hardware upgrades as they rethink their IT budgets.

A survey of big US companies by Sentry Market Research reports that US businesses plan to spend more than $30 billion on software in 1991, a 15 per cent increase over 1990.

Damian Rinaldis, of Sentry, said the jump in software sales was mainly due to the migration of older hardware technologies to new client/server systems.

He said demand for software tools was also growing. "On every machine size the biggest growth area will be in tools that allow users to programme their own solutions. These tools will be applied to problems which include querying databases, improving systems performance, developing unique applications and improving security", Rinaldis said.

The Sentry findings show that US businesses are more willing to pay for software systems and applications than they are for hardware upgrades. A survey by US publication MIS Week shows that US budgets are much lower in 1991. About 40 per cent of US companies with IT budgets of between $100 million and $500 million say they are spending less.

Many IT directors say they are under pressure to further cut costs while facing higher user demand. (Source: Computing, 14 March 1991)

US global software share

US companies command nearly a 60 per cent share of the $110 billion global market for computer software and related services, according to International Data. More than 1.2 million programmers and software engineers work in the US, while an additional 200,000 people are employed at related jobs at software companies, says the US Labour Department. Despite the huge lead, some observers fear other countries are slowly chipping away at US dominance in software. Japanese firms see US inattention to quality as a weak point: there is a growing shortage of top-flight programmers in the US, which is not likely to reverse itself as fewer college students pursue the field; and under any circumstances, the US may find it hard to keep its lead because the software field is easy to enter, requiring little capital investment and only some know-how to get started. While work proceeds on improving quality, US software firms are pushing their products overseas. Of the top 50 suppliers of commercial software and services in Europe, 13 are US companies. Article includes a detailed discussion of the position of the US in the world software market and increasing competition from other countries. (Extracted from Business Week, 11 March 1991)

US share of semiconductor market

The US increased its share of the global semiconductor market to 36.5 per cent in 1990, up 1.6 per cent; Europe's increased 1 per cent to 10.5 per cent; Japan's fell 2.6 per cent to just below 50 per cent, according to Dataquest (San Jose, CA). The global semiconductor industry overall reached $58.4 billion in 1990, up 2 per cent. While the figures are preliminary estimates, they indicate a reversal of a 10-year trend during which US and European chip manufacturers steadily lost market shares; US firms have not shown an increase since 1979. (Extracted from Defense News, 4 February 1991)

Multimedia

Interactive media systems, we are assured, are to be the next great consumer and office products.

Consumer electronics giants like Philips, Sony and Matsushita say so, which means that every consumer in the developed world is part of the target market. They recognize that the systems will extend the capabilities of computers to deal with high-quality graphics, television-quality images, and high-fidelity sound. While Microsoft, Lotus and NCR work on developing applications, IBM and its chip maker Intel are working to make interactive video an integral part of desktop computing. Within 10 years, says Intel, these facilities will be resident on volume-produced microprocessors.

The interests of the computing community are also at stake, because the Japanese consumer electronics companies see the technology as a route from their traditional consumer products into the lucrative small computer market.

And there will be lots of spin-offs along that route. The technologies involved will bolster ideas like video conferencing, video telephony, and high-definition television. The publishing industry is hoping that such consumer electronics will give it the fillip that compact discs gave the music industry in the 1980s.

The computer industry sees lots of scope to build interactive media studios, the equivalent of film or TV production houses, but reliant entirely on today's high-end workstation and mass-storage techniques. And the business community is looking forward to producing on optical disc and using viewers' desktop computers as VCRs might be used today.

What does the technology consist of? The idea is to marry up high-fidelity sound, computer graphics and video cassette quality moving pictures, with one important extra that only computers can provide - interactivity. It is this last element which has promoted one industry pundit to describe the technology as real life on a TV screen. Users can intervene to change what they see and hear, rather as they do when playing sophisticated computer games.

There are two major rivals in the race to set a world-wide interactive media standard. Philips' CD-I system is backed by, among others, consumer giants Sony, Matsushita, Sharp and Hitachi. Intel's digital video interactive (DVI) has the backing of IBM, Olivetti, and AT&T, which is promising Unix support.

The key is full screen, full motion video. This describes the ability of a system to display TV-quality pictures, read from a mass storage device. Technically, it is also one of the most difficult tasks to attempt, because it involves huge amounts of data.

To describe a single frame TV picture takes around 720 Kbytes of data. TV pictures are updated at 25 or 30 frames per second, giving a total data rate of approximately 20 Mbytes per second. So the data is required at over 100 times the rate at which an optical disc could provide it, even in a sequential fashion. To add interactivity makes the problem even worse, because the disc has to spend time seeking the correct information. The interactive part - the controlling program - also has to be stored on the disc, cutting down its total capacity.

The answer is video compression. This means storing the data on disc in a space-saving format,

and reconstituting it for display as and when it is needed, as well as studying the properties of the eye and brain, so that unimportant information can be discarded.

Recently set international standards define just how video compression should be performed. The most important of these is the International Standards Organization's motion picture expert group, or MPEG, definition, to which all of the participants in interactive video are committed.

But most development energy is presently going into training and educational applications. Renault is to use CD-I to train its mechanics throughout the world, making the most of the fact that a single disc can hold sound in several different languages.

One very promising digital video interactive application is sign language training for the deaf. The computer will show video-quality pictures of training staff demonstrating signing, while the camera will be used to monitor the user's attempts to imitate these.

Other developments include a system to allow travel agents to "walk their customers around" possible holiday destinations, and a system for estate agents to show properties on-screen, from the comfort of the office. (Source: Computer Weekly, 21 March 1991)

Company news

Computer firms under the cosh

Europe's indigenous computer makers can take little comfort from the fact that the whole world-wide computer industry is having a tough time at the moment.

While US giants IBM, DEC and Hewlett-Packard will survive the current upheaval, it is almost certain that European companies will not come out in anything like their present form.

It is crunch-time and Europe's computer chiefs know it. But they face limited options: they can join forces with each other or team up with foreign rivals - and whatever happens the job losses and plant closures will go on.

France's Groupe Bull is in deep trouble with sales falling - after taking account of acquisitions - and losses trebling to over $1.2 billion. It is cutting a fifth of its workforce, shutting half its plants and relying on State handouts to keep its research effort going.

Merger talks last year with Italy's Olivetti came to nothing and there is speculation about links with Finnish computer maker Nokia Data. But most attention is focused on the talks currently going on with Japanese giant NEC.

NEC may trade its stake in the old Honeywell operation that Bull bought in 1987 for a 5 per cent stake in the whole of a restructured Groupe Bull.

NEC already supplies Bull with mainframe technology in much the same way as Fujitsu used to supply British-based ICL before taking it over.

This puts French politicians and European Community industry mandarins in a difficult position. They argue that Europe needs a strong presence in the computer industry to counter the Japanese.

With Olivetti ruled out, Bull's only serious potential European partner is Germany's newly merged Siemens-Nixdorf Informationsysteme. But Siemens-Nixdorf is finding its merger process tougher than expected and looks like staying in the red for at least the next year. The last thing it needs is another merger.

With annual sales running at around $8 billion Germany's Siemens-Nixdorf is probably big enough to survive on its own. It is the second largest computer maker in Europe, after IBM, and ranks number eight in the world.

Similarly, Dutch giant Philips has the clout to carry on alone with its relatively small computer business. But it is concentrating on personal computer making and, significantly, the business has been put under the wing of the consumer electronics division.

Italy's Olivetti cannot continue to go it alone for much longer. It is still profitable and this will buy it a little time but last year saw profits slashed to a third of their 1989 levels on stagnant sales.

Olivetti is in the middle of cutting almost a fifth of its workforce and has just been through a costly restructuring. It is probably looking for US or Asian partners, having rebuffed overtures from France's troubled Groupe Bull. Rumours that it was talking with DEC have so far come to nothing.

One way or another, it looks like Europe will have fewer indigenous computer companies. (Source: Electronics Weekly, 8 May 1991)

Apple to eliminate use of CFCs

The Apple Computer Corporation has announced that it will completely eliminate the use of chlorofluorocarbons (CFCs) to clean electronic assemblies and circuit boards. In addition, the company says it has developed a new process for circuit board assembly which does not require the boards to be cleaned. Apple's manufacturing plants in Cork, Ireland, Fremont, California and Singapore have already started introducing production lines where no CFCs are used. A new factory in Colorado is going into operation without any CFC use.

CFCs have been linked with depletion of the earth's ozone layer, which is a natural shield against harmful ultra-violet radiation. The United Nations agreed the Helsinki Declaration in 1989 in which 81 countries declared their intention to phase out the use of CFCs by the year 2000.

The electronics industry has long used CFCs to clean electronic assemblies and printed circuit boards.

The United States Environmental Protection Agency estimated that the industry accounts for about 12 per cent of the total use of ozone depleting chemicals there. However, alternative cleaning methods such as water or terpene-based systems also have environmental drawbacks.

The Vice-President of Apple's Worldwide Manufacturing Division, Fred Forsyth, said that their ultimate goal was to reduce and eliminate

the use and emission of CFCs in all their operations and they were well on the way to achieving that goal.

Progress had been excellent and all manufacturing-sites would be CFC-free by 1992, almost a year ahead of their original schedule. The company is also involved in strategic agreements with other companies to develop and refine this technology and results of its work will be shared freely with others in the industry. (Source: AMI, May 1991)

Taiwan picks dense chips

Dense ROM, not flash EPROM, is the chip technology that will replace disks in the new breeds of portable computer according to Taiwan's largest chip maker United Microelectronics Corporation (UMC).

Since Taiwan is the world's largest manufacturer of personal computers, UMC's perception of a move to replace disks by chips is particularly significant.

To capitalize on that perception UMC intends to have the world's densest ROMs. A 16 Mbit is to be launched soon, and a 32 Mbit ROM is planned before the end of the year.

UMC reckons it has a particular edge in the ROM business, having supported the Taiwan consumer industry for many years. (Source: Electronics Weekly, 8 May 1991)

Siemens participates in Japanese venture

Japan's communications authority, NTT Corp., has chosen Siemens AG as the only European company to participate in the development of its so-called Visual, Intelligent, and Personal programme, the communications infrastructure for the broadband integrated services digital network of the twenty-first century.

The technological basis of the Japanese network will be fibre-optic cables as well as the ATM (for asynchronous transfer mode) principle, with which signals of the various services for speech, text, data, and pictures can be switched and transmitted in a simple manner in the form of digital packets. This will enable NTT to offer VI&P subscribers the most sophisticated services over just one socket at low cost.

Germany's Siemens in 1989 supplied an ATM switching system for West Berlin. With its ATM technology, Siemens has also been involved in developing Europe's Integrated Broadband Communications Network, which is part of the RACE (Research in Advanced Communication in Europe) project.

Installation of both the European and Japanese networks is to start in 1995. (Source: Electronics, March 1991)

Computer giants hold PC talks

Six US computer industry giants are holding talks aimed at forming an alliance to develop the next generation of personal computers (PCs), according to industry sources.

Compaq Computer, the world's third largest PC maker, together with US computer giant DEC, leading workstation maker Silicon Graphics, software giants Microsoft and the Santa Cruz Operation (SCO) as well as microprocessor developer Mips Computer Systems are all believed to be involved.

The three computer makers are working on desktop machines built around the Mips reduced instruction set computing (RISC) technology microprocessor family. These machines will run SCO's flavour of Unix as well as the advanced new operating system, NT, being developed by Microsoft.

The idea is to use Microsoft's Windows package and DOS running under Unix to ensure that the new machines are compatible with existing PC architectures.

None of the companies involved would confirm that talks are taking place, but analysts expect to see a series of announcements about closer cooperation with hardware set for 1993. (Source: Computer Weekly, 6 March 1991)

ICL loses out on three JESSI chip projects

ICL is not being allowed to participate in three out of five European R&D chip projects, which are part of the Joint European Sub-Micron Silicon Initiative (JESSI).

The company was accepted for the CAD Frame project and Euro-CAD project for Board Design. It was turned down for a High Definition Language for Component Modelling project, High Performance Simulation, and Test Generation and Design project.

The other partners in JESSI were asked in December 1990 whether they wanted to work with a British-based company that was 80 per cent owned by Fujitsu.

At the same time, IBM was allowed to join in two semiconductor processing projects, one of which is sub-micron semiconductor technology.

But the JESSI partners could hardly exclude the world's top producer of semiconductor production equipment - all of which it uses itself. IBM also undertakes a sizeable amount of semiconductor R&D in Europe.

