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N.B. For those readers who may be interested in further information on CAD/CAM Applications, issue No. 12/90 of the Advances in Materials Monitor covers this specific subject. Copies may be had on request from the Editor, Advances in Materials Monitor, at the address below.

Issue No. 94

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I. NEWS AND EVENTS

Diskettes available on materials science from INTIB

ASM International and the United Nations Industrial Development Organization (UNIDO) have entered a joint venture to develop informational diskettes on materials science and technology in developing countries.

Topics will include energy conservation, scrap recovery and recycling, welding and precious metals production and recycling.

The computer diskettes are expected to be completed in the mid-1990s and will be available free of charge to UNIDO's Industrial and Technological Information Bank and national data libraries. The Materials Information Division of ASM will market the diskettes to developing countries at a reduced price. (Extracted from American Materials Market, 13 March 1990)

Sematech and JESSI conduct studies on Japan's IC capabilities

Sematech (US) and JESSI (Western Europe) will jointly conduct two studies on ways to catch up to Japanese IC capabilities. The Sematech and JESSI (Joint European Submicron Silicon) consortiums were formed separately to seek the same goal: parity with Japanese chip technology. One of the joint studies will seek to develop standards in the areas of IC design, production and quality control measurements. The other study will identify leaders in specific technologies, determine how far ahead they are, and consider measures needed to catch up to them. These studies could lead to joint development of hardware, according to H. Meyer of JESSI. However, there is no prospect of merging the two groups, according to J. Stroop of Sematech. (Extracted from Defense News, 4 February 1990)

Japan leads chip attack

Aggressive introductions of new DRAM memory chip generations are being led by Hitachi and Toshiba who both expect to be producing 4-Mbit chips in million-a-month quantities in the third quarter and expect to start sampling a 16-Mbit device in the fourth.

Toshiba's die size is larger than Hitachi's - 97.4 mm^2 to Hitachi's 90 mm^2 - and the first generation shrinks will see Toshiba's at 72 mm^2 compared to Hitachi's 81.5 mm^2.

At Europe's only producer of 4-Mbit DRAMs, Siemens' Claus Knapp said: "We have been in production of the 4-Mbit chip since last autumn. (Q4 89) They are all being produced on one line in Munich but when demand ramps up we will also make the 4-Mbit at our plant at Regensburg. Recently we have a shrunk version of the 4-Mbit under way".

At the only American producer of 4-Mbit for the market, Texas Instruments, European memory boss Giorgio Morosi said yield was a "commercial secret". All TI's 4-Mbit production is coming out of the plant in Miho, Japan, said Morosi, and the company's second plant to make the 4-Mbit would be the one being built at Avezzano in Italy for which first production is planned in October 1991. TI's second generation 4-Mbit, 80 per cent smaller than the first generation, is being introduced in the third quarter. (Source: Electronics Weekly, 4 April 1990)

US launches transatlantic links

Buoyed by an exponential rise in traffic on its US computer network, the National Science Foundation (NSF) has launched the first high-speed scientific computing link to cross the Atlantic. With the new line, NSFnet now has a full-speed link to the European Academic Supercomputing Initiative network (EASInet). Operating at 1.5 megabits per second (known as T1 speed), the fibre-optic link is about 24 times faster than the previous intercontinental connections.

The European Laboratory for Particle Physics (CERN) in Geneva serves as the European "gateway" for the link, which is connected at its other side to the NSF supercomputer centre at Cornell University in Ithaca, New York.

NSF's networking partners (IBM, MCI Communications and the Merit university consortium) also demonstrated the first prototype "T3" link at a trade show in Washington. At 45 megabits per second, the T3 link is 28 times faster than the T1 connections.

NSF intends to begin upgrading the NSFnet "backbone" - nodes at seven US universities and all six NSF supercomputer centres - to T3 speed later this year.

Figures released by NSF show that traffic on NSFnet has increased 445 per cent in 1989, to 2,500 million "packets" a month. (A packet is a variable amount of data with some supporting information appended, such as a destination and routing symbols. Although packets can vary from 48 to 4,000 bytes, NSFnet packets statistically average 125 bytes.) The number of NSFnet users is expected to grow from about one million today to between four and six million - approximately one half of the US academic and research community - by the end of the decade.

Traffic is expected to grow as scientists react to the increased responsiveness and reliability of the new high-speed links by expanding their network use from electronic mail to interactive operations of remote computers and the exchange of large amounts of graphic data.

Although electronic mail is still the largest single use of NSFnet, interactive applications (now 20 per cent) and file exchange (29 per cent) are gaining ground. Further network capacity, in the form of more T3 links, is expected to spawn a whole new set of applications, including the interactive "steering" of scientific simulations on remote supercomputers. (Source: Nature, Vol. 344, 22 March 1990)

US specialists diagnose a massive virus epidemic

Computer security experts in the US are predicting a massive epidemic of computer virus programs that will infect as many as eight million PCs over the next two years and cause billions of dollars worth of damage.

Peter Tippett, a specialist in computer security issues, has completed a study on computer virus problems. In a paper titled "Kinetics of Computer Virus Replications", Tippett uses mathematical and epidemiological tables normally used for predicting the behaviour of biological viruses, to estimate the size of the computer virus problem.

Tippett said his research shows "the potential costs involved in lost data, system downtime and recovery efforts may exceed five to 10 billion dollars over the next five years". Tippett is also head of Foundationware, a company that produces software to detect infections.

William Murray, in charge of information systems security for accounting firm Ernst & Young, backed up Tippett's computer virus predictions, adding that PC users should have some kind of plan to protect their systems from virus attack.

Tippett said the increasing tendency to interconnect PCs was widening the scope of the problem.

Computer security experts estimate there are about 70 known strains of computer virus in circulation. Last year, about 10 new strains were identified. In the first two months of 1990, at least 21 new virus strains were found.

North Carolina State University is one of the latest to report virus infection and has shut down dozens of PCs.

Security experts are also worried about the emergence of sophisticated computer virus programs that can adjust to the presence of virus detection software. (Source: Computing, 5 April 1990)

Safety body may strengthen ozone controls for offices

The US's Health and Safety Executive is about to review its guidelines on the use of office equipment - in particular desktop printers and plain paper copiers - that release ozone into workplaces. The HSE's actions follow growing evidence that a lack of attention to safety precautions means such machines may be becoming a significant threat to office workers.

It is generally acknowledged that printers and copiers, especially when old or used in a small room, can release potentially dangerous amounts of ozone. Yet the firms making and selling the equipment frequently know little about these effects, provide no advice on how to avoid them unless asked, and even then frequently give contradictory information.

Ozone, O_3, is an unstable form of oxygen, produced by high voltages and electrical discharges. Laser printers and xerographic copying machines rely on high voltages to make the toner powder stick temporarily to a print drum, before its transfer to paper.

Ozone soon breaks down into oxygen, while attacking most materials except glass and some stainless steels. Although office equipment is usually fitted with filters, containing activated carbon to break down ozone, they become less efficient with time, especially if clogged with dust. The dust can come from paper, toner powder or room air. Clogging accelerates if ventilation is poor.

The HSE says it will "soon" review the situation under the Control of Substances Hazardous to Health regulations (COSHH), which was added last year to the Health and Safety at Work Act 1974 and comes into effect from 1 June 1990. The firms making, selling and setting up office equipment seem ill-prepared for whatever restrictions the HSE imposes. Most important, the computer industry has glossed over the need to replace filters in its printers.

The HSE first tackled ozone in 1983, when its Guidance Note EH38 dispelled the myth that ozone is beneficial (the bracing smell of the seaside usually comes from rotting seaweed) and confirmed ozone's "acute toxicity to man". The HSE says its 1983 notes still stand. It reminds manufacturers and users that ozone is used as a commercial bleaching agent and recommends an exposure limit of 0.1 parts per million (ppm) averaged over an 8-hour day, with no 15-minute peak greater than 0.3 ppm. Even at 0.1 ppm, premature aging may result and, in the short term, 0.1 ppm can cause irritation to the eyes, nose and throat. At 0.55 ppm nausea and headaches may occur. Exposure for 2 hours at 1.5 ppm typically results in coughs and excess production of sputum. At 50 ppm, a 30-minute exposure may be fatal.

In 1983 the main source of ozone in an office was a xerographic machine, usually standing safely in a separate room or corridor. Over the past five years, small copiers and laser printers have found their way onto office desks and into small domestic rooms, often with poor ventilation. Frequently, the smell of ozone is evident when the machine is printing, especially near the outlet of the machine's internal fan.

The American computer company Hewlett-Packard (HP) has spearheaded the laser printer revolution, selling over 2 million over the past four years, with current sales standing at 1 million a year. Like all Western manufacturers, HP uses laser "engines" made in Japan by Canon. All HP printers produce very low levels of ozone, well under the 0.1 ppm limit. But HP acknowledges that this is for factory-fresh machines, that the level will rise if the filter clogs, and that a dusty environment shortens filter life.

HP cites one machine returned by a British user who was puzzled by the smell of ozone. The filters were clogged and emission was well over the limit. The company says the cure is to change filters but the company cannot point to any passage in its user manuals which warns users of the need to replace filters or tell how to do it.

IBM, the company which started the desktop computer revolution, was unable to quote ozone emission figures for its printers two days after the question was posed.

Apple, which sells deskton publishing systems that rely on laser printing, also uses Canon engines and quotes low emission figures similar to HP's. But Apple's advice on filters differs from that from HP.

In Denmark, offices are now playing safe and fitting external filters to existing machines. Dansk Technologi of Copenhagen started making its Minozon unit in the summer of 1988 and sold 8,000 in the first year. The company claims that more than 40 per cent of the laser printers in Denmark are now equipped with add-on filters.

Minozon filters cost between £300 and £400 in the UK. A far cheaper solution would be for owners of printers to change their filters, but first the printer manufacturers must tell users how to know when a change is necessary and how to make the change. (This first appeared in New Scientist, London, 7 April 1990, the weekly review of science and technology)

Green challenge to industry on CFC use

The computer manufacturing industry is coming under fire from Friends of the Earth (FoE) as the environmental group launches a national campaign highlighting the problems of ozone-destroying solvents used by UK companies.

Computer companies using CFC solvents 113, carbon tetrachloride and 1,1,1 trichlorethane, widely used in the cleaning applications for printed circuit boards and disk drives, are being targeted by FoE.

A Right to Know law requires US companies to report use of ozone-depleting solvents, but as there is no such requirement in the UK, FoE is approaching comapnies directly.

Industrial options to phase out use of ozone depleting solvents include aqueous cleaning, as used by IBM, and the no-clean technique Northern Telecom has adopted.

The ozone layer averages only about 3 mm thick but screens out harmful UV-B radiation. This radiation can cause DNA lesions which in turn lead to an increase in skin cancers. But it can also increase the number of cataracts and retinal damage leading to blindness. The United Nations Environment Programme predicts that for every 1 per cent depletion in the ozone layer there will be 100,000 extra cases of blindness.

Tests on animals also suggest that UV-B radiation can attach suppressor T-cells, weakening the immune system against viral and parasitic diseases as well as bacterial infections.

Materials such as plastics and rubbers degrade more quickly when UV radiation is high. Atmospheric problems can further damage human health, as well as exacerbating the problems of acid rain. And ozone depleting substances are estimated to be responsible for 20 to 25 per cent of global warming - the greenhouse effect.

The biggest culprits in destroying ozone are CFCs (chlorofluorocarbons) and in particular the widely used CFC113. When CFCs reach the upper atmosphere they are broken down by UV light and release chlorine which in turn attacks and destroys ozone. But the chlorine is not destroyed in this reaction; one chlorine atom can destroy 100,000 ozone molecules and persist for more than 20 years.

CFC113 is highly dangerous because of its estimated lifetime of 90 years caused by a resistance to chemical breakdown. As such, a large proportion of it finds its way up to the stratosphere.

The Montreal Protocol signed by 24 nations in September 1987 was the first serious step to control the problem. Countries continue to sign it and today it covers countries that account for two thirds of CFC production. Its plan was a cut in CFC production of 20 per cent in 1989, a further 20 per cent by 1993 and a further 30 per cent by 1998. The task prompted the first Electronic Manufacturing and the Environment Conference held in Bournemouth in early March 1990 and sponsored by the DTI as well as Du Pont, Multicore and ECI.

Today chlorine levels are about 3 ppb (parts per billion). The hole in the ozone layer over the Antarctic appeared when chlorine levels were only between 1.5 and 2 ppb. To get rid of the hole the levels have to be driven down below this point.

If the control measures agreed in the Montreal Protocol are the only ones implemented, chlorine concentrations will rise to at least double or triple today's 3 ppb during the next century. The year 2000 CFC phaseout, which over 80 nations are committed to, will not bring down chlorine levels. Even if the phaseout was brought forward to 1995 there would be a peak chlorine level of 4.24 ppb and it would be another 60 years before levels dropped below 2 ppb. (Extracted from Computing, 7 June 1990 and Electronics Weekly, 21 March 1990)

"Strategic" hold on bonders addressed

Semiconductor Equipment and Materials International (SEMI) has announced its support of proposed US Government measures to liberalize controls on exports of high-technology products to Eastern Europe. SEMI specifically commended the US Government's decision to recommend decontrol of wire bonders.

According to government officials, CoCom will review the recommendation at its next meeting. CoCom is a multilateral organization that reviews strategic exports to Eastern Europe and the Soviet Union.

To many suppliers of wire bonders in the US the current activity by CoCom is long overdue. SEMI members initiated the wire bonder investigation in 1985 under regulations contained in the Export Administration Act.

Typically, SEMI members in the US export over 50 per cent of their production, which makes export markets crucial to their long-term survival. (Reprinted with permission from Semiconductor International Magazine, March 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Il., USA)

Telecommuting

By 1995 towards 20 million US workers will be classified as telecommuters, working from home and communicating with their supervisors over the telephone lines.

For those who do not, working from home sounds idyllic. No traffic jams to contend with, no boss looking over your shoulder, just the quiet hum from the PC and the freedom to structure the workday around your other responsibilities.

Telecommuting has certainly been in high demand from many workers but, so far, US employers have been reluctant to create suitable jobs. Changing circumstances are, however, forcing many to begin experimenting.

In the San Francisco Bay area, for example, last October's major earthquake shut down several major highways and created a commuting nightmare. Even now, some routes are closed. Under such circumstances, many companies had little choice but to begin experimenting with telecommuting as their staff could not get to work. Since then, many companies have extended their plans and more staff have begun working from home.