The decision to exclude ICL from three projects was taken by the JESSI Board Support Group rather than any one company. Now ICL's participation is a peripheral one. In order to exploit ICs fully, it is necessary to have the right CAD tools, and it is this area that ICL will be working in. (Source: Electronics Weekly, 3 April 1991)

Dexter, Hitachi form electronics project

Dexter Corp., Windsor Locks, Conn., and Hitachi Chemical, Tokyo, are planning a cooperative project in semiconductor moulding compounds. Under the agreement, Dexter's Electronic Materials Division, located in Industry, Calif., and Hitachi will share moulding compound technology and processing technology, and will cooperate on R&D and manufacturing world-wide. Semiconductor moulding compounds are used to encapsulate integrated circuits. According to the companies, Hitachi Chemical is the only company that can supply chemical materials for the entire semiconductor production process. Dexter's division manufactures electronic coating and moulding powders, resists, and process chemicals to the electronics packaging products industry. (Source: Chemical and Engineering News, p. 15, 11 March 1991)

AT&T and NEC pool chips

In the latest alliance between US and Japanese chipmakers to offset the tremendous cost of developing advanced semiconductors, American Telephone & Telegraph Co. announced Monday that it would join forces with NEC Corp. to explore new manufacturing processes.

The agreement appears significantly broader than past trans-Pacific alliances, because it focuses on a technology that will be used in a wide variety of different chips, for use in everything from digital telephones to high-definition television.

Officials from both companies said they expected to be producing the first chips using the new processes by mid-1995.

AT&T has existing research and manufacturing arrangements with NEC, Japan's biggest semiconductor manufacturer. It also has a separate, less extensive alliance with Mitsubishi Electric. But this agreement appears to be among the broadest involving more fundamental technology.

Its goal is to develop the process to manufacture chips with circuit lines as narrow as 0.35 microns, or about 250 times thinner than the width of a human hair. The most advanced chips now have circuit lines of just under 1 micron. By narrowing the lines, far more circuits, and thus far more capability, can be packed on a single silicon chip.

For US companies, the process technology to develop advanced chips has been particularly elusive. Most of the makers of critical chipmaking equipment are Japanese and they tend to do most of the development work with Japanese chipmakers.

Increasingly, American executives say that unless they form alliances with Japanese companies, they will not have early access to forthcoming chipmaking technology.

In the first phase of the agreement, the two companies will jointly work on a number of technologies, both in Japan and at AT&T microelectronics facilities. Later, the companies said they may consider building a plant together.

NEC will receive technology from the deal but it will also gain considerable political benefits.

The United States and Japan are still negotiating an extension of the five-year pact on semiconductor trade that expires this summer. American officials have suggested that an agreement on how to extend the pact could come as early as this week. The key issue now is how to word a provision that sets a market-share target for American companies selling chips in the Japanese market. (Source: International Herald Tribune, 23 April 1991)

Motorola stakes more on chips

Motorola made two major investment announcements to spend $100 million in Texas to ramp up its gallium arsenide (GaAs) capability while easing microprocessor supply problems in Europe with a $25 million injection of cash at East Kilbride, UK.

Motorola is improving the capabilities of its East Kilbride fab to try to solve the supply shortages affecting some of its most complex CMOS chips. The company is spending over $25 million to bring the wafer factory up to the level of its most advanced processing facilities.

By the end of this year, it will be making fast SRAMs in submicron CMOS.

The changes to the fab will allow it to diffuse multiple layers of metal onto wafers to connect circuit elements together. This will let Motorola make devices that need two level metal processes.

The modifications will solve a supply problem customers of Motorola's top end chips have been experiencing this year. Lead times for some of the 56000 family of DSPs have been increasing to several months, the 68040 microprocessor is sold under strict allocation to particular customers and supplies of SRAMs have been lower than Motorola would have liked.

All of these devices are made using two layer metal processes and have been launched in the last two years. The only fab making the chip is Motorola's MOS 8 facility in Austin, Texas.

Moving the production of DSPs and SRAMs to East Kilbride will relieve the pressure on the MOS 8 fab. This will give Motorola more capacity with which to meet the demand for 68040s.

At the moment East Kilbride makes DRAMs and 68020 microprocessors. The DRAM production will move to Japan to make way for the new devices. Over the next 12 months, the capacity of Motorola's Tahoko plant near Tokyo will double because a second fab will open next to the existing one.

Motorola plans to start making gallium arsenide chips through a $100 million investment and is beginning construction of a major GaAs facility in Tempe, Arizona.

The plant will make monolithic microwave integrated circuits (ICs), radio frequency (RF) ICs, RF power modules and dense digital ICs.

The chips will have up to four layers of metal interconnects and will be made on 4 inch. wafers. Building will finish in June this year and the first chips will be sold in January of next year. (Source: Electronics Weekly, 1 May 1991)

TI DRAM effort building momentum

Texas Instruments (TI) has begun limited sampling of two versions of its 16 Mb DRAM. In addition, this leading supplier of memory products has begun volume production of 4 Mb DRAMs, while design work on a 64 Mb DRAM is proceeding in the company's laboratories.

Reportedly, TI is the first manufacturer to sample fully functional 16 Mb DRAMs that use a production design; chips produced using the first mask set were fully functional and met all design specifications without repair.

The TI 16 Mb development team has drawn on company experts in the US, Germany, Italy and

Japan. In addition, part of TI's success in developing its 16 Mb DRAM comes from the company's decision in 1987 to build a 16 Mb prototyping line at its DMOS IV sub-micron wafer fabrication facility in Dallas. Reportedly, this facility allowed the team to work in a production environment that enabled quick fabrication to test circuits and designs for evaluation and testing. The 16Mb design team has made several innovations ranging from memory cell design to processing to packaging.

Briefly, TI's 16 Mb DRAM is based on a modified trench capacitor storage cell and 0.6 m design rules. TI fabricates the DRAM device with advanced twin-well, silicon-gate CMOS technology. TI's modified trench capacitor cell has a more planar surface than a stacked storage cell and provides up to 40 per cent higher capacitance than those reported by other 16 Mb DRAM manufacturers. This higher capacitance increases reliability by reducing sensitivity to alpha particles and minimizing soft errors.

TI's 16Mb DRAM operates from a 5 V power supply. An on-chip voltage regulator in each device converts the external supply to 4 V for peripheral circuitry and 3.3 V for memory array. The chip comes in JEDEC 28-pin plastic SOJ packages (400 x 725 mils). (Source: Semiconductor International, March 1991)

IV. APPLICATIONS

The route to faster networks

Over the past decade computer networks have quietly spun a communications web across the globe. For millions of users, they transmit everything from electronic sales memos to the results of particle-physics experiments. With traffic on some big networks doubling every six months, networkers are struggling to cope with their own success. The emergence of new and faster networking technology promises more challenges to come.

Researchers in America are now able to send data from California to Massachusetts at a rate of 1,400 pages of single-spaced text each second. This network, called NSFNET, is being developed by Advanced Network Systems (ANS) - a joint venture between Merit, a data-network manager, MCI, a telecoms giant, and IBM - for the National Science Foundation. It will be more than 10 times faster than most existing networks, fast enough to let a researcher in California use a supercomputer in New York to model what might be going on in a thunder-cloud.

Eventually ANS hopes to transmit data at a rate equivalent to 39,000 pages of text each second.

Much of this technology was developed in the 1970s, on a network called ARPANET financed by America's Department of Defence and largely built by BBN. A familiarity with it grew, so did the number of ways in which researchers adapted it to improve performance. A network using radio waves to send data between the island campuses of the University of Hawaii needed to organize packets differently from a network using cables to link personal computers in a room. Translating so that one network could talk to another (the second generation) was the challenge for the 1980s.

The key to overcoming the problem was a standard way of thinking about what networks do, called the OSI model. This is organized in seven layers, each of which presents an increasingly abstract way of looking at the transmission of data. The bottom layer describes the transmission in terms of electrical signals. The next concerns how packets of data are organized. The next deals with addresses and routes.

The trick to making this concept work is for software designers to be strict about observing the boundaries between layers. The third layer, for example, should neither know nor care how the layer below it organizes data into packets. To send information, it hands data and an address to that layer; to receive information, it gets the same back. That way more or less any two networks can be linked by working up layer-by-layer until they reach a common ground, handing over the data and then re-translating layer-by-layer down into the new format. Such "inter-networking" (the third generation) boomed in the 1980s. One of the biggest linkers, America's INTERNET, now joins up over 2,000 networks.

The next step is to speed up the maximum rate at which data flow - to create the capacity for video images, high-definition graphics and so on. The problem is time. At today's speeds, much of the work of running networks can be done by software on ordinary computers, in their spare time. They will not be able to keep up with the speeds of tomorrow's networks.

There are two ways to speed the progress of a packet through a network. One is to devote specialized hardware to the job. That is what ANS has done with NSFNET. It uses the same packets as many slower networks, but gets more speed out of them by using dedicated hardware to handle routing and other work. To go any faster, both ANS and BBN reckon they will have to adopt a second tactic: doing less work for each packet.

On many of today's networks the route of a packet is calculated step-by-step as it proceeds to its destination. The machine from which the message comes may, for example, simply send it to the machine that serves as a "gateway" between its network and the one its correspondent is on. The gateway is left to find a route to the final destination. For high-speed networks, however, the whole route will probably have to be specified in advance.

Such subtle changes could have big effects on the management of networks. The ability to do things like re-routing packets during their journey makes today's networks wonderfully flexible. That flexibility, in turn, lets them run with a minimum of bureaucracy. (Source: The Economist, 19 January 1991)

Intel to release second generation RISC micros

Intel will unveil its second generation of RISC microprocessors later this summer. The company has already produced the first silicon and has given samples of the device, codenamed the N11, to its customers.

The chip, which is the successor to the i860, consists of 2.5 million transistors. It is made using a 0.8 μm CMOS process with two layers of interconnecting metal. Intel is sticking with 32-bit instructions and data words in the new

device and will not start producing 64-bit micros until the mid-1990s.

About half of the transistors on the new processor are taken up with separate cache memories for data and instructions. These two stores take up as many transistors as the whole of the earlier device which was used mainly as a graphics co-processor or a CPU for parallel processing computers. Intel has also been presenting the new chip as a micro suitable for military applications.

The device is designed with a superscalar architecture. As well as the RISC integer unit, the device has separate hardwired floating point units, adding, multiplying, control and register functions. It is also provided with a bus control unit and paging circuitry with a translation look-aside buffer. It is designed to handle 3-D graphics in hardware. (Source: Electronics Weekly, 15 May 1991)

Electronic playing card maps the way

The days of navigation with a map and compass may soon be over. Last month, American aerospace and electronics company Rockwell announced it will soon begin selling a device that will tell you where you are, anywhere on Earth, to within about 100 metres. It takes the form of an innocent-looking electronic circuit board just 64 by 100 millimeters - the size of a playing card. The board receives signals from a fleet of US military satellites, from which it calculates its position in seconds.

Rockwell intends to sell its receivers to other manufacturers for $450. At that price, the company believes, it could be built into navigation devices for guiding cars, trucks, boats and tractors, or even backpackers and cross-country skiers.

The Pentagon's Navstar global positioning system (GPS), on which Rockwell's device depends, has been under development for 18 years. By 1993, when its full fleet of 24 satellites should be in orbit, the US will have spent $10 billion on the project. Each of the 16 satellites now in space has four atomic clocks each worth $100,000 - one in use and three spares. (Extracted from New Scientist, London, 4 May 1991, the weekly review of science and technology)

Supercomputer turns its back on silicon

The first commercial supercomputer made without silicon chips was unveiled by Convex, the American computer manufacturer. Instead, its processors are made entirely with gallium arsenide, the semiconductor material that was once tipped to replace silicon. Only the memory chips of Convex's C3800 computer are made of silicon. Its arrival could herald a future clash in the supercomputer market, as the traditional makers of full-sized supercomputers, such as Cray, and cheaper, small supercomputers, such as Convex, look for new customers in the middle ground.

The C3800 calculates at a rate of two thousand million mathematical operations per second, but has a comparatively modest maximum power requirement of 40 kW.

In addition to the higher speed of GaAs, the design and manufacturing process of the circuits affects the speed and power efficiency of the chip. Perhaps the most widely used technique in silicon is known as complimentary metal oxide semiconductor, or CMOS. An alternative design known as emitter coupled logic is much faster, but also more complex and costly to manufacture.

The chips in the C3800 use a design called direct coupled field effect transistor logic. The computer has 30 custom-designed GaAs chips made by Vitesse Semiconductor of Camarillo, California, which contain a total of 45,000 logic gates. These chips are simpler than those used by Cray Computer, the younger of the two companies founded by Seymour Cray. The other, Cray Research, has been making powerful supercomputers for many years.

Cray Computer is also developing a GaAs supercomputer, but using the GaAs equivalent of the more costly silicon circuit design, emitter coupled logic. Cray's design uses roughly the same power as an equivalent silicon version but calculates at three to five times the speed.

The C3800 will sell for around $8 million. Though at the low end of the supercomputer market it is the company's largest machine yet. (Extracted from New Scientist, London, 11 May 1991, the weekly review of science and technology)

Neural network takes the twinkle out of stars

A group of astronomers and technologists hopes to test a new method for taking the twinkle out of stars. They will be looking at the star Vega, using a "neural network" computer program to adapt the shape of a mirror to help compensate for the way the atmosphere distorts the starlight turbulence in the air continually changes its refractive index - its ability to bend light - making faint and distant objects appear to shimmer. This makes it impossible for astronomers to get accurate images of faint stars with telescopes on Earth. But the distortion can be cancelled using deformable mirrors, which bend the starlight back to where it should have been, and then record the image.

Calculating nearly instantaneously the movements of such a mirror normally requires a powerful computer. The new method uses an ordinary desktop computer running a neural network program instead.

By reinforcing certain connections, the network can be optimized to choose the correct mirror movements. The results from neural networks are sometimes not completely exact, but what is lost in precision is made up for by a cut in the amount of computation needed.

David Sandler of Thermo Electron Technologies in California had the idea of using a neural network, and is currently trying to improve the technique. The system will be tested at the Multiple Mirror Telescope in Arizona, which has an array of six mirrors equivalent in size to a single mirror 6.9 metres in diameter. (Extracted from New Scientist, London, 25 May 1991, the weekly review of science and technology)

Chaos equations pack more images into computers

A mathematical technique that uses fractal equations to reduce drastically the amount of data required to store an image on a computer may soon be finding applications as diverse as in

TV newsrooms and the police's "missing children" files. The technique can reduce the amount of data in an image by as much as 10,000:1.

Images are a problem for computers because they require a lot of storage space compared with text. A page of text typically requires around 4 kilobytes of storage while a tiny 2.5-by-1.7 centimetre colour photograph requires around 100 kilobytes. But there is a growing demand for computer systems to handle images, including photographs, video sequences, legal documents and engineering drawings.

Conventional compression techniques attempt to reduce storage requirements by looking for and summarizing repetitive information in an image, such as areas of sky. The new technique looks for shapes and patterns within an image and stores these as concise mathematical formulae.

The technique was developed by Michael Barnsley, professor of mathematics at the Georgia Institute of Technology in the US. It reduces images to fractal formulae - mathematical expressions of texture and shape. Fractals generate the complex and beautiful patterns associated with chaos theory and have been used in computer imaging to generate texture and images for flight simulators and movie special effects.

In Barnsley's technique a digitized image is first broken up into segments using standard image processing routines that separate colours and textures and identify edges.

The segments are then matched against a library of fractals. The library does not contain fractal images themselves because these would take up enormous amounts of data storage space. Instead it contains a compact set of numbers called iterated function system (IFS) codes. These codes express relations between parts of an image, allowing clouds to be described in much the same way as an architect describes a house. To reconstruct the image, fractals are formed from the codes to rebuild all the segments.

A key advantage of Barnsley's technique is that the compression can be carried out on a personal computer, achieving a compression ratio of 40:1. This is considerably better than most alternatives. The compression requires a set of purpose-built chips on a printed circuit board that clips into the computer's case. Decompressing the image, on the other hand, requires only comparatively simple software. The software can run on almost any standard PC that has a suitable screen. Other methods require special hardware at both ends. (This first appeared in New Scientist, London, 25 May 1991, the weekly review of science and technology)

Computers prolong life of artificial joints

The only really serious drawback of artificial joints is that they wear out.

Artificial hips only last up to 10 years and few bodies can cope with more than three replacements of a single joint - bad news for victims of arthritis in their twenties.

It is thought that the lifetime of a joint (or prosthesis) could be affected by how the joint settles down after implantation. Specialists at Oxford University's Orthopaedic Engineering Centre (OOEC) are investigating with X-rays and computers.

There are plenty of reference points on the prosthesis, but no natural ones on the bone it connects to. So small steel balls are implanted into it during the hip replacement operation. The OOEC team, led by Alan Turner-Smith and with Steve White as research assistant, makes a stereo X-ray of the bone then finds the positions of the balls, as recorded on the X-ray film.

This would normally be done using a digitizer. The operator places the film on a flat tablet with position sensors buried below its surface. Then a small tablet like a mouse, but with a transparent centre with crosswires, is placed over the film. The operator has to get the crosswires exactly over the centre of the image before pressing a button. A computer connected to the digitizer records the coordinates.

A single bone usually has 30 implanted balls, 0.8 mm in diameter. To get meaningful results, the operator must place the crosswires over the centre of each ball and up to 40 other X-rayed features, with an accuracy of 0.1 mm.

Operators get tired and bored quickly, so Turner-Smith's team developed a computer-based digitizer, for which they have applied for a patent.

A charge coupled device (CCD) camera is focused on the X-ray film, and a Virtuoso frame grabber, made by PrimaGraphics, grabs an image of a 6 mm X 8 mm area of film. The image passes to a Sun workstation, which enlarges the image to fill the computer screen.

The operator uses a mouse to place a circular cursor over the steel balls, and the computer calculates the coordinates from the cursor position. A frame management program, specially written by SIMIS, adjusts the contrast and calculates the coordinates from the cursor position. It can also store and retrieve images from a hard disk.

The researchers at the OOEC found that the accuracy of repeated measurements rose from an average error of 95 microns to 75 microns with the camera system. The team aims to reduce the total digitizing time per pair of stereo X-ray films - a total of about 180 points - to 20 minutes, including storing and retrieving the images. (Source: Electronics Weekly, 17 April 1991)

Computers and brain surgery

Computer modelling is being used to plan skull surgery. Dr. Craig D. Hall of Montefior Medical Centre (Bronx, NY) points out that once a cut is made in the real skull, it is final, but on the computer, a cut can be erased and the surgeon can start over to see how a different cut would work. Computer modelling can also let surgeons measure the skull and shape any spare parts for a good fit. Some computers directly control the machines that make surgical implants. New computer programs have greatly improved the results of reconstructive surgery and permit surgeries that could not have been performed two years ago.

The computer programs take stacked images from a series of 2-D CAT scans of the skull to build up a 3-D image that can be rotated and manipulated. I-Sight (Orangeburg, NY) offers a program that costs $15,000 to be used with desktop computers. The images can be used to aid both

diagnosis of a condition and its treatment. For example, premature fusing of two skull bones in an infant can hinder normal skull growth, but the problem can only be accurately diagnosed with the aid of computer imaging. Using the computers to fashion replacement parts has been hindered by the lack of a material as versatile as bone itself, which is often transferred from other areas of the body. The computers can make templates to guide the surgeon as he cuts, however. (Extracted from New York Times, 19 February 1991)

Advanced computing in brain disease research

Researchers from the University of California (San Diego, CA), are using advanced computing to study brain cell changes in Alzheimer patients. Brain cells obtained from biopsies of Alzheimer sufferers are serially sliced in sections about .0001-inch thick and photographed through an electron microscope. The images are digitized through a digitizing tablet from Summagraphics (Seymour, CA) and stacked in the computer. The slices are interrelated through a customized program based on a "marching cubes" algorithm and a tiling program Mosaic, and turned into a 3-D representation that can be rotated and magnified. The researchers have been able to identify abnormal cell structures common to the Alzheimer patients, and are seeking to identify the earliest appearance of the structures, to determine if they are a cause or a consequence of the disease. (Source: Technology Update, 25 February 1991)

Diskless PC

Alloy Computer Products (Marlboro, MA) has developed the EarthStation III 20, a diskless personal computer. The new machine is a PC-in-a-keyboard and offers Super VGA graphics. It has 4 M-bytes of RAM and an Ethernet adapter. The computer is well-suited for point-of-sales applications, data-entry and harsh environmental situations. The machine uses a 20 MHz 386SX processor. (Extracted from PC Week, 25 February 1991)

Modular mobile computer

Phoneix International (Fargo, ND) offers the Sys 3 modular mobile computer, which is a data acquisition and control system designed for use in off-highway vehicle markets. A major feature of the Sys 3 is its "fuzzy" software that actually permits the computer to "learn" as the vehicle runs, compensating for wear and duty influences, along with such production differences as valves of various tolerances. The Sys 3 housing is designed so that more modules may be placed between the top and bottom covers to expand the capacities of the base modules. A majority of the Sys 3's actual on-vehicle uses are now in the prototype stage; but several vehicles are due to be made during the first half of 1992. A major aspect of the Sys 3 is that it may result in entire vehicle control down the volume scale to smaller office equipment manufacturers. (Extracted from Diesel Programming, February 1991)

New electronic reading system

Reading somebody's handwriting is difficult enough for a fellow human, and even more so for a computer. Researchers at Toshiba have developed a prototype electronic reading system which combines the traditional optical character reader (OCR) and the latest neural network software, which learns from past examples.

Handwritten digits and Japanese katakana characters are fed into the machine using a scanner. Conventional OCR techniques compare the similarities of each character with the model in its memory. If the character is not immediately matched it is transferred to the neural network, choosing the one that shows the greatest number of points of resemblance. Toshiba is now working on a version of the machine that can recognize handwritten Chinese characters and the Roman alphabet. (Extracted from Financial Times, 8 February 1991)

New thermometer

Diatek (San Diego, CA) has developed an infrared ear thermometer, which can give a reading to within 0.1°C in two seconds. An electronic thermometer requires three minutes and a glass thermometer requires eight minutes for accurate readings. The new device also never touches the patient, reducing the chance of spreading infection. The unit is inserted into the ear, protected by a disposable sheath. The device uses infrared sensors developed at NASA's Jet Propulsion Laboratory for use in observing the spectra of stars. (Extracted from New Scientist, 9 February 1991)

Recycling PCs

The first green personal computer becomes available this month, but only to German and Dutch customers.

Amsterdam-based company Growth Index is offering a pc containing circuit boards made without chlorofluorocarbons and housed in a casing of polyconcrete, a recyclable plastic made from vegetable and fish oils.

The biodegradable machine will be competitively priced and as compatible with existing technology as possible.

The Growth Index product breaks new ground because once its utility is at an end, it can be disposed of with minimum damage to the environment. Unlike most old discarded kit, the green pc rots quickly when buried in a land-fill site.

Land-fill is the ultimate destiny for most redundant equipment, though a high percentage of its components are salvaged for further use.

First there are the cables. They contain valuable copper, which can be extracted and reused. Then there are the base metals of the body and casing - iron, steel, lead and tin.

These too can be recycled. Finally, there are the printed circuit boards. Their components contain precious metals, like silver and palladium, and their connectors are often gold.

Copper is removed from cables by a granulation process. The salvaged copper is then sold to foundries or direct to rod manufacturers. Its price depends on the level of contamination - the amount of plastic still in the ingot.

The base metal is sold off, the circuit boards removed and their gold connectors are cropped. Then all the boards are shredded.

The remaining plastic is passed on to waste disposal people who bury it in a landfill site. In France, the precious metals are chemically leeched from the shreds.

Metals for recycling

Chief among the precious metals that can be salvaged from printed circuit boards are gold, silver and palladium.

Gold: in many of the older mainframes, the circuit board connectors are gold. According to the London Metal Exchange, reclaimed gold is priced at around £165 a troy ounce.

Silver: this is used in many of the components found on circuit boards, again those from older mainframes. It currently retails at £1.50 a troy ounce.

Palladium: a platinum group metal, it is used as a catalyst in the plating industry and as a contact material in the electronics industry. Current price on the market is around £35 a troy ounce.

Useful contacts: UK Reclamation Association (0480) 455249; British Plastics Federation (071) 235-9483; Computer Conservation Society (071) 938-8196; DTI environmental helpline (0800) 585794; Friends of the Earth (071) 490-1555; Greenpeace (071) 833-0600. (Source: Computing, 11 April 1991)

V. COMPUTER EDUCATION

Training

The PC has never been easier to use. Graphical user interfaces, pull-down menus, mice, icons and windows all contribute to creating the ultimate user-friendly environment.