With the current emphasis on protecting the environment, telecommuting benefits not only the worker and employer, but also the environment.

Working from home means travel to the office is cut down to one or two days a week and sometimes less, saving petrol, improving air quality, cutting down traffic and making the journey easier for those who have to commute.

Certain areas of the US are actively encouraging firms to allow their staff to telecommute. In Arizona, AT&T and the state government recently announced a joint telecommuting trial to lower commute traffic and improve air quality. In the six month trial, about 150 staff from AT&T and state government employees will work from home for a few days a month. The programme will be expanded depending on the success of the trial. By setting this example, the state of Arizona hopes to involve private businesses in its telecommuting trial and let it discover the benefits.

California leads the US in terms of the number of workers already telecommuting and in programmes designed to encourage more companies to telecommute. In some areas, especially densely populated southern California, poor air quality and government enforcement of anti-pollution laws require employers with more than 100 staff to file plans showing how they can reduce car use by their staff.

Obviously, not every job can be converted to telecommuting. Brad Schepp, the author of a recently published book called "The Telecommuter's Handbook", has compiled a list of suitable jobs. His highest rankings show which jobs work well with telecommuting. Jobs at the top of his list are computer programmer, translator, software engineer, sales representative and computer systems analyst. There are 70 other jobs which, to varying degrees, can be adapted, he argues.

Schepp says the technology is in place, the workforce is ready and traffic is worse than ever. Managers have no choice but to consider alternative work options. In researching his book, however, Schepp uncovered one of the biggest obstacles to telecommuting - the myth that employers believe unsupervised workers that cannot be seen to be working will not work.

Employers generally are not used to allowing staff to work on their own initiative without a lot of direct supervision. Sadly these kinds of attitudes hinder telecommuting, despite the technology having been available for several years and improving every year.

The potential market for telecommuting workers represents more than $8 billion in computer, fax, office equipment sales and support services and products. A market this size has already spawned several magazines and dozens of newsletters and computers and software designed to make it easier to telecommute. IBM, for example, is testing a PC that will have an in-built 2,400 baud modem, high resolution colour graphics, communications software and access to the Prodigy videotext data base for news and research - all for as little as $1,000. It will be aimed at home use for telecommuting or for helping children in their education.

A key part of telecommuting's success will be educating the employer how to set up jobs and manage staff working from home. Telecommuters must also adapt to a different working environment which may not suit some. They may not have space at home for a small office or may be unable to motivate themselves to work a full day.

There are also problems that may put some people off. Getting promotion can be more difficult although most research shows that people working from home work longer and harder. This extra work may not be compensated for and some staff may dislike not having a clear distinction between work and home.

So far, telecommuting is a product of choice in the US. People who work from home have pestered their bosses to allow them to do so and are by definition motivated to make it work. It will be a different situation in the future when some companies, or even local governments, require that staff work from home.

Working from home may mean accepting extra overhead expenses and cramped working conditions with little compensation. US unions are concerned that telecommuting could lead to "electronic sweatshops" and make it very difficult to organize staff in disputes with employers.

For telecommuting to be successful, ground rules should be developed that protect telecommuters from the disadvantages of working from home while at the same time showing the positive benefits of such arrangements to employers. (Reprinted from Computing, 10 May 1990)

Telecommunications in a common European house
Second Conference EUROPE SPEAKS TO EUROPE
Moscow, USSR, 17-21 December 1990

This Conference is being organized by the International Centre for Scientific and Technical Information (ICSTI), an intergovernmental information service centre in Moscow, and KomTech Ltd., the Frankfurt-based Centre for Communication and Technology Research. Conference chairmen are Professor Alexander Butrimenko and Professor Jörg Becker. With speakers from the world of business, politics and research, the Conference will deal with the manifold possibilities for co-operation in telecommunications between Eastern and Western Europe.

Main speakers:

Henrikas Yusnkiavitshus, Gosteleradio, Moscow
Klaus Grewlich, Foreign Office, Bonn
Nicholas Garnham, Polytechic of Central London
Karol Jakubowicz, Polish Radio and TV, Warsaw
Rick Leaman, International Public Relations Association, Vienna
Cees J. Hamelink, University of Amsterdam
Dmitry S. Chereshkin, USSR Academy of Sciences, Moscow
Jacques Semelin, Centre National Recherche Scientifique, Paris
Robin Mansell, University of Sussex
Vladimir G. Lazarev, USSR Academy of Sciences, Moscow.

Numerous sessions will address - among others - the topics: telecommunications policies, data bank co-operation, GATT and the liberalization of electronic services, TV policies, joint venture in the information industries, satellite co-operation, transborder data protection, commercial communications and multinational media companies.

Participants from CMEA countries: registration 300 roubles, hotel accommodation in Mir Hotel 240 roubles; from non-CMEA countries: registration $US 300, hotel accommodation in Mir Hotel $US 240. Twenty per cent reduction on

registrations before 1 September 1990 to respective contact addresses: ICSTI, 21b Kuusinen Str., Moscow 125252, USSR. Tel.: +1987021; Fax: +9470089; Telex: +411925 monti su, or KomTech Arnsburger St. 70, 6000 Frankfurt/Main 60, FRG, Tel.: +4020144; Fax: +4020137; Telex: +416532 psyda d.

The Third Baghdad International Conference on Information Technology, 11-13 March 1991

The National Computer Centre of Iraq will host the Third Baghdad International Conference on Information Technology. The main theme is: Information Technology for Development

Main streams

- Management information systems and decision support;
- Computer networks and data transmission;
- Computer-aided learning;
- Information technology and industrial applications;
- Security and protection of information;
- Technology of information storage and retrieval;
- Applications of micro-computers in local authorities;
- Applications of information technology in the Arab countries.

Secondary streams

- Software engineering;
- Artificial intelligence and knowledge-based systems;
- Arabization of computers and software;
- Arabic desk-top publishing;
- Image processing and computer graphics;
- Modelling and simulation.

Abstracts: Annotated outline, of not less than 500 words, should be received by Conference Secretariat, not later than 1 October 1990. Full texts of accepted papers to be received by 1 December 1990 typed in a camera-ready form.

Registration fees: $US 75, covering conference proceedings.

Free courtesy registration for authors of accepted papers.

Working languages: Arabic and English.

Co-sponsors: The Economic and Social Commission for Western Asia (ESCWA), UNESCO - Regional Office for Science and Technology for the Arab States (UNESCO/ROSTAS), United Nations Development Programme (UNDP).

Conference Secretariat: Organizing Committee, National Computer Centre, P.O. Box 3261 Saadoon, Baghdad, Iraq. Telex: 212163 NCC IK, FAX: 7185290, Tel.: 7186166-7186898.

II. NEW DEVELOPMENTS

Optics matches silicon speed

Researchers at Heriot Watt University (Edinburgh) hope to demonstrate an optical data processor which will match the speed performance of silicon microprocessors by the year end.

Although optical electronics holds out the hope of higher processing speeds than pure electronics, there are a number of practical problems which will be hard to overcome. The Heriot Watt system gets around the problems by providing a number of parallel channels rather than raw processing speed. (Source: Electronics Weekly, 28 March 1990)

Digital optical processor

AT&T Bell Laboratories has come up with the first ever digital optical processor, which uses light pulses to transmit data. Five years in development, the device contains prisms and lenses to transmit light impulses. The prototype, which was demonstrated in late January 1990, is about 2-fit^2 and has a 1 million cycles/s speed. The company believes that future devices will operate at 100 million cycles/s, and will be the size of microchips. Compared to electricity, optical processing is much faster and has an information capacity a thousand times higher. Telephone-switching hardware will probably be the first area where optical computers are used. (Source: Technology Update, 2 April 1990)

Microlaser technology

Bell Laboratories' scientists have brought light-based technology closer to being used in information processing by "shrinking" the space taken up by its new "photonic" technology. A device, currently being tested that combines the smallest lasers in the world with tiny lenses and mirrors, could be used to connect regular computer chips. More information could be carried faster because it uses light, rather than the conventional electronic connections. Critics claim that although communicating with light over long distances is sensible, it is not practical for short distances. However, Bell's new device should disprove those criticisms. The "microlaser" technology which it uses is easier to manufacture and more stable than other methods. According to sources, AT&T, parent of Bell, may be close to developing an all-optical computer that could fit on a piece of quartz that is index-card sized. (Extracted from Wall Street Journal, 11 April 1990)

Microscopic vacuum tubes

Bell Communications Research (Red Bank, NJ) is developing microscopic vacuum tubes, 100 times narrower than a human hair. The devices will be found on paper-thin silicon chips. Vacuum tubes were originally used in computers, but the invention of the transistor in 1947 made the cumbersome vacuum tubes obsolete. Transistors, however, made from solid materials do not allow electrons to flow smoothly through them as do vacuum tubes. With miniaturization technology, vacuum tubes can now be reduced in size, meaning that the tubes are faster and require less energy to operate. The electric field necessary to allow a vacuum tube to operate is 10 million volts/cm, and now that vacuum tubes can be reduced to 0.5 micron, producing such an electric field is feasible. The first applictions of the vacuum microelectronic technology may be in television picture tubes and computer screens. Such

an application would allow screens to produce higher resolutions and be very thin. (Extracted from Discover, March 1990)

Fuel cell developed to provide power to microchips

Bell Communications Research has developed a tiny fuel cell that can provide power to microchips. The electrochemical device produces power when an electrode is exposed to a mix of air and hydrogen. The cell converts chemical energy from the reaction of hydrogen and oxygen into electricity. The porous aluminium oxide membrane is 2,000-5,000 A thick, sandwiched between platinum films that act as electrodes. The unit can develop 1 V between electrodes, and generates a few milliwatts/sq cm. It is still not clear why the device works. The devices could be used on integrated circuits. Larger versions using methanol and air could be used as batteries. (Extracted from Science News, 10 February 1990)

Two-level metal gate array is here

High density gate array technology could be about to take its first major step forward since the invention of sea of gates devices, following development work at National Semiconductor.

Flexcell is National's first major foray into advanced gate arrays, and is based on a double metal layer process, rather than the three used in sea of gates devices. It uses polysilicon conducting paths as well as metal interconnects to personalize the logic patterns in devices with up to a quarter of a million gates.

National experts claim the products can achieve 50 to 80 per cent utilization, and are also promising space efficiencies approaching those of standard cell devices in implementing RAM circuits.

Programming with polysilicon interconnect increases circuit density because it is used within gates and can be routed around transistors much more closely than can metal layers. It also allows routing channels to be narrowed significantly.

The company is claiming that the simplicity of the polysilicon processing steps means that turnaround time will be better than triple metal architectures.

A standard cell library in the same M2CMOS III process, including 100 core macrocells, glue logic and I/O cells, will be available for use with module-generated high density ROM and RAM from the Flexcell library. (Source: Electronics Weekly, 28 March 1990)

Pseudo static RAM chips for laptops

Hitachi America (Brisbane, CA) has unveiled new pseudo static RAM (P-SRAM) chips to make laptop and hand-held computer batteries last longer. This would be accomplised at a price less than static RAM chips. Earlier P-SRAMs were available in 256-Kbit and 1-Mbit capacities. Just four of the new 4-Mbit chips are required to achieve 2 Mbytes of memory against the sixteen 1-Mbit chips needed before. Hitachi engineers say that an inactive laptop computer that is consuming battery power to keep information housed in main memory will drain a battery anout 750 hours later it its memory consists of the company's 1-Mbit SRAM chips. If 4-Mbit DRAM chips are used, the battery will run out after some 230 hours. The new P-SRAM chip has an endurance of about 350 hours. (Extracted from Information World, 26 March 1990)

Optical receiver boosts sensitivity

Using an old concept from radio design, the superhet principle, researchers at the Federal Republic of Germany's Siemens AG have pushed the sensitivity of optical receiving systems to a record level: 5.9 nW for a system run at a 565-Mbit/s data rate, a 10^{-9}-bit error rate and a 3-mW local oscillator power.

The experimental optical receiver raises the sensitivity by a factor of 8.5 beyond the level obtainable with systems using conventional intensity modulation at the transmitter. Since sensitivity is improved about 10 bB, it should be possible to place repeaters in fibre-optic transmission lines 40 km farther apart.

As in a superhet system, the transmitted signal is mixed with the local oscillator frequency to generate a fixed i-f. This is amplified, filtered, and demodulated to yield the desired signal. (Source: Electronics, April 1990)

Silicon shift register runs at 3.4 GHz

With conventional silicon bipolar technology using 2.0-μm emitter widths, researchers at Ruhr University, Bochum, Federal Republic of Germany, have built a shift register that can handle 3.4 GHz frequencies. Today's limit for other silicon-type shift registers is 2.3 GHz; for GaAs versions it is 3.2 GHz. The speed comes from the use of three logic levels in current switching, an all-differential circuit design, and bipolar transistors whose size is carefully optimized. (Source: Electronics, April 1990)

Organic superconductors begin to show promise

Scientists may not after all have to rely on ceramic oxides for high-temperature superconductors in future. Until now, researchers believed that these were the only suitable materials, but Japanese chemists at the University of Tokyo have now made a compound that remains superconducting up to a critical temperature (T_c) of 11.4 kelvin at normal pressures. The compound is organic.

The critical temperature may not seem very impressive when compared to ceramic compounds, but it is the highest yet for an organic superconductor. The critical temperatures that researchers had previously obtained were between 2 and 8 K.

The new compound, whose chemical formula is represented as $\varkappa$-$(BEDT\text{-}TTF)_2Cu(NCS)_2$, belongs to a class of materials known as organic radical-cation salts. The molecules in the compound comprise an organic, positively charged radical-cation. This has an unpaired electron, combined with a negative anion. The cation consists of flat rings of alternating single and double bonds between carbon atoms. These can be interspersed with sulphur, selenium or oxygen atoms.

Many scientists are interested in investigating such compounds because of the way the molecules are arranged. They are stacked up

like tiles, which means that electrons can move around and interact with each other. Such freedom of movement can give rise to useful properties, such as ferromagnetism or superconductivity.

Japanese research student, Hatsumi Urayama, working in Kyoto in the laboratory of another scientist, Gunzi Saito, made a compound containing the copper thiocyanide anion. Urayama and Saito were eventually rewarded with a material that had a T_c of 11.4 K. Further investigations have shown that the compound has some unusual physical and electrical properties. It seems likely that the new organic compound, like the superconducting ceramic compounds, does not behave like a conventional superconductor.

Chemists are now optimistic that they can push the T_c for organic superconductors up a lot further. To this end, researchers all over the world are designing new variations of organic radical-cation salts. (This first appeared in "New Scientist", London, 10 February 1990, the weekly review of science and technology)

Fastest silicon-based transistor

IBM Corp. has announced deatils of a silicon-based transistor that operates at a maximum frequency of 75 GHz. Billed as the world's fastest device of its kind, its speed easily eclipses the previous frequency (fT) record of 40 GHz, set late last year by both IBM and NEC.

IBM is using a silicon-germanium alloy for the base region of its new heterojunction bipolar transistor (HBT), which accelerates the movements of electrons flowing through it. The transistor has been made in versions that range from 0.9 micron in size.

Though the company cautions that it is still in the early stages of basic research on the HBT device, it believes the transistor represents a significant advance in device technology. Furthermore, it could have a profound effect on supercomputing.

Silicon ICs appeared to be approaching fundamental speed limits. Anticipating this, some supercomputer makers - Cray Research among them - have been moving towards ICs made of compound semiconductors, such as gallium arsenide. These are generally faster than silicon but are often more difficult to work with. The fastest GaAs transistor operates at approximately 100 GHz. Should IBM be able to produce functional ICs with the new SiGe device, it might forestall having to make such a move itself.

Growing SiGe crystals has been complicated, because germanium atoms are significantly larger than silicon atoms. This makes it difficult to achieve a uniform SiGe crystal lattice. To get around that, scientists at IBM's Thomas J. Watson Research Center here developed a new low-temperature epitaxial growth process - called ultrahigh vacuum chemical vapour deposition (UHV/CVD) - that allowed them to grow uniform SiGe layers, one on top of another, to achieve a useful thickness for the base region. (Extracted from Electronic Engineering Times, 19 March 1990)

New data storage device

IBM has developed a data storage device that allows magnetic data storage density of more than 15 times that of current hard-disk devices. A magnetoresistive (MR) read element produced from several layers of thin film is the key to the new device. An inductive element writes the data in the new device; conventional devices use inductive elements to read and write. The MR head reads magnetic bits that are too small for an all-inductive head to read. Another advantage of the MR device is that it provides similar performance over all disk sizes and rotation speeds, unlike conventional heads, which provide better performance on larger-diameter disks. The device has been shown to store data at a linear density of 158,000 bits/in, providing data bit areas the size of present optical storage bit cells. All of the hardware components to the new device were made using conventional manufacturing processes. (Extracted from Machine Design, 25 January 1990)

Neural network computer chip

California Institute of Technology researchers have created a neural-network computer chip with 256 processors and 65,536 interconnections. The device is said to resemble the way the human brain functions. In typical processors, electrons travel along miniaturized metal wires engraved in silicon. With the CalTech device, packets of electrons are injected directly into the silicon. Charge-coupled devices (used in camcorders as image sensors) guide the particles, sending packets from one processor to another, allowing the circuit to be continually updated. The chip will at first be used to develop neural network software, and later possibly for speech recognition devices. (Extracted from Business Week, 30 April 1990)

Reusable switch developed

A fast, reusable switch with an active element of a high-temperature superconducting film has been developed at the University of Rochester (Rochester, NY). The switch is capable of handling 100 mA of current, and its operation is triggered by a las r. The superconducting film is wired in parallel with the load, while 100-200 p. pulses from an Nd:YAG laser illuminate the film, pushing the temperature of the film beyond the critical point. The resistance of the superconductor can be changed within 1 ns. The recovery time for the switch is entirely a thermal process and is 100 ns-1 microsec. (Source: Technology Update, 30 April 1990)

Motor uses superconducting wire

Reliance Electric has developed an electric motor that uses a superconducting wire and coil produced by Argonne National Laboratory. This type of motor could be less costly and more efficient than ordinary motors, according to Jim Edmonds of the Electric Power Research Institute. The new motor has efficiency losses less than 50 per cent those of a conventional motor. The yttrium-barium-copper oxide wire becomes superconducting at 9K. Argonne National Laboratory uses a mixture of ceramic powder and acrylic binder that is extruded to form the wire. The wire is then coated with an insulating form of the ceramic and wound into a coil, which is fired to about 900°C and annealed in an oxygen atmosphere.

The wire has a current density of 100 amperes/cm^2, versus 300 amperes/cm^2 for conventional motors. Argonne is trying to improve the current density further. Although the 10-W motor is too small for practical applications, the size of the coil has no inherent restrictions. (Extracted from Chemical Engineering, April 1990)

Shock wave increases current capacity of superconductors

High-temperature superconductors can gain increased current capacity if blasted with a shock wave, according to researchers at Lawrence Livermore National Laboratory. The shock apparently creates tiny defects in the crystal structure that improve anchoring of magentic flux lines. If the magnetic flux lines are not anchored, even a weak current pushes them out of the way and destroys the superconductivity. (Extracted from Science News, 31 March 1990)

Fields force fluids through tiny silicon pump

A tiny pump, which is made entirely from silicon and with a volume of only three millionths of a litre, is the latest achievement of the field of micromachining that uses etching technology taken from the semiconductor industry. The device has no moving parts, so should be resistant to wear and highly reliable.

A team at the Fraunhofer Institute for Solid State Technology in Munich, produced the pump that can shift 20 millilitres of fluid a minute. It could be used in alcohol-based cooling systems for electronic components.

The device exploits the so-called electrohydrodynamic principle, by which a voltage applied across a pair of electrodes submerged in a dielectric, or non-conducting, fluid causes tiny drops of the fluid to rise up one of the electrodes.

The pump's electrodes consist of grids of silicon crystals 9 millimetres square laid down as an array of orifices each 70 micrometres across. The pump is submerged in a polar fluid (one which contains ions or dipoles) and a voltage of around 100 volts applied across the two grids. The liquid is forced between the grids by the interaction of the electric field produced by the applied voltage with the field of the ions in the fluid. (This first appeared in "New Scientist", London, 2 June 1990, the weekly review of science and technology)

Neural network recognizes smells

An electronic nose built at Warwick University uses a neural network - that mimics the way nerve cells process information - to recognize smells. The prototype detects five alcohols (methanol, ethanol, butanol and two forms of propanol) in minute concentrations.

The human nose is poorly understood, but probably has between 6 and 20 varieties of smell receptors - sometimes given labels such as "fruity" and "pungent" - with about a million copies of each. Our brains recognize smells by the pattern of responses from these receptors.

The Warwick electronic "nose" uses 12 sensors, in which the electrical resistance of a film of tin oxide varies with the concentration of gases surrounding it.

The output from each sensor enters one neurone in the first layer of a neural network, which is arranged in three layers. Each of these neurones is linked to all neurones in the middle, hidden, layer. And each of these to all the neurones in the third, output, layer. Neurones - whether electronic or biological - multiply the signal on each of their inputs by a weighting factor and pass the sum of the results to the next layer. Electronic neural networks are being developed for many pattern-recognition tasks, particularly image, speech and text processing.

The researchers trained the nose to recognize smells by presenting it with the five alcohols, and adjusting the weighting on each link in the network until it produced a consistent pattern of outputs for each substance. This training takes a week to collect the sensor test data, then a few hours to run through 20,000 cycles of adjusting weights and checking outputs.

Other attempts to build electronic noses have relied on statistical analysis of the sensor signals: a group in Japan is doing this to test sushi freshness. Julian Gardner of Warwick says the neural network is "more readily adaptable and more akin to what we know of the biological system". It is also tolerant of faults: once trained, it will produce roughly the same outputs if several neurones or sensors malfunction. The Warwick device is more sensitive than others using statistical methods. It takes a few seconds to recognize a smell.

The group will now test the nose's sensitivity against a smelly background. They also plan to develop it for food freshness monitoring, perfume quality control, and eventually sniffing out waste products in the environment. (This first appeared in "New Scientist", London, 2 June 1990, the weekly review of science and technology)

IBM sets record for magnetic storage density

Using precision thin film recording heads, IBM has achieved a record 1 gigabit for magnetic data storage density on a single square inch of disk surface. Composed of several layers of thin films, the new magnetic recording head was made using photolithographic methods common to semiconductor manufacturing.

Scientists at IBM's Almaden Research Center, San Jose, Calif., say the gigabit density - equivalent to 100,000 double spaced, typed pages - is 15-30 times greater than current hard disk storage devices.

The aluminium disk, onto which the data was written, is coated with a thin film of a magnetic cobalt alloy. The alloy's composition and fabrication is designed for very high bit density and very low magnetic noise.

During a demonstration, information was recorded and read at a data rate of 3.5 million bytes/s, with an error rate of one in a billion. IBM said this would decline to one in a trillion if standard error correction codes are used.

The technology is now experimental and was conducted on precision laboratory test equipment. Several more years of development will be needed to commercialize gigabit technology, researchers note. (Reprinted with permission from Semiconductor International Magazine, March 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, IL, USA)

four-million-device SuperChip integrates and "repairs" 61 macrocells

A TRW-Motorola team reports that they have fabricated, tested and proved the functionality of the first multi-million-device superchip. Dubbed the CPUAX (central processing unit, arithmetic extended) SuperChip, this chip contains approximately four million 0.5 μm devices and is able to perform 200 million floating point operations per second.

The CPUAX was fabricated by Motorola at its Advanced Products Research and Development Laboratory (APRDL) in Austin, Tex., using a proprietary 0.5 μm CMOS process. It represents the highest level of integration yet achieved at 0.5 μm dimensions and is intended to function as the central brain of an advanced digital signal processing system.

"The half-micron process is extremely challenging since it requires lithography at the limits of current optical technology on a very large die," notes Dr. Charles S. Meyer, Motorola's VHSIC program manager. "It also employs advanced processing modules, such as triple-level metal and salicide - self-aligned silicide."

When used in conjunction with the TRW-Motorola universal processor (UP) - a tiny "satellite" chip of 35,000 0.8 μm devices which tests, monitors and configures the on-chip assets of the CPUAX - and TRW's SuperChip architecture, the CPUAX is able to repair itself.

The CPUAX is comprised of approximately 142 macrocells. Each macrocell is a building block, representing a standard mathematical, memory or housekeeping computer function. In essence, each macrocell is equivalent to a standalone VLSI chip. The macrocells involved are an address generator (AG), a microcontrol unit (MCU), a multiplier/accumulator (MAC), a universal processor (UP), a read memory interface (MEMTIR), a write memory interface (MEMTIW), a column disable block (CDB), an arithmetic logic unit (ALU), a storage element (SIFL) and a one-part random access memory (1PRAM).

Of the 142 macrocells in the CPUAX, 61 must be functional for the CPUAX to be fully operational. In other words, the CPUAX contains approximately 4 million devices, of which 1.7 million must be functional.

Functionality was proven through a testing routine: the CPUAX assessed the health of its individual macrocells, separated functional from non-functional, configured the functional macrocells into a working CPUAX, and set aside any extra macrocells that were functional into a bank of spares for later use, if required.

The chip represents the culmination of a ten year effort between Motorola and TRW on the Department of Defense's advanced VHSIC (very high speed integrated circuits) programme. This newest generation chip is 150 times as complex as those produced in the first phase of the project.

The TRW-Motorola team has also designed, fabricated and proved functional a 0.5 μm bus interface unit (BIU) that links the internal chip-to-chip data buses of TRW's SuperChip architecture and the backplane standard PI bus. (Reprinted with permission from Semiconductor International Magazine, April 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, IL, USA)

Hughes makes fastest InP transistor

Scientists at Hughes Research Laboratories are claiming that a recently fabricated 150 GHz indium-phosphide (InP) transistor is the fastest transistor ever built. They disclosed their work in a paper presented at the 1989 International Electron Devices Meeting held in Washington, D.C.

The device is a high electron mobility transistor (HEMT). In HEMTs, layers of doped semiconductors are separated from layers where charge-carrying electrons move. Thus, electrons can move faster and with less scatting than with conventional field-effect transistors.

The new Hughes HEMT consists of aluminium-indium-arsenide (AlInAs) and gallium-indium-arsenide (GaInAs) layers on an indium-phosphide substrate. The Hughes scientists fabricate these layers with molecular beam epitaxy.

They developed the transistor using a novel self-aligned gate technique and electron beam lithography to define structures as small as 0.15 μm in length.

The gate alignment technique is the key to the transistor's performance: it allows the source and drain electrodes to be self-aligned to a so-called T-gate. The T-gate acts as a mask during metal deposition of the source and drain terminals, resulting in minimal spacings between the terminals.

In tests of the indium-phosphide transistor, the Hughes scientists estimated the maximum transit time across the device at 0.67 psec - equivalent to 250 GHz operation.

This speed is more than 20 per cent faster than the best previously reported speed, set by Hughes scientists a year ago. Of particular significance, they achieved the record at room temperature, requiring no special cooling as is generally the case with other types of ultra-high-speed devices.

The speed attained by the device makes it a valuable tool for use in ultrahigh-speed digital circuits and ultralow-noise amplifiers. Potential applications are in satellite and other high-speed data communications links. The speed provides greater communications capacity and better security. Indirectly, using such devices in communications applications can also reduce the size and weight of a receiver's antenna.

So far, the team of Hughes scientists have successfully produced indium phosphide transistors with 0.15 μm T-gates and a source-drain spacing as small as 0.3 μm. Further work should reduce these dimensions even more, resulting in switching speeds of more than 300 GHz. (Reprinted with permission from Semiconductor International Magazine, February 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, IL, USA)

Tektronix colours flat-panel technology

A clever way of making large flat-panel colour displays has been proposed by US instrumentation giant Tektronix.

Monochrome prototypes measuring 1.5 cm by 20 cm will be shown off at a trade show in the US this week. Tektronix says that it is determined to develop colour versions of what it calls its "TekVision" technology.

Japanese companies led by Sharp and Toshiba have already displayed imperfect prototypes of larger colour flat panel displays measuring up to 35 cm on a side and these are expected on the market shortly.

However, Tektronix believes that the Japanese liquid crystal flat-screen technology will not produce very large displays, while its technology may be capable of delivering metre-plus high definition television screens.

Tektronix's displays are based on plasma-activated LCD panels. The large glass panels will have narrow grooves etched into it and thin conductors will be laid into those grooves. It will require more than 2,000 data drivers as well as driver transistors capable of providing signals of a few hundred volts. (Source: Electronics Weekly, 16 May 1990)

Semiconductor laser gets the blue light

Researchers at IBM have generated blue light from a semiconductor laser with a record 10 per cent efficiency. Ordinary blue gas lasers generally convert less than 0.1 per cent of electrical input power into blue light. In the past, this low efficiency, together with the high cost and large size of blue lasers, has limited their usefulness.