But to a department that has to move from a manual to a computerized way of working for the first time, it is still bewildering. And giving individuals a 386-based machine with Microsoft Windows and the Excel spreadsheet program on it will not make them whizz kids overnight.

Although the standard of disc-based tutorials included with many PC packages is generally improving, at the end of the day nothing can beat face-to-face, hands-on training.

The best recommendation a training establishment can have is by word of mouth. Some of the most established and well-known outfits come by 80 per cent of their business in this manner and would not have it any other way.

If you are starting from cold and have no clues as to why you should choose one course over another, then it is often a good idea to contact the vendor or publisher of the program that you want training in. Microsoft, Lotus and Ashton-Tate all have some kind of accreditation program and will happily make lists available to end users or tell them the nearest accredited centre in their area.

As software becomes easier to use, these companies are placing more instead of less emphasis on training. As software becomes more sophisticated it can offer more competitive advantage to companies, but only if its full potential is tapped and that can only come with a thorough knowledge of the package's capabilities.

Microsoft has recently expanded its professional training network from 30 to 71 centres. The courses at these centres have been vetted by Microsoft and the company has also trained the course tutors.

Lotus has around 170 Authorized Training Centres (ATCs) and renews the scheme annually. Criteria that must be met before an organization can be authorized include: one dedicated training room with an IBM PC or compatible available for each attendee, three levels of course - introductory, intermediate and advanced, and two trainers fully conversant with Lotus products and trained by Lotus.

Five years ago it was common to find up to 20 people on one course Now the better establishments limit the number of attendees to six.

As well as general introductions to computers and computer studies, many offer specialized courses such as Autocad for mechanical engineers.

It is possible to take higher national diplomas and City & Guilds certificates in these subjects and in some cases you can get a local authority award.

The courses can be held in the evenings so that no work time is sacrificed and prices need not be high. For instance, a 18-week course in Autocad costs just £36 at Highbury College of Technology in Portsmouth and a further £25 is charged to take the City & Guilds exam. This makes it affordable to individuals but most of the attendees are sponsored by their companies. In some cases companies will offer to reimburse attendees if they pass the exam.

It is important that every course should continually test its delegates to make sure that there are no comprehension problems. It is also important that delegates are of the same standard. There is nothing worse than a course that is held up because one of the attendees should have been on the beginners and not the advanced session.

When choosing a course, try to find out if anyone else has been on one that they would recommend. Check to see if it has been accredited by the vendor. See if it advertises in the trade and national press and remember, less is more. You will get more value for your money if there are only four as opposed to 10 people on the course. Even if you can only afford a local technical college you may still find out things that make your day-to-day life a lot easier. (Source: Computer Weekly, 25 April 1991)

Education

Computer education in prisons

The public image of prison is one of rioters on the roof, slopping out and prisoners breaking rocks or sewing together endless mailbags.

The sight of a roomful of prisoners sitting in front of computers trying out the latest word-processing or spreadsheet packages, or writing programs, is at odds with this image. But it can be seen at prisons in the UK every weekday.

The Lord Justice Woolf report, which was commissioned after the spate of riots at Strangeways and other prisons, emphasizes the need for more constructive occupation and training for prisoners as part of the improvements needed to prevent such riots.

Computers have a big part to play in teaching basic skills, like reading and maths, and in giving prisoners marketable skills for when they re-enter the outside world. They are also used for desktop publishing to produce prison magazines or as tools for prisoners studying for Open University degrees. The past four years have seen a huge improvement in the use of computers in prisons, largely as a result of the efforts of two men, Mike Frisbee, senior lecturer and IT manager at Ashwell, a category C male prison in the east Midlands, and Denys Edwards, a principal education officer for the prison service at the Home Office.

When Frisbee joined the prison service in 1987, he and Edwards wrote a paper on how to coordinate IT in prisons. The result of the paper was a decision to set up IT centres at five prisons across England and Wales, which would act as centres of excellence for all the other prisons in the region, training staff and giving advice.

These centres are headed by IT managers who double as senior lecturers. The managers meet once every quarter and advise the Home Office on its policy for IT in prisons. A year ago a policy decision was made to use Acorn Archimedes as the recommended hardware for prison education and 386-based machines for vocational training.

The IT centres are funded directly by the Home Office. Funding for computers in other prisons has to come from the individual prison's education budget, the size of which varies from year to year depending on how much is made available by central government.

Because each prison has to bid for its own education budget, and has its own priorities for spending that budget, the standard of computer teaching varies hugely from institution to institution. The standard also depends on the enthusiasm of individual lecturers and education officers.

As one of the five IT centres, Ashwell has better resources than most. It has a network of 14 Archimedes machines running DOS and Unix as well as the proprietary operating system.

Within the prison service there are two streams of teaching - education and vocational training. Prisoners are allocated to one or the other depending on their individual circumstances and the time they have served. At Ashwell every education course uses IT in some way. There are packages to help prisoners write CVs and fill in their tax return forms, draw cartoons or compose music.

There are also modular courses leading to the internationally-recognized Cambridge certificates in IT. (Extracted from Computing, 25 April 1991)

VI. SOFTWARE

Computer juggling act provides happy landings

Computer scientists in Australia have developed a computerized air traffic controller that can juggle the timing of arrivals and departures at airports to minimize delays. Its designers hope to sell the concept to a number of European airports suffering delays when the number of flights exceeds the capacity of their runways.

The designers believe that reductions in errors of timing, more sophisticated scheduling and fewer "lost slots" in the sequence due to flight changes will produce a 7 to 10 per cent improvement in an airport's capacity. At Sydney's congested Kingsford-Smith Airport, even a small rise in capacity should substantially cut landing and takeoff delays which, early this year, lasted up to an hour.

The system is known as OASIS, for optimal aircraft sequencing using intelligent systems. It was developed by the Australian Artificial Intelligence Institute (AAII) in Melbourne and the Australian Civil Aviation Authority, and will be tested at Kingsford-Smith Airport in October 1991.

OASIS will direct aircraft to start later or slow down en route, which saves fuel and is less annoying to passengers.

AAII's research at Kingsford-Smith Airport found that flow managers, who control the sequence of arrivals and takeoffs, experience very busy periods during which they can cope only by adopting a "first come, first served" policy.

OASIS uses radar data and information about aircraft performance and individual airline practices to generate the sequence of arrivals and departures that will cause the least delay.

Systems similar to OASIS are already operating at Frankfurt and at Paris's Orly Airport, but they are designed for only one runway. OASIS can handle two or more runways, including runways used for both arrivals and departures.

The OASIS computer program is divided into a collection of so-called reasoning agents, each dealing with a different task. Each agent has four components: a database containing the system's current beliefs about the world; a set of current goals; a library of plans describing what actions need to be taken to reach the given goals; and an agenda or set of those plans chosen for execution.

Different agents concentrate on individual aircraft in the region or on coordinating groups of aircraft. A sequencer agent, for example, carries out a search of all possible combinations of aircraft on all available runways to generate the most cost-effective sequence. A coordinator agent oversees the tasks of the other agents. The system is overseen by the flow manager, who can enter new procedures through a graphical display screen.

Computerized air traffic control systems, he says, have a poor image with air traffic controllers, but OASIS was developed with the close cooperation of controllers. If successful in Sydney, it will be extended to cover all major airports in Australia. (This first appeared in New Scientist, London, 25 May 1991, the weekly review of science and technology)

Computer pretends to pollute the sea

British researchers have unveiled a new weapon in the war against pollution: a computer

software package that mimics the behaviour of contaminants in an estuary.

Known as ECoS - Estuarine Contaminant Simulator - the software has been developed by scientists working at the Natural Environment Research Council's Plymouth Marine Laboratory.

ECoS is a logical extension of pioneering work undertaken by the laboratory for the British government to gauge the impact of the anti-fouling paint containing TBT (tributyl tin), the most toxic substance released into the marine environment over the past 20 years.

In 1987, the British Government banned the sale of anti-fouling paints based on TBT for use on small boats, but larger commercial ships and naval vessels are still allowed to use it.

Using the software, researchers can simulate the behaviour of any contaminant in the estuary of their choice. By feeding the topography of the estuary, its hydrographic details and the pollutant involved, it is possible to assess the environmental impact.

The software indicates where the worst pollution is likely to be. As well as being a useful aid to pollution control, ECoS could prove an invaluable aid to emergency services wrestling with the aftermath of a chemical spillage. (This first appeared in New Scientist, London, 20 April 1991, the weekly review of science and technology.)

Pen is set to become much mightier than the mouse

US software house Microsoft says keyboards and mice will disappear from hand-held computers when its handwriting recognition software, Pen Windows, comes out next year.

The company believes that a new breed of portable computer, based on the Intel 80386 microprocessor and using around eight Mbytes of memory, will use an electronic pen to perform tasks and manipulate data.

But the company warns that Pen Windows will not be 100 per cent completed when first released.

Microsoft believes companies will use laptops running Pen Windows for stock control applications, electronic note taking at conferences, challenging many of the areas that use standard laptop PCs.

Research by Gallup in the US says that by 1993 80 per cent of Fortune 1000 companies will use notebook or laptop PCs. By 1995, laptops will account for half of all PC sales.

Pen Windows' Recognition Manager is an application programming interface that sits on top of Windows and translates gestures and handwriting. It will not run with version 3.0 of Windows, but is an extension to version 3.1, which will be available by the end of 1991. (Extracted from Computer Weekly, 18 April 1991)

Epi Information

Epi Info is a series of microcomputer programs produced at the Center for Disease Control, Atlanta, Georgia, USA and the World Health Organization (WHO), Geneva, Switzerland, for handling epidemiological data in questionnaire format and for organizing study designs and results into text that may form part of written reports.

A questionnaire can be set up and processed in a few minutes, but Epi Info can also form the basis of a powerful disease surveillance system database with many files and record types. It incorporates the features of statistical and database software packages most used by epidemiologists into a single system that may be freely copied.

Version 5 of Epi Info requires a PC-compatible microcomputer running PC-DOS or MS-DOS (Version 2.0 or higher) with 512kb of RAM and at least one floppy disk drive. Epi Info is not copyrighted and the producers, CDC and WHO, permit and encourage copying for further distribution. Version 5 costs $US 35. The manual is available for $US 20, diskettes alone for $US 15, and the manual on diskette for $US 15.

For further details, contact USD, Incorporated, 2075 A West Park Place, Stone Mountain, GA 30087, USA. [P+1 404/469 4098.

Access to scientific literature

A programme to promote access to scientific literature in developing countries is being carried out by the United Nations Educational, Scientific and Cultural Organization (UNESCO).

The programme will use new technologies such as CD-ROM and telefax for document delivery, and promote the improvement of the management of document delivery services. It will also establish a database on book and journal donation programmes, which will be available to information centres in developing countries.

Further information is available from Mr. Aziz Abid, CII/PGI, Unesco, Place de Fontenoy, 75700 Paris, France. (Source: PADIS Newsletter, Vol. 5, No. 4)

Free scientific software

Scientists and engineers looking for inexpensive software should investigate the Laser and Science Bulletin Board. They will find IBM PC-compatible software in such diverse subjects as astronomy, biology, chemistry, electronics, laser and general physics, and even project management. Some of the programs are in the public domain, the others are either freeware or shareware. Uploads donated by users are always welcome and posted with due credit to the donor.

Use of the bulletin board is free but a password, issued by mail only, is required. Contact: R. T. Pitlak, 1639 Valecroft Avenue, Westlake Village, California 91361; or circle 111. (Source: IEEE Spectrum, April 1991)

CD ROM stores a heap of abstracts

Given the seemingly exponential accumulation of journals, conferences and papers, isolating the information you need can be a labour of Hercules. So Engineering Information Inc. has scooped up a million abstracts of articles published in the past 10 years onto a CD-ROM database that it calls Ei EEDisc. The compact disc (CD) homes in on such

areas as computer science, magnetics, optics, and electrical engineering, and includes many journals and conferences in its sweep.

The same information can also be dug up by means of many online services, but the bill can be big if many searches are done. It may make better economic sense to use a CD ROM for most searches and reserve the online service for finding abstracts published after the CD was made. Since the Ei EEDisc is offered in conjunction with Dialog Information Services, Palo Alto, California, it facilitates this approach. After the CD search, the researcher can use the Dialog OnDisc software to dialup and search Dialog's Compendex Plus database without re-entering the search criteria.