Semiconductor lasers already in use are small and efficient. They are easy to control, because their output varies directly with the electrical current passing through them. Those advantages have led to their inclusion in laser printers as well as in fibre-optic communications.

The drawback, until now, was that most semiconductor lasers emit red or infrared light, which has less energy than blue light, and is less effective in recording data on optical discs or promoting chemical reactions. The shorter blue wavelengths can also be focused to smaller spots, so that data can be recorded more densely.

IBM's new approach is to shorten the wavelength of a conventional semiconductor laser by passing its infrared light through a special crystal, potassium niobate, which doubles the frequency of light passing through it, in a process known as harmonic generation. In this way, the infrared light, with a wavelength of 856 nanometres, is converted to blue light with a wavelength of 428 nanometres. (This first appeared in "New Scientist", London, 16 June 1990, the weekly review of science and technology.)

No gate oxide damage from X-rays

Engineers at Philips Laboratories in Hamburg, Federal Republic of Germany, have concluded that, apart from a residual positive oxide charge, exposure using synchrotron-based X-ray lithography does not seriously degrade MOS gate oxides.

In their tests these engineers evaluated 6×10^{-3} cm^2 capacitors fabricated on boron doped 20 ohm-cm <100> wafers. They used a 600 nm thick field oxide and a 12.5 nm gate oxide, the latter grown in oxygen at 900°C. They deposited 0.3 m thick polysilicon doping it with a phosphorus ion implant. The delineated gate electrodes were etched in a chlorine chemistry plasma. After a 900° C anneal, they deposited aluminum on the back of the wafers. They completed the fabrication process with a 450°C forming gas anneal.

Testing consisted of C-V measurements of the flatband voltage on each wafer before and after exposure to synchrotron radiation and a 450°C forming gas anneal. The Philips' engineers saw that exposure produced a negative shift in the flatband voltage, which suggests the formation of positive oxide charge. The forming gas anneal returned the flatband voltage to within 50 mV of its original value, suggesting that the residual positive oxide charge remained in the oxide.

They also measured gate oxide defect density as a function of X-ray exposure dose and found no differences in defect densities between wafers having undergone a forming gas anneal and those fresh from exposure. (Reprinted with permission from Semiconductor International Magazine, February 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Il., USA)

Organic crystal/polymer composites

New organic crystal/polymer composites offer potential for future optoelectronic devices, according to P.D. Calvert of the University of Arizona and N. Azoz, M. Kadim, A.J. McCaffery and K.R. Seddon at the University of Sussex (Brighton). Zone-melting techniques were used to grow aligned crystals of 3-nitroaniline (an optically nonlinear compound) in a transparent polymer matrix of poly(methyl methacrylate) or poly(vinylcarbazole). The needle-shaped composite, when irradiated with an infrared laser, emits visible light whose frequency is doubled (second harmonic generation). (Extracted from Chemical and Engineering News, 5 March 1990)

Superconducting substances process

A low-temperature process for synthesizing oxide superconducting substances has been developed. The Superconductivity Research Laboratory has made yttrium-based superconductors at temperatures below 650°C via a chemical liquid phase process called the sol-gel process. The process takes yttrium and barium metal alkoxides and dissolves them in xylene and ethanol and then mixes them in a nitrogen gas environment. The process eventually supplies uniform and extra-fine superconducting particles which can possibly result in the commercialization of thick superconducting films and tapes. (Extracted from New Technology Japan, February 1990)

Wafer-thin cells make more out of sunlight

A new record has been set for the efficiency of solar cells that are suitable for use in space. American researchers, working with conditions that simulate space, have made wafer-thin photovoltaic cells that can convert almost a quarter of the power of sunlight into electricity. Although other types of cell can concentrate sunlight, increasing their efficiency, this is a record for cells that use light at its normal intensity.

Photovoltaic cells turn solar energy directly into electricity. The new cells, developed jointly by Ronald Gale of the Kopin Corporation in Taunton, Massachusetts, and Boeing Aerospace and Electronics, are constructed of two very thin layers of different semiconductors.

Compared with earlier cells, they are exceptionally light, which makes them ideal for space applications: they can generate 600 watts per kilogram of their mass. In simulated conditions of space, the cells converted 23.1 per cent of sunlight to electricity.

Boeing's old cells were made with one layer of gallium arsenide and one of gallium antimonide. In the new cells, the second layer is copper indium diselenide. This is less efficient, but better able to withstand the radiation encountered in space.

Some spacecraft already use thin-film photovoltaic cells made of silicon, but Gale says that these are less efficient and become degraded more rapidly than gallium arsenide. Kopin and Boeing hope that the first of their cells will be ready for use on satellites by 1992. However, it is unlikely that any satellite powered by these cells will reach orbit before the mid-1990s. (This first appeared in "New Scientist", London, 19 May 1990, the weekly review of science and technology.)

Josephson 8-bit digital signal processor

Fujitsu Ltd. has developed and experimentally fabricated an 8-bit digital signal processor (DSP) by using Josephson chips. All Josephson computer constituent elements, such as the logical circuit and memory circuit, are mounted on one chip to enable 8-bit signal processing (4-bit up to now), by which superhigh-speed processing is possible, which is over 50 times faster than with a conventional silicon chip.

This DSP is used for high-speed Fourier transform, digital filtration, speech recognition, and video signal processing and is distinct in that it is capable of high-speed arithmetic operations involving multiplication and addition in combination.

The new DSP consists of an 8-bit multiplier, 13-bit ALU (arithmetic logic unit), 256-bit RAM, 1.7 Kbit ROM, and a sequencer. Experiments conducted by placing the DSP chip in liquid helium proved that the chip performs its designed functions at 4.2 K (-269°C), corroborating its possibility of clock operation at 1 GHz. This means that the chip has a performance of 1 GOPS (giga operations per second), or a superhigh-speed processing capacity over 50 times that of a conventional CMOS silicon chip. The power consumption is only 12 mW, which is less than one-tenth that of the company's 16-bit CMOS DSP despite its tremendous speed, which is 100 times faster.

A Josephson junction switching device is a special device made of superconductive substances and is characterized by superhigh-speed arithmetic processing and low power consumption. The company previously developed 4-bit sliced microprocessors, and development of the 8-bit DSP has brought the development of a Josephson computer a big step forward. Further details available from:

Fujitsu Limited
Public Relations Dept.
1-6-1, Marunouchi, Chiyoda-ku, Tokyo
Japan

(Source: JETRO, May 1990)

Ultra fast experimental processor

Researchers at Fujitsu Ltd. have developed an experimental processor they claim has the potential to crank out 1 trillion floating-point operations per second. The gallium arsenide device, which operates at -200°C, integrates five resonant-tunneling-hot-electron transistors ($RHET_s$) with conventional transistors. Research is continuing into improving the device's stability and making it capable of functioning at room temperature, according to Fujitsu's Makoto Saito. Saito said the chip is at least 10 years from commercialization and was developed as part of a research project sponsored by MITI's New Energy Development organizations. (Extracted from Electronic Engineering Times, 8 January 1990)

New prototype neurocomputer

Fujitsu's (Japan) new prototype neurocomputer operates 400 times faster than conventional equivalents. It features 250 digital-signal processors linked to each other. Its memory circuits are set up in a spiral structure, with each one connected in parallel to a processing unit. The so-called "ringed register method" design results in a parallel architecture that is extremely efficient. (Extracted from Asian Wall Street Journal, 22 January 1990)

Fujitsu aims its non-stop machine at scientists

Fujitsu has launched its first fault-tolerant computer, a duplex version of the A-series minicomputer jointly developed with Matsushita and Uchida.

The A-series machines run SX/UTS Unix and SX/UR, a real-time variant, as well as the OSIV/S from Fujitsu's mid-range 4300-class M-series machines.

The machines appear to be aimed at scientific and technical users, rather than the commercial market and the new fault-tolerant machine, the A-80HR, is similar to DEC's new fault-tolerant offering.

The Fujitsu model takes up one third the space of two A Series machines and costs two thirds the price - from $20,000 up to $850,000.

Fujitsu has developed a revised version of its Coms Corporate Network Management System. The Coms-C version for the A-series can manage disparate networks of heterogeneous machines, while a Coms-I version is available for the M-series mainframes, handling networks of office computers. (Source: Computing, 10 May 1990)

New LAN controller chip

Standard Microsystems Corp. has put the squeeze on its latest LAN controller chip to come up with an IC that cuts by two thirds the number of devices needed to implement a 16-bit Arcnet node. The COM90C66 need be teamed with just three other chips to realize a complete node, with 8-/16-bit PC bus interface, down from the 13 ICs needed previously.

"The COM90C66 is the first controller chip to bring zero-wait-state operation to the 16-bit Arcnet application", said Ralph Malboeuf, SMC's marketing manager for network products. He added that the chip is expected to slash the cost of high-performance interface boards by over 40 per cent, while increasing reliability by lowering parts count.

The controller handles zero-wait-state transfers at a bus bandwidth to 12.5 MHz. In addition, it provides enhanced diagnostics and a command-chaining feature that improves system throughput in high-traffic applications.

The IC is fabbed with 1.25-micron CMOS and integrates a zero-wait-state PC AT interface,

2 K x 8 high-speed SRAM and Arcnet transceiver on a chip 200 mm on a side, about 20 per cent larger than the company's earlier 90C65 Arcnet controller.

While the 90C66 simplifies the hardware implementation for a 16-bit Arcnet node, it does require that 16-bit software drivers be written. SMC plans to supply such drivers when the device is sampled at the end of the month. Production is slated for the end of April 1990.

The industry's first 16-bit Arcnet chip with an interface to the PC AT was introduced late last year by NCR Microelectronic's Products Division (Dayton, Ohio). NCR's 90C198 does not include an on-chip RAM buffer and needs about 12 support ICs to implement a 16-bit Arcnet node. Also, it works only at 16 bits. But the 90C198 can control 8 Kbytes of external SRAM to provide the sort of expanded addressing that may be needed in high-speed Arcnet Plus applications. The SMC part does not address external RAM.

The COM90C66 comes in an 84-pin surface-mountable PLCC and is priced at $24.25 in quantities of 2,000. NCR's 90C198 comes in a 68-pin PLCC with a price tag of $17 in quantities of 5,000. (Extracted from Electronic Engineering Times, 8 January 1990)

Miniature bacterial solar cells as temporary storage medium

A researcher at Syracuse University claims that a collection of chilled bacteriorhodopsin molecules can store zeros and ones just as easily as silicon chips. Robert Birge proposes using thin films of the bacteria for RAMs with eventual access times of 2 ns - a factor of 10 improvement over today's best RAM access times.

Bacteriorhodospin is a miniature solar cell that converts sunlight to energy by changing shape. Striking the molecule alternatively with green and red light flips the bacteria's chemical bonds between two distinct states.

Birge has made thin films of the pigment suspended in membranes that are encased in plastic. Scanning an alternating helium-neon laser's spot of red or green light onto the film causes a group of molecules to slip to the red or green state, resulting in a mosaic of red and green storage cells.

There are a couple of snags. The laser must cover its tracks with bursts of red light because the light used to read the "green" bits also causes those bits to be flipped to the alternate state. And the pigment reacts too quickly for current scanners, thus limiting access time to 20 ns. With better scanners likely to be available within a year, access time should fall to 2 ns.

Birge predicts a $45,000 price to install the films and laser, compared with $1 million for an equivalent silicon-based RAM system. The pigments will live only six months, but replacing them will cost a mere $200, according to Birge.

While the pigments are not for everybody, Birge hopes they will interest the likes of Cray Research as a fast and dense temporary storage medium in supercomputers. (Extracted from Electronic Engineering Times, 8 January 1990)

Fastest neural network microchips

Nestor Inc. and Intel Corp. (Santa Clara) have secured a $1.2 million contract from Darpa to fabricate the world's fastest neural network microchip. The target speed for the NI1000 is 150 billion interconnections per second. The NI1000, to be fabricated at Intel's E(2)PROM memory operation, will have over 1,000 neurons, using 250,000 E(2)PROM cells for its synaptic wieghts and bias signals.

It will be a single, standalone chip custom-tailored to realize Nestor's patented neural model, called restricted-coulomb energy (RCE). A special version of its development system will control a state machine that allows the chip to learn by programming its E(2)PROM. (Extracted from Electronic Engineering Times, April 1990)

Chemical research may reduce electronic circuits

Chemical research may hold the key to reducing electronic circuits to the size of molecules. Chemists achieved the first step to this objective by developing conducting polymers. Such a compound is a lengthy chain of like molecules with the capability of carrying electricity. In some cases, polymers do this as effectively as metals. A team of researchers at the University of New Mexico in Albuquerque may have made the next step. The team leader has found a method to reshape lumps of polypyrrole, an electrically-conducting polymer, into individual chains that at the most, have the thickness of one molecule. It is hoped the strings can be utilized as "wires" for molecular circuits. (Extracted from The Economist, 23 March 1990)

Silicon pits made by STM

Philips Research Laboratories has discovered that minute pits in silicon can be made with a scanning tunneling microscope (STM). The pits have diameters of about 10 nm and depths of 0.6 nm. The method might pave the way to performing extremely high-precision operations on silicon.

Researchers Evert van Loenen and Dick Dijkkamp used the tungsten needle of an STM to make not only pits, but also extremely fine tracks, by overlapping the pinpricks. "It would be possible to fit 10,000 pits into the space taken up by one pit on one of today's compact disks", said van Loenen.

The STM's needle operates in a vacuum about half a nanometre above a surface and can detect surface-height variations as small as .01 nm by monitoring voltage variations between the needle and the surface.

The Philips researchers briefly switched off the circuit controlling the STM needle's distance from the silicon surface, pressed the point several tenths of a nanometre into the surface, and repeated the procedure. They then scanned the surface with the STM. Surprisingly, the needle had suffered no damage, and the pits made by physically pricking the surface were stable.

Van Loenen cautioned that "the structures must also remain stable outside the vacuum. A great deal more research must therefore be carried out to ascertain whether these pinpricks can be usefully employed in practical applications". (Extracted from Electronic Engineering Times, 12 March 1990)

Microelectronic nerve chips

Researchers at Stanford University have developed microelectronic nerve chips with the idea of restoring limb functions to amputees. The technology has the potential to enable physicians to reconnect severed body parts or the creation of prosthetic devices that are controlled like natural limbs using nerve signals from the patient's amputated stump. The 1 x 3.6 mm chips contain 8-16 micron diameter holes surrounded by indium microelectrodes. Fibres from the severed nerves regenerate through the holes and rejoin nerve endings on the other side of the chip in laboratory tests conducted on rats. The researchers have been able to sustain successful nerve signal transmissions with the chips for more than a year in tests conducted on a rat's foot. The technology will not be ready for human use for 10 years or more. (Extracted from Research and Development, April 1990)

Chinese crystal makes sense of silicon chemistry

With the help of crystal from China and a laser, researchers in Atlanta are developing a technique that will help them to understand the chemical reactions involved in the formation of silicon chips. Eventually, the technique could help manufacturers to fit more and more transistors onto a chip. It could also improve the manufacturing process and make it less expensive.

One of the techniques for laying down silicon devices on chips is known as chemical vapour deposition. A gas of a silicon compound is heated to split it into simpler silicon compounds, which are then laid down on the surface of the chip. Silane gas - a compound where on silicon is attached to four hydrogen atoms - is often used. Scientists want to know precisely how the short-lived, simpler compounds that result from the breakdown of silane behave in the laying down of silicon.

A more sophisticated variation of this technique uses radiation at radio frequencies, rather than heat, to split the silane. The method, known as plasma-enhanced chemical vapour deposition, involves even more complex chemistry, and scientists need to know more about it.

A team at the Georgia Institute of Technology in Atlanta, led by Anthony Hynes, is adapting one of chemistry's best-established techniques for probing what happens during a reaction, known as laser-induced fluorescence, to examine these two ways of making chips.

Chemists use a laser to excite electrons within molecules to a higher energy level. The radiation given off as fluorescence from the molecules as they return to their normal state is monitored. This radiation emerges within nanoseconds of the molecule being excited, and it is at the same wavelength as the laser beam or longer. By monitoring the fluorescence, researchers can map the concentration and distribution of compounds involved in a chemical reaction.

Unfortunately, it is difficult to produce laser light of the frequency needed to excite electrons within some of the compounds formed during vapour deposition. But the Georgia group have used a crystal found only in China, called beta barium borate, that doubles the frequency of the laser light. By shining a particular laser beam's light through this crystal, the researchers found they could achieve the right frequency to make the silicon compounds fluoresce.

Others besides Hynes have tried to adapt laser-induced fluorescence to explore some of the chemistry of chip formation. But Hynes believes that the high-powered lasers they are using create too much scattered light and may in themselves be breaking down the silane, thus giving an incorrect picture of the reactions. Hynes uses a laser of lower power which reduces scattered laser light. He has also shown, by the detailed analysis of all the fluorescence from his experiment, that the laser does not cause the silane to break down.

So far, Hynes has tested the technique on silane in a small glass cell. He is looking for funds to scale up the technique so that it can be applied directly to plasma-enhanced chemical vapour deposition, and is talking to Texas Instruments about possible joint experiments. (This first appeared in "New Scientist", London, 26 April 1990, the weekly review of science and technology)

III. MARKET TRENDS AND COMPANY NEWS

Market trends

Trend towards client/server models

Businesses are moving towards client/server models for their computing needs. These systems combine the high performance of desktop computers with the capabilities of host systems. Clients, which can include several different types of workstations and PCs, supply a user interface and run parts of an application. Servers, which include workstations, midrange computers and dedicated servers, perform application management, help with computation, and aid in data base distribution. Super-servers (host systems), which include super-minicomputers and mainframes, perform intensive processing and central data base management, control directories and manage security functions. There are three computing modes available: client/server computing (the client handles local data processing while the server handles heavy-duty processing); co-operative processing (data is distributed across several systems); and distributed processing (multiple systems can process an application). (Extracted with permission of DATAMATION® magazine, 15 February 1990©. Copyright by Technical Publishing Company, a Dunn and Bradstreet Company - all rights reserved.)

Electronic instrument market expected to rise

A strong market for electrical and electronic instruments is expected to continue, and has not changed much during the 1980s. A recent study indicated 55.7 per cent of workers in research, development and quality assurance expect to purchase twice the amount of electrical or electronic instruments in the next year. The 10 instruments cited most often as an instrument expected to be acquired include digital storage oscilloscopes, printer-plotters, analog-to-digital converters, line conditioners with uninterruptible power supplies, dc power supplies, digital voltmeters, microprocessor development systems, standards calibration instruments, digital multimeters and IEEE-488 buses. (Extracted from Research and Development, February 1990)

Silicone materials use increasing

Silicone materials' utilization in electronic packaging is rising largely because of their capabilities to manage the difficulties of thermally induced mechanical stresses and stress-related failures, according to G. Gensler, General Electric Silicones' electronic materials programme manager. A vital benefit of silicone electronic packaging materials is their low surface-tension features. The characteristic permits the materials to supply entire coverage. Another benefit is that numerous silicone products offer circuit repairability and gels permit probe testing. The utilization of silicone packaging materials is expected to rise as circuitry becomes more complicated and operating conditions more demanding. Applications of silicone packaging materials include coatings, encapsulants/pottants, gels, adhesives and moulding compounds. (Extracted from Auto Engineering, April 1990)

Sales of US PC software accelerate in Europe

Sales of US PC software in the US and Europe have shot up and surprised industry analysts expecting a slow sales season. The increased sales show that a general slowdown in the PC software industry has come to an end.

The Software Publishers Association (SPA) says that PC software sales by US companies rose by 50 per cent in Europe in the first quarter of 1990 compared with the same period in 1989. US sales grew more slowly, showing 26 per cent growth compared with the same period last year.

The SPA says that the European market grew 46 per cent in 1989 compared with 12 per cent growth in North America.

There are several factors helping software sales. These include new products, new versions of software, and an anti-piracy campaign aimed at large corporations.

US software companies increasingly rely on foreign sales which now represent 34 per cent of total sales. (Source: Computing, 7 June 1990)

Export race to Eastern Europe is on

Computers using the Unix operating system and running advanced design software may well be allowed into the Eastern bloc, possibly within the next ten months.

All the major electronic design automation (EDA) vendors are applying for export licences and expect to get a positive response from Western governments. Britain's Racal-Redac recently got permission to sell its top-selling Cadstar printed circuit board design package and is now applying for licences to ship its more advanced Visula suite, running Unix, into Eastern Europe.

Redac's US rivals have filed for similar licences, although they cannot move yet because of the confusion over what the future restrictions will be from CoCom, the informal body which sets export limits on sensitive technology.

Hans-Peter Klein, general manager for Valid logic systems in the federal Republic of Germany and Austria, believes that the company's whole range of software, except advanced integrated circuit design tools, will be licensed. (Source: Electronics Weekly, 21 March 1990)

EC price fix damages chip supply

European equipment makers could be facing a serious shortage of 1-Mbit DRAM memory chips before the end of the year as a direct result of European Commission (EC) attempts to halt dumping by Japanese chip makers, according to several industry sources.

A top executive with a major Japanese memory chip maker has said there could be a shortfall of up to tens of millions of 1-Mbit DRAMs this year in Europe, and Japanese chip makers are deliberately running their factories at below full capacity in order to keep the price of 1-Mbit DRAMs above the floor price of £4.11 fixed by the EC, according to an insider at another major Japanese memory chip supplier.

Three months ago Japan's MITI trade industry instructed chip makers to cut back on 1-Mbit production as a result of falling prices which were leading to accusations of dumping in Europe.

Indeed, senior UK executives from two leading Japanese memory suppliers have confirmed that order books are getting fat as worried volume buyers sign up six-month supply contracts to see them through to the end of the year. (Source: Electronics Weekly, 23 May 1990)

Chip sales to grow rapidly

World-wide semiconductor sales will be flat this year, but will jump with double-digit growth rates over the next few years, according to the mid-year WSTS forecast from the Semiconductor Industry Association (SIA).

The WSTS (World Semiconductor Trade Statistics) Committee projected that world-wide shipments would drop by 0.8 per cent this year to $48.8 billion. This agrees closely with the SIA projection made last September.

But in the interim, IC orders dropped by 14 per cent in the third quarter of last year, causing actions by some semiconductor companies almost like preparing for another recession. But the general mood of executives in recent months has been buoyed by restoration of order rates. Although the SIA figures are more assurances of a flat year, it is still very good news for most of the semiconductor industry.

The forecast calls for growth rates of 12.8 per cent, to $54.5 billion next year, followed by 19.3 per cent and 14.5 per cent growth rates in the following two years. The WSTS figures are for consumption - the markets - and not for production. (Source: Electronics Weekly, 23 May 1990)

Electronics executives hoping for movement to ease East bloc trade

Anyone who was hoping for a rapid relaxation of trade restrictions to the Eastern bloc has a little bit longer to wait. Cocom, the international association that controls sales of security-sensitive technology, has so far been implacable. Insiders say the earliest any change might emerge is May 1990.

The global electronics industry had high hopes for a meeting of the group - formally, the Co-ordinating Committee for Multilateral Export Control - 14 February in Paris. After all, the US, historically the most hard-line Cocom member, early this year had announced its support for a sweeping liberalization of export rules.

But virtually nothing did change. The only exception was a shortening of the review procedure for exports from 12 weeks to eight.

That means that Western manufacturers still have to wait to enter Eastern Europe with their best products, while South-East Asian manufacturers are already becoming established there, especially in computers.

Despite its public support of trade relaxation, it was the US that apparently held things up. When other nations - besides the US, Cocom members including the NATO allies, Japan, Australia, and Iceland - proposed relaxing many restrictions at the February summit, the US tabled the proposals. Allied frustration rose to the point where the US was accused of using Cocom to cut down on foreign competition. Negotiations are proceeding, but industry insiders - though hopeful of some movement in late spring - describe the atmosphere as tense.

The irony of US foot-dragging is not lost on European-based firms, which are just waiting for their chance to compete in the newly opened Eastern European market. (Extracted from Electronics, April 1990)

Japanese seek best route to future memories

Boom times are returning sooner than expected for the microchip business, according to new production figures from the Japanese companies that dominate the chip market. But while the big three makers of memory chips, NEC, Toshiba and Hitachi, all increased production in April, there are still unresolved technical problems in the mass production of the latest generation of chips. The chip makers have divided into two rival camps in their efforts to overcome the problems.

Analysts say this increase in production may mark the end of the latest five-yearly downturn in the business. The reason for the improvement is demand for portable "laptop" computers, especially in Europe.

The upturn is good news for the companies producing the latest generation of memory chips, dynamic random-access memories (DRAMs) with a memory capacity of 4 megabits. Companies have been slow to find applications for the chips, which came into production last year, because they cost more than four of the 1-megabit DRAMs. Toshiba, one of the first companies to produce the newer chips, admitted that the only application it has found for them is in extra memory for its own laptop computers.

The split over production techniques involves the way the manufacturers create the three-dimensional electronic circuits necessary for the chips on the surface of slivers of silicon. DRAMs store information as tiny electrical charges in microscopic capacitors. For the first few generations of the chips, designers formed the capacitors by depositing almost flat layers of the necessary materials on silicon wafers. However, these capacitors are too large for today's DRAMs.

To pack capacitors more closely together, engineers had to move into three dimensions. They took two approaches. The simpler of the two involves forming components above the chip's surface. They are called stacked capacitors. The other process makes the capacitors from tiny trenches cut in the silicon. The latter is a more elegant design, but has turned out to be difficult to mass-produce reliably.

The "big three" chip makers all initially opted for the trench approach. Between them, the three account for almost all the 4-megabit DRAMs sold on the world market. IBM of the US also makes the chips but only for its own computers.

NEC, however, is about to abandon trench technology for its second generation of 4-megabit chips, preferring to stick to stacked components. The company says the change would allow higher production yields. But industry observers in Tokyo say the change shows that NEC is having difficulty running trench production lines.

NEC has announced plans to produce 4-megabit chips in California from April next year. Production in California will begin at 2 million chips a month, rising to 4 million a month by 1992. The plant will cost about $400 million. The company will also produce chips at its plant in Scotland.

NEC's move leaves only Toshiba and Hitachi using trench technology, which they say will enable them to make the jump easily to the next generation of memory chips, with a capacity of 16 megabits.

Toshiba said it had begun producing small quantities of a second-generation 4-megabit chip. The circuit is both smaller and faster than the previous versions. Production will exceed a million chips a month by September.

If the upturn in the memory chip market continues, it will be cheaper to use 4-megabit chips than 1-megabit chips in computers by the end of this year. (This first appeared in "New Scientist", London, 19 May 1990, the weekly review of science and technology.)

Company news

Agreement to jointly develop 64-Mbit DRAM chips

IBM (US) and Siemens (FRG) have agreed to jointly develop a 64-Mbit DRAM chip. The agreement is the latest in a series of moves by US, Japanese and European semiconductor manufacturers to share the high costs of developing chips of ever larger capacity. The two companies will share the costs of the development, which were not disclosed but are estimated to be high, and the project will begin at once. The companies plan to produce the chip in the mid-1990s. IBM will carry out the project at its advanced semiconductor technology centre in East Fishkill, NY. (Extracted from Financial Times, 25 January 1990)

DRAM consortium just a memory

US Memories Inc., the consortium begun in 1989 to supply US-built dynamic RAMs (DRAMs), disbanded in January before building its first fabrication line. At the time Advanced Micro Devices Inc., Digital Equipment Corp., Hewlett-Packard Co., IBM Corp., Intel Corp., LSI Logic Corp., and National Semiconductor Corp. formed US Memories, DRAMs were scarce, expensive, and usually from Japanese companies. US companies supply less than 20 per cent of the DRAMs produced world wide.

DRAM manufacturing is expensive and risky, so the seven founding companies each contributed $50,000 to develop a business plan, which they expected to use to recruit 20 to 30 other companies to join the venture, contributing a total of $500 million. This way, the risk would be spread among many companies. But the DRAM shortage let up in late 1989, and no other companies joined US Memories.

In January, after revising the consortium's business plan, which had been deemed unrealistic, US Memories executives found that most of the founding companies were not willing to commit to buying 20 per cent of their DRAMs from the consortium. Without those guaranteed buyers, the consortium decided to disband. (Source: Spectrum, March 1990)

Consumer electronics

The world's two biggest sellers of televisions, France's Thomson and Holland's Philips, are pooling their efforts to create the next generation of high-definition television (HDTV). By sharing their research, not to mention R and D budgets which will total about $3 billion over the next five years, the two firms hope to steal a march on Japanese firms that are cutting a swathe through consumer-electronics markets. The complication, however, is that the product Philips and Thomson are joining together to create is not global but European, tied to a European technical standard.