A PC with a CD-ROM drive and Microsoft extensions is required. The CDs are published quarterly. A one-year subscription costs $US 6,750 for 10 years of abstracts or $US 3,850 for five years. Contact: Marcia Kaufman, Engineering Information Inc., 345 East 47 St., NY, NY 10017-2387; 212-705-7616. (Source: IEEE Spectrum, April 1990)

Multiple perspective software

Bell Communications Research Inc. has come up with new software that lets users examine a set or sets of data from multiple perspectives. Bellcore uses the software, called XGOBI, to work with computer-system transactions and telephone usage patterns, which involve numerous variables and multiple statistical parameters. Bellcore says the software lets users colour-code certain data for easier reference, or to elongate pictures as needed. XGOBI can be used on a workstation or personal computer equipped with the X Window System windowing technology. Bellcore, Livingston, NJ, said XGOBI grew out of joint research with Stanford University, Harvard University, the University of Washington and others. (Extracted from Communications Week, 4 February 1991)

IDAMS

Internationally developed data analysis and management software package (IDAMS), for IBM compatible mainframe and microcomputers, distributed free-of-charge by the UNESCO Secretariat.

IDAMS is a collection of computer programs for the validation, manipulation and analysis of any data that is in the form of values for the same set of items (variables) for each of a set of cases (or observations), e.g. an opinion survey, information about education, health, food resources, environment, etc.

The programs input and generate data in a common format known as the IDAMS dataset comprising two files: the data itself and descriptive information about the variables called the dictionary.

The programs are used with a common control language. Preparation of "control statements" is considerably simplified by two language features: (1) any reference to a variable is by its variable number; (2) many of the parameters which are available to the user for selecting program options have associated default values, so the user often needs to explicitly give only a few of them.

Data management features

Data transformation/recoding
Listing of data
Sorting data
Data verification
Data correction
Subsetting data
Merging data
Data aggregation

Statistical techniques

Univariate distributions and statistics
Bivariate distributions and statistics
Non-parametric tests
Pearson correlations
One-way analysis of variance
Factor analyses, including correspondence analysis
Multidimensional scaling
Partial order scoring
Rank-ordering of alternatives
Typology and ascending classification
Multiple linear regression
Multiple classification analysis

Written requests for the software should be addressed to: UNESCO, IDAMS Group, DIT/MS, Place de Fontenoy, 75700 Paris, France. Telephone: (33)(1) 45.68.23.09 and 45.68.38.97/96, telex: 204461 PARIS and 270602 PARIS (specify IDAMS), fax: (33)(1) 45.67.26.39 (specify IDAMS), e-mail: SCVDB@FRUNES21; SCTFA@FRUNES21; DSJCD@FRUNES21. (Extracted from IDAMS News, UNESCO, Issue No. 3, January 1991)

Over the hozizon

Sight is perhaps the most important of all our senses. It gives us detailed information about the world around us without any conscious effort. Yet the processes behind vision are extremely complex, a fact that is emphasized when we attempt to build artificially sighted machines.

Over the past 20 years, research in computer vision has had two main goals. One has been to construct and test theories of human vision, the other to build artificial vision systems. Some computer vision systems are already being used in a variety of areas including robotics, quality inspection and safety monitoring.

Since the 1970s, researchers in computer vision have gone a significant way towards replicating the mechanisms of biological vision. Algorithms that perform edge detection in the retina are now well understood, and they have been implemented in a number of computer systems.

Although many of the computer implementations of these visual processes have been software based, recent projects have tried to implement them in hardware devices.

In many computer vision systems the recognition process involves obtaining an image and then finding the important features using edge detection methods. The edge description of the image is then compared with an edge description of a previously stored object. If the two descriptions match then the object is recognized.

There are, however, problems in this matching process. Many algorithms fail to match if the input edge description does not exactly match that of the previously stored object. For many

important applications, the input images never exactly match that of previously stored cases.

Recently, neural computing techniques have been applied to a variety of vision problems. As neural networks can recognize patterns in cases where the data is inaccurate, vague or even incomplete, they have been quite successful in computer vision tasks.

In neural network-based vision systems, there is no need to store manually a description of the object to be recognized. Instead, the network learns the features of objects by being presented with many examples of it. Because the network is doing most of the work, these neural vision systems can be quite straightforward to construct, requiring relatively little effort.

Motorola has recently begun installing computer vision systems with neural networks to check the quality of microchips. The vision system, developed by Applied Intelligent Systems in Michigan, is expected to bring Motorola's chip reject rate down to four parts per million. The system, which uses as many as 512 parallel processors, can verify the printed markings on a Motorola chip in 20 to 60 milliseconds, about one-tenth of the time taken by conventional vision systems.

SD-Scicon has recently started to use neural networks for a variety of scene monitoring tasks. One of these projects involved monitoring a railroad crossing for British Rail. The task of the neural network was to learn to spot obstructions on the lines - people crossing, cars moving and so on. The network learnt this after training on many images and the performance has been impressive.

There are plans to use similar systems to monitor high-security installations such as banks. Such automated monitoring systems will activate video-recorders or notify people when seemingly suspicious activities occur. Because the networks can be focused to respond only to particular areas of interest, the warnings it gives are reliable and useful.

In the area of safety monitoring, London Underground has recently been experimenting with the use of neural vision systems to determine the level of crowding on platforms. Similar systems may also be used in monitoring crowds in football games, potentially preventing tragedies like Hillsborough.

One of the most interesting applications for neural vision systems is personal identification. As plastic cards are used for ever more important financial, medical and professional transactions, the accurate verification of cardholders becomes increasingly important. Face recognition is one of the so-called "biometric" technologies that can identify genuine cardholders without any doubt. Other biometric technologies include fingerprint identification, retinal scanning and signature verification.

The neural face recognition system developed at SD-Scicon requires a person to stay in front of a camera for about 40 seconds for the network to complete the learning process. This neural description of the face is then etched on to a plastic card. So the face recognition part acts like a pin number - each time you try to use the card, an image of your face taken from a camera will be compared with the previously stored description on the card. (Source: Computing, 6 June 1991)

ASIC designers select software

More evidence of the growing ties between the chip industry and the electronic design software community came when Japanese chip maker NEC Electronics joined forces with US chip design software specialist Cadence.

They are planning to jointly develop and market software for the design of complex application specific integrated circuits (ASICs). This software will be aimed at devices sporting more than 100,000 gates made using sub-micron technology.

Similar ties with ASIC makers are being planned by Compass, the chip design software company recently spun-out of US ASIC specialist VLSI Technology Incorporated.

Analysts expect other electronic design software companies including Mentor Graphics and Racal-Redac to unveil closer links with chip makers over the next few months.

There are two reasons for this trend. First, chip makers are finding it increasingly expensive to keep developing their own proprietary ASIC design software. Second, increasingly complex ASICs require very close ties between design software and particular chip making processes. (Source: Electronics Weekly, 3 April 1991)

European firms try to lower language barriers

To a small group of firms and institutes, Europe's multitude of languages - and the resulting speech barriers - is a challenge to their software engineering capabilities. Computer-based translation systems are taking on special significance in light of Europe's economic integration as well as the opening of Eastern markets, which is adding about eight new official languages to West Europe's dozen or so.

As part of a $5 million, four-year project called Euro-Triangle (for Translation and Retrieval Oriented Information Base Adapting Data From Native Speaking Grammatical and Lexicographical Form), German, French, and Austrian groups are developing a translation workstation for professionals.

The project involves developing task-specific editors with interfaces for data input and output of various wordprocessing systems, including spelling aids and rules for separating words, identifying basic word meanings, as well as for assembling dictionaries for English, French, and German words. Aside from basic dictionaries with 20,000 words, the system will have special dictionaries for international business, mechanical engineering, electronics, computer science, and so on.

The translation workstation runs under MS-DOS on IBM personal computers or compatible systems. A second project phase will cover languages such as Italian, Spanish, and Portuguese. (Source: Electronics, March 1991)

VII. COUNTRY REPORTS

China

Chinese to build PBXs from Siemens

The popular Hicom 300 private branch exchange system from Siemens AG will be built under licence at two factories in China. An agreement that the German company recently made with China Great Wall Industry Corp. provides for each factory to ramp up production to 100,000 subscriber lines annually within four years.

The first phase, which just started, calls for the assembly of subsystems and racks from Siemens into complete systems as well as final functional tests. During the next phase, to begin in mid-1991, Chinese technicians will put together the subsystems. To prepare, about 50 workers underwent a nine-month training course at Siemens. (Source: Electronics, April 1991)

European Community

European electronics research moves away from basics

Fearing a financial crisis, the board of Europe's advanced microchip research programme has decided to concentrate on flagship projects. It will drop work it considers less important to Europe's electronics industry - mostly fundamental research carried out in universities.

The Joint European Submicron Silicon Initiative (JESSI) is independent of the European Commission, but the Commission had promised to fund 25 per cent of JESSI's £2.6 billion budget. So far it has hardly contributed anything.

Arguments between the Commission and the European Parliament over how some research programmes are administered has delayed payments for research under the Commission's Framework programme. This means JESSI is unlikely to get as much money as was originally agreed.

As a result, the JESSI board is assessing the commercial value of the 70 projects it hoped to carry through to 1992, the end of the 18-month start-up phase of the programme. There then follows the main four-year phase of JESSI. The projects most likely to be scrapped are those carried out at universities without industrial partners. This work is more fundamental, and further from commercial exploitation.

But the JESSI board believes these economies will not guarantee adequate funds for its most important work, such as the development of high-capacity memory chips. It wants some of the money allocated to ESPRIT, a better-funded EC programme for research in information technology. The board of ESPRIT agreed to temporary funding for three JESSI projects last year. It is now considering financing some projects for their entire four-year lifetime. (Extracted from New Scientist, London, 13 April 1991, the weekly review of science and technology)

Will JESSI save the European semiconductor industry?

Taking a long, hard look at Europe, the brightest stars in the European firmament are to be found outside the electronics field. The outlook for the European semiconductor industry is far from healthy. Negative circumstances include a spiralling trade deficit in key electronics products and cutbacks in military spending. In consumer electronics, the merger of Britain's two satellite TV broadcasting companies (BSB and Sky), and their common adoption of the PAL broadcasting standard, could be the beginning of the end for Europe's D2 MAC HDTV standard, which competes with Japan's MUSE system.

For their part, major semiconductor users, such as the European computer industry, are also feeling the pinch. This is confirmed by forecasts of hard times to come and thousands of job losses.

Against this background, a report, published in Paris by the European office of the New York based Electronics International Corp. (EIC), came to some interesting, if somewhat gloomy, conclusions about a Europe preparing for the single market of 1992. The first conclusion, not surprisingly, is that the overall trend is running against Europe (and the USA) in favour of Japan. Indeed, Japan's foreign trade surplus in electronics will be $86.8 billion in 1995, compared to $62.7 billion in 1989, and $62.6 billion in 1988.

For its part, Europe's electronics foreign trade deficit in 1995 will be $50.8 billion in 1995, against deficits of $34.2 billion in 1989 and $33.1 billion in 1988. Corresponding figures for the US cited by EIC are deficits of $17.0 billion (1995), $7.7 billion (1989) and $5.2 billion (1988). Moreover, Europe is currently running, and will continue to run, large trading deficits with Japan and the US in the electronics field. EIC forecasts that 1995 will see deficits of $29.3 billion (Europe-Japan), and $23.6 billion (Europe-US).

But perhaps the real danger facing Europe is the possibility that her indigenous electronics industry will quite simply be wiped out. In 1989, the only "positive" sectors were measurement/instrumentation, medical electronics and professional electronic equipment. For their part, imports and exports of telecommunications equipment, often thought of as a European strong point, almost exactly balanced out. The "worst" sectors were those where Japan is strongest: computers, consumer electronics and active components, with cover ratios of only 72 per cent, 55 per cent and 65 per cent, respectively. On a world-wide basis, European firms control only 10 per cent, 16 per cent and 13 per cent of these key markets.