Though Philips and Thomson have been co-operating for years on HDTV, under the auspices of the Eureka programme of EC-subsidized R and D, the timing of their announcement of still closer co-operation seems rather pointed. It came at a press conference held on 15 May in Paris - just a week before the latest plenary meeting of the International Radio Consultative Committee (CCIR). At its last meeting four years ago the CCIR nearly convinced its members to agree on a single, global standard for HDTV originally developed by the Japanese. Much to everyone's consternation, the Europeans walked away.

So when the CCIR meets this time it will face, instead of the dream of a single world standard, 2 1/2 de facto regional standards. Japan backs the Muse standard originally developed by its big electronics companies. Europe backs MAC, as developed by Philips and Thomson. America's Federal Communications Commission (FCC) promises to decide on its own standard for the broadcast of HDTV signals by 1991. It is likely to differ from both Europe's and Japan's. Both of those standards involve signals being broadcast via satellite; America prefers conventional transmission. The FCC also wants an HDTV standard compatible with today's television, which rules out a direct transplant of either Japanese or European technologies.

Philips and Thomson, along with other consumer-electronics firms, would like to see an American HDTV standard which is at least friendly to their technology.

The Japanese, meanwhile, say they are happy to build televisions to two, three or however many standards westerners want. While patents will no doubt protect part of a Euro-standard developed by Philips and Thomson, those sorts of barriers can prove remarkably leaky. In the 1970s European television manufacturers relaxed behind seemingly impenetrable patent protection on the sorts of big-screen televisions which Europeans had always bought - only to see the Japanese roll in with small-screen sets which evaded the patents. (Source: The Economist, 19 May 1990)

16-Mbit fab for Europe

A European joint venture to build a $1 billion 16-Mbit DRAM memory chip factory is on the cards following top-level talks between German electronics giant Siemens and Franco-Italian chip maker SGS-Thomson Microelectronics.

Sources in Siemens' chip operation suggest that production of 16-Mbit DRAMs from a joint venture plant could begin by the second half of 1992. This is an aggressive target date which, if met, should coincide with the production plans of the world's top DRAM makers.

SGS-Thomson and Siemens have been discussing plans to join forces in the DRAM market for some time. The two companies are working closely together in the European JESSI chip technology research project and have just agreed to join forces in the microcontroller market.

Analysts reckon the high-technology chip factories needed to make 16-Mbit DRAMs will cost around $1 billion each; which is about the same as the individual annual semiconductor sales of Siemens and SGS-Thomson. Neither company can afford the risk of going it alone with such a massive investment.

SGS-Thomson has been making small quantities of 256-kbit and 1-Mbit DRAMs at its Texas plant for some time. The company plans to start selling 256-kbit devices in Europe in June with 1-Mbit going on the market shortly afterwards.

Siemens makes 1-Mbit devices in volume and has just started making 4-Mbit chips. (Source: Electronics Weekly, 25 April 1990)

Japanese companies research neural networking applications

A spate of separate announcements by SonyCorp., Toshiba Corp. and Hitachi Ltd. has demonstrated the intensity with which the Japanese are researching applications for neural networks.

Sony has developed a digital simulation of a neural network using a network of 128 of Intel Corp.'s 80860 microprocessors, according to a report in the Nikkei-Sangyou newspaper.

Sony rates the performance of the system at 4.5 million connections per second. That contrasts with 11 million connections per second for two San Diego firms' offerings: Science Applications International Corp.'s (SAIC's) Delta board-level simulator and Hecht-Nielsen Neurocomputer Corp.'s Anza-Plus simulator.

Intel's own neural-network chip runs at 2.5 billion connections per second and is a genuine analog model of cognition (a cognizer) rather than a digital simulation (a neuro-computer). Sony, however, claims it can expand its neurocomputer architecture to take it to 1 billion connections per second in the near future.

Toshiba, meanwhile, has developed the world's first kanji word processor using software running a neural-network simulation, according to a report in the Nikkan-Kogyo newspaper. The Japanese character set, with its thousands of characters, is notoriously difficult to input to a word processor. The standard solution - inputting a phonetic version of the word - is troublesome because there are many symbols with the same sound but different meanings. After the phonetic spelling is entered, the conventional word processor displays all the possible characters that match that sound, and the user must manually choose from among them.

Meanwhile, Hitachi has developed a wafer-scale neural network, according to New York-based newsletter Intelligence. The 5-inch wafer holds

576 neurons and uses a novel time-division multi-plexing method to make 100 physical connections appear to be 10,000 virtual connections. The system is on a schedule for delivery to users within three years. (Extracted from Electronic Engineering Times, 8 January 1990)

Superconductivity industry

In an arrangement carefully crafted to avoid charges of federal meddling in industry, an investment fund set up by the Argonne National Laboratory and the University of Chicago has been used to start a company to market the laboratory's superconductivity technology. Officials say the arrangement marks the first time a US government laboratory has become involved in the creation and management of a private company.

Known as the Illinois Superconductor Corporation (ISC), the start-up company obtains one third of its initial $1.5 million funding from the ARCH Development Fund, a venture-capital fund started by the laboratory and the University of Chicago, which runs Argonne for the Department of Energy. Additional funds come from the state and a private venture capital firm. The company is the first Argonne spin-off created by ARCH.

Six Argonne superconductor inventions will go into ISC's first product, a sensor to measure the temperature of refrigerants. Because the independently run ARCH - and not the laboratory directly - is the actual partner in the new company, other companies are unlikely to complain that they are forced to compete against the US Government.

Argonne puts $200,000 a year into ARCH to find outlets for the laboratory's technology. If ISC becomes successful, a share of its profits will return to ARCH, which will then return funds to Argonne's technology transfer programme to encourage further spin-offs. (Source: Nature, Vol. 345, 24 May 1990)

IBM's next top-end systems

One of leasing giant Meridian's senior strategists has revealed a completely new future mainframe scenario for IBM this week, with three separate 370 mainframe ranges to be launched before the middle of the 1990s.

The Summit will come first, a four-processor machine offering 200 mips in 1991; a six-processor version will appear in 1992, offering 300 mips; and an eight-processor version is expected in late 1992. A future systems version of the operating system will emerge with this range of machines during 1993.

IBM is aiming at a three-tiered level of 370 architecture machines, beginning at the 4381 level, and ranging up to 1,600 mips. This transition will begin in 1993, long after the Summit is launched.

To support these systems, IBM will have to introduce partitioned processors. VM, VSE and older versions of the MVS operating system like XA will run on one dedicated processor, while future systems will run on another processor with the vtam logic. The third processor will be the central processing unit and the fourth will control memory and manage processor swapping.

Meanwhile, the 3090 will continue to grow with IBM planning to stick two 3090 600J machines back-to-back in order to keep up with the processor growth from Amdahl and Hitachi. (Source: Computing, 7 June 1990)

SVG awarded joint development contract

Silicon Valley Group, San Jose, Calif., has been awarded a joint development contract by Sematech to design next generation 16/64M DRAM photoresist processing systems.

In addition to an unspecified amount of funding, the research consortium in Austin, Texas, will also provide personnel, laboratory equipment and training to support development of the new track system.

In turn, SVG will boost its staff by 50 per cent, resulting in a 75-member team dedicated to the project. The new system will probably be introduced at Semicon/West this summer. The development contract is not for development of a single machine, but constitutes an ongoing relationship with the consortium. (Reprinted with permission from Semiconductor International Magazine, February 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Il., USA)

Du Pont to build plant in the Netherlands

Du Pont will build a 40,000 ft^2 photomask manufacturing plant in the Netherlands, near Nijmegen. The company has begun design work and expects construction will be completed by the end of 1990, ready for start-up early in 1991.

Du Pont plans to equip this new plant with the latest manufacturing, inspection and repair equipment, and initially will have two dedicated electron beam lithography lines.

Du Pont has signed a letter of intent with Philips International B.V. to acquire the assets of Philips' photomask manufacturing plant in Nijmegen. (Reprinted with permission from Semiconductor International Magazine, February 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Il., USA)

Motorola delays new Philippine facility

Motorola has delayed plans to build a $50 million assembly/test facility in the Philippines, citing "market conditions". A spokesman at Motorola's Semiconductor Sector in Phoenix, Ariz., said, however, that construction will probably go ahead in about a year.

The project is to be located in Cavite province, about 50 miles south-east of Manila. For more than 10 years, Motorola has assembled ICs in the Philippines using leased buildings. However, the existing plant is spread over several small buildings which do not offer maximum efficiency.

Contrary to some reports in the general media, which reported Motorola was abandoning the project, a spokesman emphasized "There's no situation of abandonment; we're continuing our local site preparation." (Reprinted with permission from Semiconductor International Magazine, February 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Il., USA)

Vitelic provides Europe with non-Japanese DRAM

A new source of non-Japanese-made DRAM memory chips, which gets round the EC floor price mechanism, is coming into the UK, from Vitelic.

Formerly regarded as a specialist producer of fast and logic-intensive DRAMs, Vitelic is gearing

up for the commodity market and is building a $200 million 20,000 wafers-a-month plant in Hsinchu City, Taiwan, backed by technical help from Oki, a $150 million stock market offering on the Taipei exchange and possible financial assistance from the Taiwan Government.

Vitelic is committing between 20 to 25 per cent of its output to Europe this year - about 12 to 14 million units of DRAM - and is hitting the market just as it turns up following the EC floor price which only applies to Japanese producers.

Vitelic's ownership is a model of what is happening to the chip industry world wide. It has three Japanese investors - Sony, Oki and Kyocera with about 27 per cent of the equity, three US investors, the venture capitalist firms J.H. Whitney, Bessemer Associates and Wilson, Sonsini, Goodrich with about 45 per cent, two Taiwanese investors including Kennex Industries with about 27 per cent, and a Hong Kong Chinese president, Alex Au. (Source: Electronic Weekly, 28 March 1990)

Thai Micro Systems opens contract assembly plant

Add a new name to your roster of IC contract assembly firms: Thai Micro Systems. The firm opened near Bangkok, Thailand, recently, bolstering the ranks of the kingdom's contract assemblers to three. The others are Chinteik and Hana Semiconductor.

The force behind TMS is Nandi Prasad, a veteran of the chip assembly business. Prasad was most recently president of Dyne-Sem International (formerly Dynetics) of the Philippines. Earlier he was president of AMI/Gould, also in Manila, where he was responsible for setting up AMI's assembly/test facility some years ago.

Prasad believes TMS is the first venture-capital-funded assembly/test operation in Asia Pacific. The initial investment for the company's first year of operation will be about $10 million. That amount includes 45,000 ft^2 of bricks and mortar. Equipment for final test will represent another $2 million-$2.5 million. Three Thai firms are the principal investors: Business Venture Promotion Co., Ltd.; Asia Securities Trading Co.; and Manistee (Thailand). A major US-based venture-capital firm not yet disclosed, will also be funding the start-up. (Reprinted with permission from Semiconductor International Magazine, February 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Il., USA)

Motorola starts second major fab

Motorola's Semiconductor Products Sector (SPS) has begun construction of an advanced 6 in. wafer processing facility in Chandler, Arizona, a Phoenix suburb. This $325 million project will result in 430,000 ft^2 of R and D, manufacturing and support operations. The new facility will primarily serve Motorola's Application Specific Integrated Circuits (ASIC) Division. Motorola officials have dubbed the facility CATMaC - Chandler Advanced Technology and Manufacturing Center.

The new facility is in addition to Motorola's $500 million MOS-11 facility - the largest single construction project ever undertaken by Motorola - now under construction in Oak Hill, Texas., a suburb of Austin. Initial manufacturing at Oak Hill will focus on 4M DRAM and advanced microprocessors.

During the next five years, forecasters expect the world-wide market for ASICs to achieve a compound annual growth rate in excess of 22 per cent. By the end of the 1990s, advances in design automation tools will reduce the challenge of configuring 100,000 gate circuits to a relatively straightforward task.

CATMaC will support an emerging design methodology that Motorola calls Customer Defined Arrays (CDAs). CDA devices will meet burgeoning market needs for high integration and performance levels by mixing silicon technologies and architectures on the same chip.

One of the first products using the CDA concept is Motorola's new MCA IV family, which combines bipolar, BiCMOS and CMOS technologies with megacell, standard cell and gate-array cells to allow maximum design flexibility. Significant MCA IV product features include 50K gate density, four-layer metal, over 80 per cent utilization, 90 ps gate delays, 400 signal pads and high-speed memory up to 256-Kbits.

Motorola officials believe that the laboratory at CATMaC will be the most advanced BiCMOS research centre in the world.

Motorola employees will begin processing wafers at CATMaC in the first quarter of 1991. (Reprinted with permission from Semiconductor International Magazine, April 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Il., USA)

European firms set for link-ups

A wave of high-tech alliances in Europe is poised to follow the recent spate of link-ups in the US and Asia.

Asian and US semiconductor companies talking to their European counterparts include: Samsung, Advanced Micro Devices, Toshiba, Hyundai, Harris Semiconductor, Lucky Goldstar, Micron Technology, Sony Semiconductor and Matsushita.

These companies are looking for deals with European companies who have spare fab capacity such as Plessey Semiconductors, LSI Logic at Footscray, Philips and SGS-Thomson.

Dataquest analyst Jim Eastlake notes that Plessey's Roborough plant is running below capacity. He thinks that a link between Harris and Plessey Semiconductors would "make a lot of sense".

Other foreign companies would be interested in gaining access to Plessey's facilities in return for investing in them. (Extracted from Electronics Weekly, 18 April 1990)

Philips moves into Eastern Europe

Philips International NV plans to set up two offices, one in Prague and the other in Warsaw, this year.

The new offices could well be the nucleus of future nation-wide sales organizations in Czechoslovakia and in Poland. Initially, though, they will operate as liaison offices supporting Philips' product divisions, act as contact points for local authorities and industries, and identify opportunities for co-operation. Philips already has offices up and running in Moscow and Belgrade.

In the Soviet Union the Eindhoven company is involved in projects worth about $150 million, while in other Eastern European countries its projects are worth $75 million.

In addition, Philips will set up a joint organization in East Germany to produce X-ray equipment. Meanwhile, in Czechoslovakia, it will develop and manufacture electron microscopes. (Source: Electronics, April 1990)

Siemens leaps the monopolies hurdle

The Federal Republic of Germany monopolies authority has given the go-ahead for the creation of Europe's largest indigenous computer company.

The German Federal Cartel Office's stamp of approval on Siemens takeover of Nixdorf means that Siemens can get down to the task of forming Siemens-Nixdorf Information Systems. With a combined turnover of DM 12 billion, it will be the largest computer company in Europe after IBM.

A Siemens spokesman says more details about the merger should come to light in June.

In the six months to March, Siemens produced profits after tax of DM 49 million, 15 per cent better than the same six months a year ago, on turnover up 16 per cent to DM 30 billion. Siemens' purchase of Nixdorf came too late to show in the accounts.

Siemens says neither its investment in Plessey - it owns Plessey's defence, radar and control divisions - nor the acquisition of Nixdorf had any effect on first half business volume or profits.

New orders grew by 12 per cent from DM 31.9 billion to DM 35.8 billion for Siemens overall. The largest new orders came from its overseas business. There orders increased 21 per cent to DM 21.4 billion, while German domestic orders virtually stood still at DM 14.4 billion.

But the takeover of Nixdorf - which is thought to have made losses approaching DM 1 billion - could affect Siemens' year-end results. Nixdorf is likely to show up on Siemens' accounts at the start of the next financial year, although it may be included in second half figures. (Source: Computer Weekly, 3 May 1990)

Sony goes for top of league in SRAMs

Sony Semiconductors has set its sights on being the world's number one static RAM producer.

Last year the company rose 10 places from 17 to seven in Dataquest's European SRAM league table. Revenues jumped from $5 to $30 million.

Sony's push will be on all three fronts - fast static, standard products and some application-specific devices like cache memory. In the burgeoning fast static arena, Sony is now sampling a 1-Mbit device configured 128 x 8k which boasts an access time of 35ns.

It is also producing a 64-kbit static RAM configured 16k x 4 which runs at 20ns. Its fastest 256k device runs at 55ns with a 25ns device waiting in the wings. The company is backing up product development with investment in its processes.

Within the next three years its Nagasaki plant will increase output by three times. At present it produces 4.5 million devices a month. It has a 0.8-micron CMOS line for its 1-Mbit SRAM devices.

The SRAM products will provide the spearhead for Sony to move into other focused areas of the semiconductor market. It has a 4-Mbit mask ROM device, a raft of cellular radio chips and an 8-bit 300 MHz A/D converter. (Source: Electronics Weekly, 23 May 1990)

The two Germanys agree on CD venture

The first major joint venture in electronics between the two Germanys is being negotiated. The object is a $140 million company owned by the Federal Republic of Germany's Reiner Pilz GmbH and the German Democratic Republic's computer builder VEB Kombinat Roootron to manufacture compact disks.

Current talks are aimed at 33 per cent and 67 per cent participation by Pilz and Robotron, respectively. The operation may later go public, Western style, the companies say.

The joint venture, to be established in Zella-Mehlis, GDR, will employ Pilz's latest CD production equipment. The venture's aim is to produce 24 million CDs annually.

The endeavour will be run according to the rules of a market economy, a novelty in the GDR with its 40-year tradition of a planned economy. (Source: Electronics, April 1990)

Sharp sets up the first Japanese R and D laboratory in Europe

Claiming to be the first Japanese company to establish a basic research laboratory in Europe, Sharp Corp. has opened a facility in Oxford, England, that will concentrate initially on optoelectronic materials and devices. It will support the company's French and Spanish production operations, where Sharp builds photo-copiers and fax machines. The focus is expected to be on display and image-capture technology based on laser techniques and LCDs, including Sharp's high-resolution 14-inch-diagonal active-matrix colour panel.

Apart from devices, the laboratory will research information processing, including natural-language processing and the application of artificial-intelligence systems to word processors, machine-translation systems, electronic organizers, and PCs. That work will also extend to encompass an exchange of expertise with Sharp's Japanese R and D centre on two pressing sectors: high-definition TV and mobile communications. (Source: Electronics, April 1990)

IV. APPLICATIONS

Computer system recognizes continuous speech

A new computer system that recognizes continuous speech may be used for a voice-controlled personal computer, according to Edinburgh University's Centre for Speech Technology Research. The hardware of the new Osprey computer system includes two standard computer boards that connect to the back of an IBM personal computer. The first computer board converts the voice signal to digital form and analyses the signal for key speech

frequencies. The second board, holding four self-contained computers called transputers, combines memory, communications and processing on a single piece of silicon. This board converts key frequencies into phonemes, the 44 characteristic speech sounds of the English language. The system can understand any clear-speaking English voice and is adaptable to suit any application. (Extracted from New Scientist, 17 March 1990)

Voice recognition systems

Voice recognition, where a computer can "comprehend" and respond to human speech, is not imminent in product form. Vendors are now projecting that it will be another 5-10 years before that type of product is set for shipment to the general public. Practical, commercial voice recognition systems are still too expensive and the accuracy is not high enough for the average personal computer user to profit, says K. Bosomworth, president of International Resource Data (New Canaan, CT). The speech recognition market up to now has not matched its level of about 20 million in 1980. There are examples of very successful uses of voice recognition know-how. Shearson Lehman Hutton, for instance, has a voice recognition system that lets traders use verbal commands for tasks previously performed manually. Traders say the system has allowed them to avoid mistakes caused by illegible or lost pieces of paper when sending important trades by pneumatic tube to clerks. (Extracted from Information World, 26 March 1990)

Laptops with touch-sensitive screens

Sony and Canon (both Japan) have introduced notebook-sized personal computers that have touch-sensitive screens instead of keyboards. Users can write on the screen with a special pen and the writing is converted into lines of computer type, which can then be printed out just as with ordinary personal computers. The personal computers can also accept sketches or drawings. The battery-operated personal computers, which are known as pen computers, stylus systems or smart paper, cost $500-$2,000 and are now only available in Japan. The need for such systems by Japanese users is regarded as particularly acute, because of the problems involved in entering some 7,000 Chinese-based ideographs into PCs using keyboards. However, the new pen computers are still not perfect due to errors in recognizing handwriting.

Many US and Japanese firms are working hard to try to solve the technical hitches. However, the emergence of Sony's Palmtop and Canon's AI Note in Japan heralds the beginning of a new way to communicate with computers and may help to boost sales of personal computers in Japan. Despite the size of Japan's population and economy, sales of personal computers will total only 1.6 million units in 1990, compared to 12 million units in the US. The US economy and population are about double that of Japan. The development of the new touch-sensitive personal computers could help to reduce the gap between sales of PCs in the US and Japan. Sony's Palmtop can convert a handwritten note into type and drawings, dial a phone and send the contents as a facsimile. Eventually, the new PCs will be able to handle all of the functions of ordinary laptop computers with keyboards. (Extracted from New York Times, 26 March 1990)

Giants begin to put pen to screen

Personal computers with electronic pens rather than keyboards are set to become a $5,000 million business in the 1990s - and leading companies such as IBM and Apple are starting to move into the market.

This technology has the potential to grab a quarter of the notebook PC market over the next few years, US industry analysts say.

The electronic pen technique will lure business users from traditional laptop machines in areas such as sales and manufacturing.

The emerging machines will be used by staff out on the road for entering insurance claims or completing reports on sales calls. People will also use them to record personal notes and enter electronic mail messages.

With such a market in prospect IBM is believed to be backing a new Californian company, called Go, and providing it with algorithms for recognizing handwriting. (Source: Computer Weekly, 26 April 1990)

Faster and cheaper computers

AT&T Bell Laboratories is working on development of faster, inexpensive computers for designers. The development may occur with help from the time-honoured art of paper-folding known as "origami". Work is under way to produce a computer utilizing light rather than electricity. In its work, the laboratories have devised a method to push huge problems though extremely small computers. Essentially, researchers fold the problems as if they are pieces of paper. That way, small computers that can focus just on four points at a time would be able to solve the problem. (Extracted from Wall Street Journal, 23 March 1990)

Fuzzy computers go home

Japanese housewives are about to have their first encounter with fuzzy computing: Matsushita Electric Industrial Co. has announced the launch of two new products intended to ease household cleaning chores, the fuzzy vacuum cleaner and the fuzzy washing machine. These are the first consumer products to emerge from a huge effort by Japanese industry to develop fuzzy computing technology.

Fuzzy computing is based on fuzzy set theory, developed by L.A. Zadeh of the University of California in the 1960s. Whereas conventional computers operate on Yes/No logic, fuzzy computers form conclusions from imprecise data (such as "faster" or "stronger") by giving such input a value somewhere in the continuum between zero and one.

Matsushita's fuzzy washing machine, affectionately called "Aisaigo (beloved wife) Day Fuzzy", comes equipped with two "eyes" (optical sensors) which can detect the quantity of clothes and the quality and quantity of their dirt. A fuzzy microcomputer then selects the most suitable of 600 possible cycles to wash the clothes. The fuzzy vacuum cleaner assesses the amount of dust and the nature of the floor and adjusts the suction power of the cleaner accordingly. Both machines are intended to allow housewives "to enjoy easier, more comfortable lives", says a company press release.

Matsushita is just one of many Japanese companies involved in developing fuzzy computing. Last year, MITI set up the Laboratory for International Fuzzy Engineering Research (LIFE) with the backing of 42 companies, including steel,

automobile, electronics, transportation, electric utility and security companies. And the Tokyo stock market is a future target for fuzzy control through fuzzy programme trading. (Source: Nature, Vol. 345, 10 May 1990)

ITT chip is the first to put captions on a TV screen for the hearing-impaired

Barely six months ago, the National Captioning Institute awarded ITT Corp. a $1 million contract to develop a chip that puts captions on a TV screen for deaf and hearing-impaired viewers. Already the landmark component is on its way to becoming a commercial device, with first silicon expected next month.

Built into a TV set to decode the digital captioning data contained in the 21st line in the vertical blanking interval of an NTSC signal, the chip was conceived at Intermetal GmbH, lead house of the ITT Semiconductors Group in Freiburg, Federal Republic of Germany.

Now in the final stages of development at the group's facility in Shelton, Mass., the chip could be available to set makers as engineering samples late this year. Receivers using the device could be on US markets by late 1991 or 1992.

Essentially, captioning, or line-21 technology, delivers the audio portions accompanying a TV programme as text, which is displayed on the screen much like subtitles. The captions can be shown anywhere on the screen or can be scrolled over it, and the viewer can switch them on and off at will. Besides giving deaf and hearing-impaired people access to TV, such captions are also a boon to children and illiterate adults who are learning to read, and to anyone learning English as a second language.

Industry insiders believe that the chip will add only $20 to the retail cost of a TV receiver. (Extracted from Electronics, April 1990)

Traffic lights learn to go with the flow

"Smart" traffic lights will soon be cutting queues at road junctions. Researchers at the United Kingdom's Transport and Road Research Laboratory have developed a system known as MOVA - short for microprocessor-optimized vehicle actuation - that can alter the timing of lights at isolated junctions to minimize the time vehicles have to wait.

MOVA is a slimmed-down version of the long-established SCOOT technology, which already controls networks of traffic signals in London and other major cities in Britain and abroad. SCOOT (which stands for split-cycle optimization) is a larger system which enables a computer to control dozens of interconnected traffic lights.

MOVA has been made possible by the increasing miniaturization of electronics. It is also a relatively cheap technique: 10 years ago, SCOOT was economic only if the computer controlled a large number of signals. Now a small microprocessor can control a single junction.

Detectors buried under the approach roads to a junction count vehicles. The microprocessor balances the delays to the queue waiting at a red light against the volume of traffic favoured with a green light. When the time lost by those waiting exceeds the time gained by those moving, the lights change. The microprocessor is continually balancing these competing demands and calculating the optimal cycle of changes. On average, MOVA cuts delays by 13 per cent.

However, the system cannot help with very heavy traffic. If the traffic is bad enough to cause substantial queues on the approach roads, MOVA switches automatically to a programme which gives the maximum time of green lights to oncoming traffic. At isolated junctions such heavy traffic rarely occurs.

MOVA is likely to be particularly useful at junctions with uneven traffic flows, such as those near sports stadiums or cinemas. The system was first tested for three years at a junction on London's North Circular road, near Wembley Stadium, where rock concerts, football matches and the freeing of Nelson Mandela conspire to cause erratic traffic flows. (This first appeared in New Scientist, London, 5 May 1990, the weekly review of science and technology)

Computers weave a new fashion

Another Industrial Revolution is under way in the textile business bringing an end to familiar working practices and throwing skilled artisans out of their jobs. The new revolution is affecting the entire industrialized world in one go, and its progress can be measured in years rather than decades. This time the power behind the change is computers rather than steam, and the employees at risk are the designers and artists who create the fabrics that go into clothing, linen and upholstery. Designers can now turn yarn into fabric and sketch a garment from the fabric without leaving their workstations. A design process that took weeks or months can now be over in less than 24 hours. The images on colour monitors and those reproduced by colour printers are so realistic that buyers from department stores, who once insisted on seeing and touching sample garments, are now willing to commit millions of pounds to a new range of clothes after looking at a design on a computer screen or seeing a print-out. For instance, take Tootal Fabrics of Manchester. Its designers select a weave pattern and the yarn colours, which are keyed to individual yarns in the mills' inventories, and then they watch the fabric appear on their monitors. They can modify the design - make the stripe a bit broader, the blue a bit deeper, or change a pink background to a red one and insert checks between the stripes - before printing a paper copy of the fabric for senior directors to inspect the designs. After approval, the design is sent over the international telecommunications network to an identical computer and printer at the mills in Japan, using a modem at each end of the link. When the bid comes back, the design is distributed in the same way to Tootal's London office, which serves the buyers with screenings or print-outs of the design. Before the sun sets over the Midlands, Tootal may be able to confirm an order for thousands of metres of fabric from Japan. And when it arrives, the fabric will look so much like the paper copy from the printer that few people can tell the difference between the two from more than a metre away. According to Halliwell, computerization of design means that Tootal can respond to the whims of fashion in weeks, rather than months. When a particular style does well, the firm can create dozens of similar designs and rush them into production while buyers are still interested. (Extracted from New Scientist, 10 February 1990, pp. 48-50)