Within the active components market, European companies control only 10 per cent of the specific semiconductor sector. Another weakness, according to the EIC report, is the low percentage of world electronics production controlled by European companies. EIC's figure of 19 per cent for Europe has to be compared with 44 per cent for the US and Japan's 28 per cent. Furthermore, only 73 per cent of European production is controlled by "local" firms, against 21 per cent by American companies and 5 per cent by the Japanese. (Extracted with permission from Semiconductor International Magazine, April 1991. Copyright 1991 by Cahners Publishing Co., Des Plaines, IL, USA)

ICL expelled from JESSI projects

The UK-based computer company ICL has been expelled from three projects within the

Joint European Submicron Silicon Initiative (JESSI), the $5,000 million collaboration in semiconductor research funded by European computer companies, the European Communities (EC) and EC member Governments. The decision comes in response to ICL's takeover last year by the Japanese company Fujitsu - a sensitive issue for JESSI, which was set up in 1989 to help the European computer industry to compete with Japanese companies.

The ejection from JESSI follows ICL's expulsion in January from the European Information Technology Round Table, a group of 12 European computer companies that lobbies the EC and European Governments to influence policy towards the industry. An ICL spokesman says that the decisions are "unfortunate, but not devastating".

ICL, never more than a minor player in JESSI, will continue to participate in two JESSI projects in computer-aided design when the companies involved decided there was no other European company to take ICL's place. ICL researchers are also still working on a number of EC projects. (Source: Nature, Vol. 350, 4 April 1991)

EC proposal makes firms liable for faulty goods

Electronics manufacturers and distributors will find themselves liable for damages for injury caused by faulty products or services if two draft proposals now before the European ministers become law.

The proposals, one dealing with products, and the other with services, are being contested by the Confederation of British Industry (CBI) and its European equivalent, UNICE. But the proposers of the directives say that there will be an improvement in safety and operational standards throughout the service sector.

Legal liability takes into account possible damage caused to health or private property. It is not certain whether the liability of component distributors would come on the product proposal or the service one.

The implications are far-reaching. If the proposal becomes Community law, companies will have to pay higher insurance premiums to cover themselves against possible claims from buyers. This in turn could be reflected in higher prices paid for the products and services themselves. (Source: Electronics Weekly, 15 May 1991)

EC halts R&D projects

The EC has put two IT research development projects on ice in a row over spending.

The Commission's decision means that a $263 million project for an electronic nervous system of computer networks and a $340 million telecoms programme must go through the EC's legislative procedure for a second time.

EC politicians had agreed a common position on the nervous network last December and on the telecoms research earlier this month, but both needed a second reading from the European parliament before final approval.

The European parliament has expressed concern that its attempts to tighten up on access to funds and increase scrutiny of R&D have been rejected by the EC.

As a result, Antonio La Pergola, the Italian chairman of the European parliament's research committee, called on the EC to withdraw funding.

Filipp Pandolfi, European Commissioner for Research, confirmed he would be asking research ministers for a full debate on each programme in accordance with requests from the research committee.

Only then can the parliamentary procedure begin, after scrutiny by the research committee. (Source: Computing, 28 March 1991)

Research shows results

The fruits of the European Commission's research and development programmes are beginning to reach the market-place.

In the mid-1980s, Philips, Siemens and Thomson set themselves and collective task of improving the sound and picture quality of transmitted television pictures. The high definition television (HDTV) system they began work on was based on multiplex analogue components (MAC).

With the approval of the European Commission, Eureka project EU95 began work on improving the picture quality. In the process, it would do away with the fine platterning that occurs when someone comes on the screen wearing a chequered jacket. MAC also allows for the transmission of up to eight sound channels along with the vision. This September, Thomson will be selling its HDTV set in the UK.

Eureka runs in parallel with Esprit, but it is not directly funded by the European Commission. Whereas Esprit puts the emphasis on pre-competitive R&D, with funding coming equally from industry and the Community, Eureka is aimed at applications. It is more market-oriented than Esprit.

The shortage of trained people in VLSI design prompted the Commission to launch a special Esprit project called Eurochip. Today, there are 44 workstations in selected European establishments, and 40 testers ordered, with shipments under way.

The installation of software is well advanced, with 322 licences requested. Orders for training courses in the software have been placed to accommodate 322 participants. The first courses have already taken place.

Three fabrication technologies have been selected with further technologies planned. The first fabrication runs, each including about 20 circuits and involving areas of 200 mm², have been finalized.

The European Commission points to 155 completed Esprit projects, producing 211 out of a total of 313 major results over the first five years of Phase I. Of these, 152 results contributed directly to products or services. Some 118 contributed to tools and methods used outside Esprit, and 43 to international standards.

Esprit, like other EC research programmes, arose out of the recognition that it was necessary to focus European research and share the cost among a group of participants.

Esprit is an ongoing precompetitive R&D programme, covering microelectronics, information technology and basic research. It is open to all European-owned companies. Participants receive 50 per cent of the cost of projects once they have been approved.

Unfortunately, European collaborative R&D has low visibility in the eyes of the public. And for that reason it is easy to believe that nothing is happening at all. This is a pity, because small companies are often put off from participating in programmes.

The situation is not helped by having to set the ground rules first before groups get started on collaborative ventures. This means deciding upon standards. Everyone involved has to be consulted first, which causes delays.

To get the benefit from European research programmes it is necessary to approach them in the right frame of mind. This means seeing the world through the eyes of the Commission, looking at the broader issues. (Source: Electronics Weekly, 17 April 1991)

EC boosts software engineering

The European Community is preparing to contribute 100 million ECU (£70 million) towards a billion ECU two-year pilot research, development and technology transfer programme to boost software engineering tools.

The European System and Software Initiative (ESSI) is part of the EC's Esprit R&D programme but unlike the Siemens/SGS semiconductor initiative, JESSI, it is not a private-led project.

Brian Oakley, former director of the UK's Alvey programme, is backing the project as a member of the Esprit advisory board.

ESSI is being planned in three parts. The first will examine a series of software engineering applications with EC money monitoring the progress of software tools.

The second part will comprise a training programme for engineers and the third will disseminate the results.

Planning of ESSI is being led by Professor Dennis Tzichritizis of Geneva University who is also involved in the review of the Esprit programme. If agreed, ESSI could become the largest Esprit project funded by the EC.

The parliament has called for restrictions on non-EC companies in Esprit and more control via management committees and over annual budgets. Governments are refusing to meet these demands which cover a range of R&D programmes. (Source: Computing, 4 April 1991)

France

French merge research activities

Two of the largest French research organizations have decided to merge their semiconductor process technologies to avoid duplicating their costs. CNET (Centre National d'études Télécommunications) the French telecommunications research organization, and LETI, the laboratory of the Commissariat à l'Energie Atomique, will collaborate on the Grenoble Silicium Submicronique (GRESSI) programme, which has a budget of $155 million over an eight-year period. These laboratories already collaborate on basic research, but the new agreement will extend their collaboration to specific semiconductor process technologies.

GRESSI is intended to follow on smoothly after the Grenoble 92 project. The latter is a joint venture between SGS-Thomson and CNET that is scheduled to produce devices with 0.5 μm minimum geometry in 1992. GRESSI will investigate lithography techniques down to 0.35 μm for the production of devices to follow those from Grenoble 92. Other work to be investigated under GRESSI concerns new substrates and the use of tungsten in submicron interconnects.

The reorganization of these French groups is closely connected with the pull out of Philips from the static memory part of the Joint European Submicron Silicon (JESSI) programme. (Reprinted with permission from Semiconductor International Magazine, March 1991. Copyright 1991 by Cahners Publishing Co., Des Plaines, IL, USA)

Germany

The German PC market looks at a stagnant future

After years of stormy growth, Germany's market for personal computers is now levelling off and will eventually face a period of stagnation according to experts at Diebold Deutschland GmbH in Eschborn, a management and technology consulting firm. The reservoir of new customers, they say, will be exhausted in the next two to three years while sales of replacement PCs will drop.

The trend matches those in the US and UK. The result is further concentration in the industry, as small and medium-sized firms are gobbled up by the giants. In Diebold's view, only five to six large companies active on the German market will grab the lion's share of PC sales. The small ones will have to look for niches.

After PC sales in Germany rose 15 per cent in 1990 to reach $5 billion, this year's market will level off to between 5 per cent and 10 per cent growth. Only in the five new eastern states will there still be a 15 per cent rise in sales in 1991, because of the enormous demand for PCs in that region. For the whole of Germany, however, the longer-term PC future is anything but bright. (Source: Electronics, April 1991)

Siemens mounts major initiative in fuzzy logic

Determined not to leave the field to Japanese producers, Germany's Siemens AG is launching a long-term, multimillion-dollar effort in fuzzy-logic technology. The company's Task force fuzzy project aims at research and development in fuzzy controller hardware and software.

While most European companies have assigned just one or two people to watch over the fuzzy-logic scene, Siemens is going all out.

R&D will emphasize automation, medical diagnostics, household appliances, environmental control, image processing, character recognition, and related areas. In many of these applications, no exact programs can be set up for certain

processes to allow the use of conventional logic methods. Fuzzy logic overcomes this problem and offers a better solution with lower hardware and software development costs. (Source: Electronics, April 1991)

Japan

Japan moves more R&D to Europe

Japanese firms, particularly electronics manufacturers, are flocking to set up subsidiaries in Europe, with a growing proportion of R&D facilities and an increasing dependence on European managers, according to a survey by the Japan External Trade Organisation.

In the year to January the number of Japanese manufacturing operations jumped by 28 per cent to 576, the survey found, of which 177 were electronics firms. Britain leads the field in wooing Japanese electronics manufacturers, with 58 firms making goods here.

Since last year's survey the number of R&D centres established in Europe by Japanese firms almost doubled, from 73 to 140, partly in response to complaints that inward investment tended to concentrate on "screwdriver" assembly plants.

Two thirds of firms said they were actively involving Europeans in their management teams. (Source: Electronics Weekly, 15 May 1991)

The private sector offers an alternative

While the world's attention focuses on MITI's next generation computer project, a group of Japanese academics and industrialists have been trying to launch an alternative to the sixth generation computer project with private sector funding.

Their initiative, called the International Institute of Novel Computing (IINC), may never get off the ground. But the very fact that some top Japanese companies have been prepared to put money into the project shows a growing movement in Japanese industry to look for alternatives to MITI projects, which, although often seen in the West as a source of Japan's economic might, are viewed in a very different light by Japanese industry.

The IINC initiative was launched last year by the Japan Technology Transfer Association - a non-profit organization funded largely by private industry - with the backing of none private companies, including Hitachi, Nissan and Nippon Steel Corporation.

The project is led by Hideo Aiso of Keio University and includes many academics who are also involved in MITI's sixth generation project.

IINC may focus on various types of next-generation computing, including parallel, optical and neural computing - key targets of MITI's project. When the initiative was announced last September, officials of the Technology Transfer Association said they were confident that many more companies would join the scheme. (Extracted from Nature, Vol. 351, 30 May 1991)

United Kingdom

Fibre network link up for R&D teams

A broadband optical fibre network is planned to link together 200 research departments in universities, polytechnics and government establishments within five years.

It will upgrade the existing 2 M-bit/s government supported data network called Janet with a fibre-based network operating at over 100 M-bit/s. Called Super Janet, the new network would radically increase the services available to the academic community by offering high-speed file transfer, voice and even high-definition graphics.

The high cost of the project, which may require a dedicated fibre network, is hoped to be shared with industry.

First network trials at five sites use the 100 M-bit/s data networking standard FDDI (fibre distributed data interface). In June it is expected that FDDI will be selected for the Super Janet project.

The project could also be important in the development of high-definition television and graphics services within the UK. Expensive HDTV terminals could be used in research and educational applications such as Super Janet long before it becomes a consumer product. (Source: Electronics Weekly, 10 April 1991)

United States of America

US funds high-tech research

Research into flat-panel displays, X-ray lithography and mass storage systems has received a $9 million cash boost from the US Government. Half the money will go into industrial research projects.

The awards are being interpreted as a sign of growing government commitment to high-technology companies in the face of foreign competition.

These are the first awards under the Government's Advanced Technology Program which will spend $36 million on non-military research this year.

AT&T Bell Laboratories and McDonnell Douglas won grants for work on X-ray lithography. Used in the production of semiconductors to etch the ultra-fine circuit patterns directly onto the silicon, X-ray lithography is seen by US chip makers as a means of maintaining a technology lead over Japanese rivals.

Japanese companies such as Hitachi, Toshiba and Fujitsu, which have prototyped 64 M-bit DRAMs, appear to have opted for improving conventional technologies. (Source: Electronics Weekly, 13 March 1991)

War pushes COCOM to software curbs

Export restrictions on software that transfers data between computers have been tightened in the wake of the Gulf war because US military and intelligence officials were dismayed by the difficulty the allies had in destroying Iraq's command and control computer links during the conflict.

The new software controls are expected to be formalized at a high-level meeting of the Coordinating Committee for Multilateral Export Controls, known as COCOM.

The software, which is widely available from manufacturers around the world, makes modern computer networks reliable and resistant to attack

by rerouting messages in a network automatically after any single link has been destroyed.

COCOM was established after the Second World War to control Western trade with the Soviet Union and Eastern bloc countries. When the Committee votes for a policy, each country is responsible for putting it into effect.

Such an action would at least partly reverse recent attempts to liberalize the trade in computer technology with the former Eastern bloc countries and China, computer executives said.

American computer manufacturers have been looking to Eastern Europe and the Soviet Union as new markets for such applications as banking systems, which routinely use wide-area computer networks to link branches and automated teller systems. Such networks are also used for reservations systems by hotel chains.

The largest US computer makers, including International Business Machines Corp., Digital Equipment Corp. and Unisys Corp., could be affected by the new restrictions, the industry executives said.

The software trade restrictions have been stiffened in recent months because of vocal objections from the National Security Agency's signals-intelligence division and the Pentagon's tactical-intelligence group, according to the industry executives and former government officials with knowledge of the situation.

US intelligence agencies have determined that Iraq was able to obtain some of the most advanced computer-networking equipment before the war, mostly from European manufacturers, and have re-examined the issue of exports of computer communications equipment.

The dispute is likely to intensify in the future because advanced computer technologies, often sold for commercial uses, are increasingly being viewed as crucial in modern warfare, particularly in the wake of the Gulf war.

The issue is taking on new urgency because the Government is planning to make final the COCOM "core list" for controlling the export of computers and other high technology, and the computer executives said they were concerned that the new controls might include stiff limits under its telecommunications section.

The executives said the limits on telecommunications equipment could affect computer hardware and software exports, depending on how the core list's language was worded.

At stake is the interaction between two categories of the list regarding computer and telecommunications equipment, they say. They fear that restrictive language in the telecommunications section could prohibit many computer sales.

The communications technologies at issue are referred to as "datagram", "fast select" and "dynamic adaptive routing", and are used in many modern computer networks. They are hardware and software systems that make data communications highly reliable and permit networks to reroute information around damaged network links. (Source: International Herald Tribune, 23 May 1991)

USSR

Soviet systems: much need, but few roubles

Although computers have become fairly common in Moscow and Leningrad, there is still a huge unmet demand in this enormous country. Covering one sixth of the earth's surface and with a population almost 20 per cent larger than that of the United States, the Soviet Union at the end of 1990 had an installed base of only 350,000 to 500,000 computers, by various estimates. The Soviet Government projects that the country will need to produce or import more than 20 million computers in this decade to modernize the economy. This is a difficult task, as domestic production of computers is minuscule and was until recently channelled exclusively to the military.

The barriers to massive imports of computers and other high-tech products are formidable. The most serious is the lack of convertible currency in the Soviet Union. In addition, the almost complete lack of communications and transport infrastructures and the constantly shifting political, legal and commercial frameworks make penetrating the Soviet market a difficult proposition.

The unmet demand for computers means that computers and peripherals are among the most highly prized of Western imports. In the USSR, an IBM AT sells for an average of 60,000 roubles, putting it beyond the reach of all but the most affluent individuals.

These high computer prices are used as benchmarks in establishing the black market value of the rouble against the dollar and other foreign currencies. Some Soviet economists predict that increased computer imports will stabilize the rouble. Underlining the financial importance of computers in the Soviet Union, PCs are traded on the new Moscow Commodities Exchange alongside wheat and oil. There is even a de facto futures market in personal computers. Some reports say that shipments of personal computers are so valuable that armed guards must protect them against hijacking.

But despite the difficulties, the allure of the last great, untapped market has stimulated American, Asian and European companies to dip their toes into the Soviet market for high-tech products. The Wild West atmosphere in the East bloc has fostered some innovative approaches to business - including barter, arcane currency swaps and the establishment of domestic manufacturing facilities by foreign companies. For instance, IBM PC clones are often purchased in Taiwan or Thailand in barter deals for timber or metal products. It is also not unusual for foreign students to smuggle PCs into the country.

Since 1988, thousands of small computer resellers have established themselves in Kiev, Leningrad, Moscow and other Soviet cities. But resellers have already earned unsavoury reputations by culling up to 200 per cent profits on computer products, which they hawk along with imported automobiles, electronic musical instruments, washing machines and beer.

In an effort to curtail excessive profits and stimulate local production, the Soviet Government recently imposed a 40 per cent duty on sales of imported personal computers. Domestic companies

that add significant value to the products are taxed at a lower rate. While many resellers are making token gestures to avoid the tariffs - integrating a few components or bundling some software - several firms have accepted the challenge and launched significant computer-manufacturing ventures.

In September 1990, Aquarius Systems Integral opened a computer factory in Shuya, 250 kilometres from Moscow. Using a military electronics factory left idle by Soviet defence cutbacks, the Soviet-Taiwanese joint venture plans to produce up to 100,000 computers annually. Most of the factory's IBM AT compatibles will be sold in the Soviet Union for roubles, but a portion will be exported to Europe and sold for hard currency, according to an Aquarius spokesperson in Moscow. Aquarius personnel are working closely with Boris Yeltsin and his advisers on a plan to computerize the Russian Republic.

In another joint venture, San José, California-based Chips and Technologies Inc., a manufacturer of IBM-compatible chips, is working with Soviet partners to produce PCs in the Byelorussian city of Minsk starting this year, as part of a company called Golden Gate Computers.

The new computers, built around state-of-the-art very large scale integration (VLSI) technology, will sell exclusively for hard cash, at lower prices than they would cost in the United States. But support and training will be available for roubles.

Most foreign computer companies are selling systems to Soviet buyers through dealers and distributors, but are not establishing manufacturing presences in the Soviet Union. In a variety of innovative arrangements, products from companies such as Apple Computer Inc., AST Research Inc., Epson, Hewlett-Packard Co., IBM and Tandon Corp. are turning up in the USSR.

Tandon has found a unique route around the problem of converting roubles. Exploiting the barter system (which the Soviet Union is in the process of abandoning), Tandon will sell Indian-made computers for roubles. Indian state banks will convert the roubles to Indian rupees in exchange for oil and industrial products the USSR has sold to India.

Other foreign companies are finding somewhat more conservative ways to sell systems to the Soviets. Few Soviets buy their computers in stores; thus, post-sales service, training and maintenance that Westerners take for granted are not widely available. Two US companies are trying to reverse this trend, introducing American-style retailing and service. ComputerLand Corp. and MicroAge Inc. opened stores in Moscow in 1990. Both sell PC products from AST, Epson, HP and IBM for hard currency. ComputerLand and MicroAge offer support, training and Soviet-produced software in exchange for roubles.

US companies selling directly to the Soviet market include Apple, Hewlett-Packard and IBM. Apple, however, is having limited success in its attempts to break the near monopoly of MS-DOS in the Soviet Union. (Reprinted with permission of DATAMATION magazine, 1 April 1991. Copyright by Technical Publishing Company. A Dunn and Bradstreet Company - all rights reserved.)

VIII. STANDARDIZATION AND LEGISLATION

Standardization

Standard for electronic document citation

An increasing number of publications and other documents are appearing in electronic form, having been created, maintained and disseminated on a computer system. An electronic document may be fixed and unchangeable, or it may take advantage of its computer environment to incorporate modifications in both form and content.

An electronic document may or may not have a paper equivalent. Despite the complexity of the task, electronic documents need to be referenced if the integrity of the intellectual process is to be preserved.

Recognizing this need, the International Organization for Standardization (ISO) has set up a committee (ISO/TC46) which aims to establish an international standard for the creation of references to electronic documents. More information can be obtained from: SCC (Canada) c/o Office of Library Standards, National Library of Canada, Ottawa K1A 0N4, Canada.

US suppliers unite in RISC standards drive

Major US hardware and software suppliers announced a consortium backing a fresh set of workstations standards.

Members of the Advanced RISC Computing Architecture consortium include DEC, Compaq, Microsoft, the Santa Cruz Operation, Siemens, Unisys, Control Data, Sony and Mips Computer Systems.

Its main aim is to persuade large corporations to use RISC-based workstations by promising high performance and a wide range of business applications. Until now, business users have standardized on IBM and compatible PC systems and shunned RISC-based workstations.

Arca has chosen the R4000 RISC microprocessor from Mips as the core processor for a range of low-priced workstations that will include laptop computers, desktop workstations and multiprocessor high-end systems. The R4000 was chosen because of its architecture, which makes it easier to run MSDOS-compatible software.

Arca is developing standards that will allow applications to run on R4000 systems as well as IBM and compatible PCs. This effort depends on the development of application programming interfaces based on various versions of Unix.

Arca will split its development efforts into two broad groups code-named Gibraltar and Apache.

DEC will lead the Gibraltar group in the development of APIS for its proprietary version of Unix which is called Ultrix.

The Apache group, led by Compaq, will develop APIS for RISC workstations using the R4000 microprocessor and Unix System V.

The first APIS will not be ready until mid 1992. (Source: Computing, 11 April 1991)

Encryption system backed as standard

Several major computer companies are set to endorse a public-key encryption system as an international standard.

Novell, Lotus Development and Digital, three users of the 14-year-old Cryptosystem from California-based RSA Data Security, have said they will endorse the product as a standard.

Industry observers also believe Sun Microsystems, Apple Computer and Microsoft will add their names to the list.

RSA's proposed public-key encryption standard would allow the companies to exchange scrambled data among disparate platforms.

Encrypted data is based on an algorithm and translated into a series of numbers. Those who hold the mathematical key can encode or decode a message. (Source: Computer Weekly, 25 April 1991)

IBM, AT&T put heads together on standards

Rival US giants IBM and AT&T have set aside their differences on operating system software to join forces in an effort to develop the standards needed to manage large computer networks.

Both companies have agreed to develop software that will allow their respective network management systems to talk to each other using "existing interfaces". This will lay foundations for future versions which adhere to Open System Interconnection (OSI) network management standards.

However, IBM and AT&T are still at loggerheads over the future of the Unix operating system that controls many of the computers that sit on these large networks.

AT&T's Unix International camp backs a different flavour of Unix to that being developed by the Open Software Foundation which is backed by IBM, DEC and others. An IBM spokesman indicated that the agreement on network management was totally independent of this. (Source: Electronics Weekly, 3 April 1991)

EC drops bid for HDTV standard

The European Commission (EC) has abandoned its attempt to impose a standard for HDTV.

It will not now issue a directive forcing all satellite TV pictures to be broadcast using the MAC format, which it had hoped would be the basis for HDTV systems later this decade.

The Commission's disarray will leave European companies selling TV equipment and services falling further behind the Japanese. NHK, the main TV company in Japan, will start regular broadcasts for HDTV sets in the autumn. It intends to launch a new satellite, called OS-3b, in the summer. Companies, such as Sony, are already selling TV sets to receive the pictures. (Source: Electronics Weekly, 3 April 1991)

Standard for compressed digital images

The standard for compression of digital images, developed by the Joint Photographic Expert Group (JPEG), was launched formally in March 1991. This introduction will be followed by a second standard for full-motion digital video developed by the Motion Picture Expert Group (MPEG). The JPEG standard allows ease of editing because each image is taken separately, while the MPEG uses the fact that video often contains many images in which part of the picture stays the same. JPEG also allows the user to pick the degree of compression needed. One of the major problems with images is that it takes a huge amount of computer storage capacity to display and print the images. (Extracted from New York Times, 23 January 1991)

Support gathers behind frame relay standard

Networking specialists Racal-Milgo and Proteon are among 12 companies that have pledged their support for the emerging frame relay high-performance data networking standard.

Frame relay is expected to replace the popular X.25 packet-switching wide area network standards within the next two or three years. Significant efficiency increases and lower costs are seen as the main benefits.

The latest addition of the communications companies brings to 35 the number of organizations belonging to the Frame Relay Implementor's Forum, which will promote the public specification announced last September by Cisco, DEC, Northern Telecom and Stratacom.

That specification in turn is based on the frame relay interface definition spelled out by the American National Standards Institute (ANSI).

Besides Proteon and Racal-Milgo, the other new members include Coral Network, Cryptall Communications, Infotron, Multi-Tech, Network Systems, Newport System, OST, Sigma/TME and Telco Systems.

Frame relay conforms to the CCITT I.121 specification, otherwise referred to as broadband integrated services digital network (ISDN) and synchronous transfer mode. CCITT will work with ANSI to ensure the development of a common standard.

The technology enables groups of local area networks (LANS) and wide area networks (WANS) to operate in a much more integrated manner, opening up applications like videoconferencing. (Source: Computer Weekly, 7 March 1991)

Legislation

Europe 1992 the legal underpinnings

The unification of the European Common Market is likely to leave its mark on technology and its applications in post-1992 Europe.

The intellectual property laws of the members of the EC have long provided incentives for innovation, development and industrial investment. Despite their benefits, these laws are viewed by the EC as potential obstacles to trade among the member States. The EC has therefore been working to minimize such barriers.

One ongoing effort is devoted to software protection. In 1989, the European Commission, the executive body of the EC, proposed a directive for harmonizing member countries' laws for protecting software. Besides mandating a uniform copyright duration of 50 years from the date of creation of

the software, it prescribes legislation to help thwart illegal copying and promote research and investment in computer technology. Also, an authorized user would be allowed to decompile software to the extent required to achieve interoperability.

The EC's policy-making body, the Council of Ministers, approved the directive in principle on 13 December 1990.

The EC has taken steps to protect semiconductors as well as software. A directive adopted by the Council in 1986 established uniform protection in the EC for the topographies, or mask works, of integrated circuits. Implemented through laws of the member States, the directive prohibits unauthorized reproduction and commercial exploitation of semiconductors containing proprietary topographies, as well as the unauthorized importation of such products into the EC. The topographies, identifiable by the symbol "T", will be protected generally for 10 years from the date of first commercial exploitation or registration with a member State's agency charged with administering these laws.

Shortly after this directive was adopted, the Council granted interim protection to products from the United States, Japan, and other countries. Last year, protection was extended on a permanent basis to Australia, Austria, Japan and Sweden, and, until the end of 1992, to Switzerland and the United States.

In addition to legislating protection for technical advances, the Commission plays an important role in regulating competition among businesses operating within the Common Market. This activity is somewhat akin to the enforcement of the antitrust laws in the United States.

The Commission's power to regulate the marketplace stems from the 1957 Treaty of Rome, which contains several provisions concerned with competition. One of these, Article 85(1), is of particular interest here. Article 85(1) gives the EC the power to prevent anti-competitive arrangements. It prohibits "all agreements ... and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the common market".

From time to time, the Commission is called upon to evaluate a transaction in the light of this provision. A recent decision concerned a joint venture formed to develop and manufacture equipment for Group Special Mobile, a proposed pan-European digital cellular telephone system. The partners were AEG AG of Germany, the Dutch/French Alcatel NV, and Oy Nokia AB of Finland.

On 27 July 1990, the Commission granted the enterprise a "negative clearance", stating that the consortium does not violate Article 85(1) because the companies could not have been effective competitors individually given the investment and staffing required, the short time frame mandated by the project, and the financial risk.

By the end of 1992, the EC hopes to have much of the legal and physical infrastructure of a unified market in place. Nevertheless, the process of unification is an evolving one, and will therefore continue as necessary to accommodate new developments and technologies. (Source: IEEE Spectrum, May 1991)

IX. RECENT PUBLICATIONS

CD-ROMs from CGIAR

The Consultative Group on International Agricultural Research (CGIAR) has released the first in a series of full-text CD-ROMS which will eventually constitute a library of 6,000 titles on agriculture in English, French and Spanish. The first disc to be released is entitled **Food, Agriculture and Science**. It includes titles dealing with such subjects as rice growing, field problems of growing beans in Latin America, potato research and sorghum breeding.

The disc will be distributed free of charge to interested institutions in developing countries by agricultural research centres, and is available for purchase by other users at $US 99. For further information, contact CGIAR, c/o The World Bank, 1818 H Street NW, Room N5063, Washington, DC 20433, USA. (TP+1 202/334 8031). Information on copies for purchase is available from: Knowledge Access International, 2865 Marine Way, Suite 1305, Mountain View, CA 94043, USA. (TP+1 415/969 0606).

UNESCO library network

The General Information Programme of the United Nations Educational, Scientific and Cultural Organization, in cooperation with the World Federation of UNESCO Clubs, Centres and Associations (WFUCA) and the International Federation of Library Associations and Institutions (IFLA) recently announced a project for the establishment of a UNESCO Network of Associated Libraries (UNAL).

The purpose of the Network is to bring together and support a group of libraries which will work in association with UNESCO and organizations cooperating with it, in order to foster international understanding, promote dialogue between different cultures, increase awareness of international issues and disseminate information on UNESCO publications and key works such as those included in UNESCO's collection of representative works.

The Network will be managed by a steering committee (comprising UNESCO, WFUCA and IFLA as permanent members, and temporary members to be appointed as required), a general assembly and a coordinator. Membership will be open to any libraries which serve the general public; it is hoped that eventually there will be at least one Associated Library in each UNESCO Member State.

Participation in the Network will enable members to make contact with libraries in other countries, contribute to the promotion of international understanding, experiment with new techniques, attract new groups of readers, and establish direct contact with UNESCO and receive its documentation.

Libraries interested in joining should contact: the Bureau of the Coordinator, PGI, UNESCO, 7 place de Fontenoy, 75700 Paris, France. Further information on the Network is contained in a UNESCO booklet: The UNESCO Network of

Associated Libraries: an introduction, published by UNESCO/PGI in January 1990 (serial number PGI-89/WS/5 rev.).

Rural community information services: guidelines

Recent years have seen a growing awareness of the importance of information services that meet the needs of rural communities in developing countries. This prompted the IFLA Section of Public Libraries to convene a small working group that met at the 1987 IFLA Conference in Brighton. The group recommended that a project should be set up to promote and assist the development of such community information services. The first stage of the project was a literature review, to establish the state of the art and provide guidelines on the development of rural community information services.

Rural community information services: guidelines for researching need, setting up services and evaluating performance, by Elaine Kempson, is a paper summarizing the guidelines under three main headings: (1) analysing community needs; (2) establishing appropriate services; and (3) monitoring and evaluating performance. It is published in IFLA journal 16 (1990), No. 4, p. 429.

New magazine on disc

PC Vision (Melbourne, Australia) is a new magazine that comes on a 1.2 Mbyte floppy disc for viewing in IBM PCs and compatible machines. Publisher John Gould says that four software packages have been combined to create the magazine. It should appeal to advertisers, who can demonstrate software in this format. Some of the graphics in the first issue are also animated. A page in the magazine can have 16 of 256 possible colours. Extra information can be stored in a disc for readers who want more information than is available in the main advertisement. A run of 11,000 copies of the disc is equivalent to 2.6 million tons of paper for a regular 130-page magazine. An issue will cost A$3.95. It will be available on 5.25 and 3.5 inch discs. Technology for the magazine cannot be patented. (Extracted from New Scientist, 23 February 1991)

IBE education thesaurus revised

A completely revised fifth edition of the IBE education thesaurus has been prepared by UNESCO's International Bureau of Education (IBE). The revision, which has taken several years, has seen changes to some 200 terms, reflecting new trends and concepts in the field of education, to make them more compatible with the terminology used in the education section of the UNESCO thesaurus.

Information contained in the Thesaurus, which has a wide usership among institutions in Member States, has been presented in such a way as to make documentary research easier. A number of definitions of terms have been introduced, to avoid any doubt about the choice of descriptors. This revision affects the English, French and Spanish editions. The new English version is scheduled to appear early in 1991. It is available from: Sales Office, UNESCO, 7 place de Fontenoy, 75007 Paris, France.

New ACCIS directory published

ACCIS has just published the Directory of selected collections of United Nations system publications. The directory, compiled on the basis of information gathered from 39 United Nations organizations, is aimed at assisting users in locating collections of United Nations system publications at the country level.

Information about libraries and documentation centres included in the directory was derived from the Database of United Nations Databases and Information Services (DUNDIS), maintained in the ACCIS Secretariat.

For each of 170 countries and areas listed, the user may find: libraries and documentation centres within the United Nations system; select libraries and other information services which maintain depository collections of United Nations system publications; and United Nations Information Centres/Services.

The 126-page directory (ISBN 92-1-100351-2; UN Sales No. GV.E.90.0.4) is priced at $US 25, and is available from United Nations Sales Sections in Geneva and New York.

Computer-aided translation systems: an overview

Only 2.5 per cent of all documentation is translated into another language, according to a report produced by Praetorius Ltd. for the European Commission (EC). One method of overcoming the language barrier, says the report, is to use one of the increasing number of computer-aided translation systems that can translate 25 pages a minute.

Systems available include the Canadian **Taum-Meteo** (English to French), **Systran** (it began as Russian-English, but is now owned by the EC and work is in progress towards its use with 16 language pairs). **Spanam/Engspan** is a US system for English-Spanish and vice versa, **Titus** was developed in France for the textile industry for English, French, German and Spanish. **Weidner** is another US system for English to French, Spanish or German and **ALPS**, from the same source as **Weidner**, is for English to French, German, Italian and Spanish. **Logos**, another US system, covers Vietnamese, English, German and French. **Smart** is a very fast system (200,000 words an hour) for English-French and French-English translations, used by the Canadian Government. **SUSY**, from Germany, covers Russian, German, English and French. **Socrata** is a Canadian system for English/French-French/English. **METAL** offers German and English, French and Dutch pairs plus German to Spanish. **PC-Translator**, from the USA, is available for under $US 1,000 for Danish and English, English/French and English/Spanish. Another low-priced (under $US 2,000) system is **Globalink**, for a French/Spanish pair, German to English, English to French and English to Spanish. Finally, **Iovna** from Israel, for an English/French pair and an English/Russian pair, is under development.

The report, which outlines all of these products, is available free of charge from Ian Pigott, European Commission, DG XIII-B, L-2920, Luxembourg.

Arab League guidelines

The Arab League Documentation Centre (ALDOC) has recently issued a new set of Guidelines for the preparation of national policies for information systems and services in the Arab countries.

Available in Arabic and English, the guidelines deal with the following topics: procedures applied in designing national policies; objectives of national policies; designing and implementing a national policy, and establishing a national body responsible for coordinating information activities.

For further details, contact ALDOC, 37 Khereddine Pacha Street, Tunis, Tunisia (TP+216 1/890 100; TX 14411/2-13241/2 JAMIA TN; Fax +216 1/781 801).

Libraries in Africa

The quiet struggle: libraries and information for Africa is a new book published by Mansell Publishing, which outlines the current information environment in Africa. Also described are strategies for the development of an African library and information programme. Much attention is paid to the importance of information for development, including the tendency of decision-makers to overlook and disregard indigenous research. Authors Paul Sturges and Richard Neill maintain that Western library models are inappropriate for Africa and that change must come from library schools.

Managing a nation: the microcomputer software catalogue

This is the second edition of a reference book that surveys and reviews microcomputer programs of special interest to managers responsible for - and scholars concerned with - the management of the affairs and business of nations. It focuses on specialized, often little-known programs, rather than general-purpose software such as word-processing and spreadsheet packages.

Published by Westview Press, the book covers sector-specific programs as well as multi-sector and global models; it includes chapters of general application to help users derive full benefit from the programs reviewed.

Managing a nation (388 pp.) sells at $US 48.50. The publishers can be contacted at the following address: Customer Service Dept., 5500 Central Avenue, Boulder, Colorado 80301, USA. TP+1 303/444 3541; Fax +1 303/449 3356.

Brokers' directory published

A Directory of European Information Researchers has just been published. Identifying information brokers in nine European countries, the directory gives full contact details and describes services and specialist areas of expertise.

Published by EIRENE, the European Information Researchers Network, it will be published annually with a supplement containing additions and amendments distributed each November. The price is £95. For further information, TP+44 71/490 5519.

Computer fraud and security bulletin

This monthly publication provides comprehensive and up-to-date international coverage of significant developments in the areas of: audit and financial control methods; security techniques in personnel management; data encryption; physical security of computer instalment; risk management; network security; access control; security software and software protection; computer crime insurance; authentication and validation; telecommunications security; and virus and worm reports.

Further details are available from: Elsevier Advanced Technology, Europe: 256 Banbury Road, Oxford OX2 7DH, UK or US: 655 Avenue of the Americas, New York, NY10010, USA.