Head-mounted display creates screen

Reflection Technology (Waltham, MA) is offering a head-mounted, ultraminiature CGA-compatible monochrome virtual display creating a screen equivalent to that of a 12-in CRT. The innovative display weighs about 2 oz. with the dimensions 1.2-x-1.3-x-3.2 in. Customers snap the product onto his/her headset and the image seems to float in space about 2-ft from the customer. Thanks to its compact size, the product can serve as a secondary screen or it can be used to bring computers where a full-size screen would be awkward. Contents of files are revealed only to the user. (Extracted from Information World, 23 April 1990)

Small memory card

Canon (Japan) has introduced a credit card-sized memory card coated with optical-recording material, potentially allowing users to carry vast amounts of information with them. The card is made with technology licensed from Drexler Technology (US), and can hold up to 2 MBytes of text, photos or graphics - 250 times the storage capacity of a smart card. Canon also says its Optical Memory Card is unaffected by magnetic fields and static electricity. Applications include high-security access cards and storing patients' medical histories. The firm predicts the market for such cards could pass $1 billion/year by 1995. A personal computer add-on will be required to read and write on the card, and should be available in early 1991. (Extracted from Business Week, 30 April 1990)

Computer using superconducting circuits

NEC plans to develop a computer using superconducting circuits. The company says it has discovered a way to make microchips with superconducting circuits. The circuits (Josephson junctions) are much faster than transistors made from semiconductors. The Josephson junctions switch on and off extremely rapidly when a magnetic field is applied or removed. The new NEC memory chip has 25,000 Josephson junctions in a chip 6 mm square. The chip can store 4,000 bits of digital data. The niobium and aluminum oxide superconductors operate only at 4K. The next step will be to make a microprocessor from the circuits. Fujitsu has also built a memory chip, containing 14,468 Josephson junctions. Josephson junctions operate 20-50 times faster than silicon or gallium arsenide semiconductors, but use 0.001 as much energy. (Extracted from New Scientist, 31 March 1990)

Data compression board boosts disk storage capacity

Infochip Systems (Santa Clara, CA), a new company, will offer a data compression board that boosts the storage capacity of every disk and tape drive on an MS-DOS computer by three times. The low-cost IC-105 data compression chip has been incorporated in the Expanz AT/XT-bus half card and the initial 1,000 cards will be at hand by spring, 1990. A three-fold increase is also seen for all floppy, tape and hard disk data transfer rates. IBM and other leading personal computer (PC) suppliers are now assessing the IC-105 for incorporation on the motherboards of upcoming PCs. The new chip has application for all forms of file data, including binary executable files for which the loss of even a single bit is intolerable. (Extracted from Information World, 30 April 1990)

Japan's electromagnetic ship prepares to test the water

Construction of the world's first ship driven by electromagnetism is nearing completion in Japan. If all goes well, the Yamato-1, a catamaran 30 metres long, will begin sea trials next year. But engineers doubt whether the technology will be suitable for commercial application in the near future.

The Yamato-1's propulsion system has electromagnets at the front of tunnels set in the ship's float. Sea water flows into the tunnels and charged electrodes set up a current in the water. The magnetic field from the magnets interacts with the current and the resulting electromagnetic forces push the water down the tunnel, emerging at the end as a high-speed jet. The problem with the technique is finding a way to generate a magnetic field strong enough to propel the ship at a reasonable speed.

The Japanese consortium, organized by a private foundation and the Government, increases field strength with superconducting electromagnets, cooled in liquid helium. Two diesel-powered generators, each rated at 2,000 kilowatts, provide electricity for the magnets, which will propel the 280-ton ship at a maximum speed of 8 knots.

Despite the use of the superconducting magnets, the result will be prodigiously inefficient. "If they just connected propellers to the diesels they might have a 20-knot ship," said one foreign engineer who has studied the project. The Japan Foundation for Shipbuilding Advancement, which is funding the project with the Ministry of Transport, agrees that electromagnetic propulsion is not cost-effective in the short term. Since 1986, the consortium has spent £16 million on the project. "The practical use of these vessels is still sometime off, but with a breakthrough in high-temperature superconductors it can be realized," one engineer said.

The companies building the magnetic thrusters, Mitsubishi Heavy Industries and Toshiba, are both working on new ceramic materials that become superconductors at relatively high temperatures. Unfortunately, no one has yet succeeded in producing them in a form that can generate powerful magnetic fields.

The foundation says that one day magnetic propulsion, which is in theory quieter and less polluting than conventional machinery, may be suitable for driving offshore structures and survey vessels. (This first appeared in New Scientist, London 9 June 1990, the weekly review of science and technology)

Self-healing DPLD can carry 10,000 ICs

A small British research company, Pilkington Microelectronics, has been set up specifically to promote the development of dynamically programmable logic devices (DPLDs) which can each carry up to 10,000 ICs. Any of these ICs can be reprogrammed while the device is being used. The system will call upon circuits as they are required and can substitute untapped circuits for any which develop a fault. This reconfiguration can be arranged at long range, such as the self-healing of a fault in a spacecraft.

Designer Kenneth Austin says the DPID combines the speed and power of an ASIC with the capability of a microprocessor, while self-healing is an important bonus. He added, "I conceived the idea out of frustration with existing ASICs."

Pilkington Microelectronics has a patent on this configurable IC with a unique local connection system in which each gate connects directly with a small number of other gates, each in a separate set. Each connection can be dynamically changed to bring in new functions or to bypass faults. The Pilkington group has rejected the possibility of producing the DPID devices itself or of selling the patent to the highest bidder but has decided to license the technology to silicon foundries.

The first licensee is Plessey, which will use it in an electrically programmable array with a high packing density. Pilkington now hopes to interest Japanese manufacturers. (Reprinted with permission from Semiconductor International Magazine, April 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Il., USA)

Laser-based mask making advances

Two new mask making systems have put scanned laster lithography into its second generation.

Late in 1989, ATEQ Corp. of Beaverton, Ore., introduced its CORE-2100. Among other benefits, this system provides an enhanced rasterizer engine that increases throughput of high density circuits. For example, the 2100 can write 1X mask for the Perkin-Elmer Micralign 660 at four to six times the speed of competitive electron beam mask writing systems.

ATEQ's latest system - the CORE-2500 - is capable of 0.6 m and a 0.025 m minimum address size. This system's key feature is a 0.6 numerical aperture 20X post scan lens that provides a more than 30 per cent improvement in overall system performance. (Reprinted with permission from Semiconductor International Magazine, February 1990 by Cahners Publishing Co., Des Plaines, Il., USA)

Sony first with laptop workstation

Sony Microsystems has launched the world's first portable workstation, Laptop News, based on the company's existing NWS-1500 series machines.

Steve Boniwell, Sony Microsystem's UK marketing manager, said the laptop News had been developed by repackaging existing technology into a compact portable unit. "This follows the typical drive for Japanese companies to make things smaller," he added.

The laptop News will be shipped to the UK in September and will cost about £8,000. "We have already received over 50 advance orders throughout Europe," said Boniwell.

"The workstation will be particularly useful for software vendors and anybody working out in the field," he continued. "The same capability is now available in the field as in the office."

The machine will come with an integral 240-Mb hard disk, as well as a 3-1/2 inch floppy disk drive. Main memory is 8-Mb, expandable to 12-Mb, and can run the full News-OS or Unix 4.3 operating systems.

Standard software supplied with the workstation includes X Window System version 11, a network file system, CGI graphics, TCP/IP and XNS communications, and four high-level languages - C, Fortran 77, Franz Lisp and Pascal. (Source: Computing, 7 June 1990)

Neural network technique reads handwriting

Nynex Corp.'s Science & Technology Center has received a patent for a neural network technique that enables computers to read handwriting with greater accuracy. The invention has widespread applications in the financial services, cheque processing and mail distribution industries, says Nynex, one of the seven US Bell companies. For example, when a customer pays a telephone bill now a clerk normally reads the amount on the cheque and manually keys in the payment. The system developed by Nynex could allow the computer to read the information directly from the cheque, Nynex said.

The method recognizes and "reads" documents that have been named into a computer and digitized by using neural network technology, external knowledge sources (such as past payment history) and probability theory. Neural technology is loosely modelled on how the brain works: instead of using a traditional computer's serial central unit, neural network have hundreds of simple processors operating in parallel and tied together by a dense web of companies. (Source: Technology Update, 12 March 1990)

Self-repairing chip

Motorola has jointly developed a self-repairing microelectronic computer chip with TRW (Redondo Beach, CA). The chip replaces non-functional chip cells with stored operational spare cells. The chip will be used as the central brain of a digital signal processing unit in airplanes, satellites and missiles. (Extracted from Research and Development, February 1990)

Infinite storage server

Epoch Systems (Marlborough, MA) has developed the Epoch-1 Infinite Storage server, providing access to nearly unlimited number of files almost immediately. In addition, the cost of the system is only $3.50/Mbyte compared to conventional storage methods costing some $20/Mbyte. Some problems with conventional methods include limited capacity, decreased performance near capacity, lengthy and inefficient backup time, long load times for files not stored on magnetic disks, and lack of expandability for most. In a hierarchical storage system, magnetic disk capacity is automatically managed by software, which transfers and loads information from optical systems at high- and low-water marks. In addition, hierarchical storage servers provide data for access within seconds of request. Hierarchical storage servers automatically backup information, while the server is supporting workstation users. New storage technologies can be added to the hierarchical system as they become available. (Extracted from Research and Development, February 1990)

Laser plotter

A Swiss company, [illegible]ng in printed-circuit-board production systems has developed a laser plotter that will allow small-

and medium-sized PC board manufacturers to run high-quality film production. The plotter, called HoloFlash and made by Fela Tec AG, also speeds the production of films.

The HoloFlash flatbed plotting surface measures 20 X 26 inches (510 X 660 mm), and the resolution can be set at 12 microns (2,000 dots per inch) or 6 microns (4,000 dpi). Regardless of the complexity of the circuits, the plotting time for the entire surface is four minutes at 2,000 dpi.

Using a Transputer-based parallel processor, the raster image processor (RIP) converts the customer's CAD data to a bit-map format on the fly.

An important part of the HoloFlash system is an integrated software package called FlashCAM. This was developed in conjunction with Fela Tec's US consultant, GraphiCode (Lynnwood, Wash.), and runs on an IBM-compatible PC AT.

With FlashCAM, image data can be previewed so that any errors are eliminated before starting production. The integrated package also allows users to edit and manipulate data.

The HoloFlash plotter uses a green, high-stability helium-neon laser. It operates at a wave length of 543.5 nm, which is particularly suitable for use with high-definition photoplotting films. It can also be used in a red safety-light environment.

The traditional mirror deflective element: this reduces sensitivity to vibrations and wobble, and it contributes to plotting precision. (Extracted from Electronic Engineering Times, 29 January 1990)

Optical data storage

Creo Products (Vancouver, B.C., Canada) is developing an optical tape recorder that is able to store 1-Tbyte of data/reel. The worst case time to access the 1-Tbyte will be 60 seconds, with an average access time of 28 seconds. The cost of the media is an order of magnitude less than present data storing systems. The media will also feature an archival life of more than 20 years with a corrected error rate of 1/1 tril. One of the most popular methods of storing data via optical systems involves using a reflective material on the back of a polyester, and burning holes or pits in the reflective material with a laser, so the material no longer reflects light in that particular area. Another method involves using a dye-polymer that when exposed to light changes its reflectivity properties. Finally, a third method involves using a laser to create a phase change in an amorphous material. Creo's optical tape recorder writes 32 data bits simultaneously, writing 4 bytes of information as the linear scanner crosses the tape. An address track is included along the side of the tape; this track is written with bigger bits, which can be read while the tape is running at high speed. Some applications for optical tape recorders include satellite communications, seismography and medicine. (Extracted from Photo Spectrum, February 1990)

Architects' plans transformed into holograms

For architects and designers, the chance to see three-dimensional images of their ideas would be a boon. Now, Japanese researchers have devised a system that can "print out" a hologram of any object designed on a computer. And their invention will not need a powerful supercomputer to function: all it needs is the kind of workstation common in industry.

The system is the work of a team at the Tokyo Institute of Technology. It begins with the object the designer has drawn up on the computer, viewing it through an imaginary wire grid. Initially, the system concentrates on the particular view of the object that is visible through a single hole of the grid. It scans that image through the single hole and transmits the resulting signal to a liquid-crystal display.

The display is illuminated with a laser beam which passes through the display. A lens focuses the beam, which then falls on a photographic plate. At the surface of the plate, the beam interferes with a second beam, which is in phase with the original beam, and the interference pattern that the two beams create forms a hologram on the plate. The resulting tiny hologram contains a view of part of the object as it would appear through a pinhole. The system then starts again and scans the image of the object through a square of the imaginary grid next to the first one. It transmits this image to the liquid-crystal display, and creates another tiny hologram on the plate next to the first. It continues doing this until it has scanned every hole of the imaginary grid and has, in effect, reconstructed the view through the grid onto the photographic plate as an array of tiny holograms. These holograms, the equivalent of a "pixel", or picture element, in a two-dimensional image, are known as voxels.

The array of voxels fulfils the two necessary requirements of a three-dimensional image. First, a viewer sees the image in stereo: each of the viewer's eyes focus on a different voxel, producing a different view of the object. Secondly, the image has parallax in all directions: by moving, the viewer sees different parts of the image through each voxel, so the object looks different from different angles.

The Tokyo system uses a Sun-4 workstation, a computer that designers use to visualize three-dimensional objects and which is about 10 times as fast as conventional personal computers. On this machine, it takes half a second to calculate the image for each voxel. A hologram of 160 X 128 voxels takes about three hours of computer time to compose. Unfortunately, it takes more than 50 hours to actually record the hologram, using the "printer" at 10 seconds per voxel.

At the moment, the holograms are in black-and-white. An additional benefit of the photopolymers, however, is that they can be made sensitive to red, green and blue all at the same time. As a result, the holograms could be made in full colour, from separate red, green and blue laser beams.

So far, the only major stumbling block seems to have been in the liquid-crystal display systems, where multiple reflections inside the display caused the researchers some unwanted interference patterns. In addition, the contrast was poor and there were too few shades of grey between black and white, says the team. Working with the Matsushita Electric Company, the researchers are solving these problems and have already made an improved display system.

With all the proposed improvements, the team says their system would take just over four-and-a-half hours to generate a hologram of 1,000 X 1,000 voxels, using half a dozen optical heads. (This first appeared in New Scientist, 19 May 1990, the weekly review of science and technology)

16-Mbit CMOS EPROM

NEC Corp. has developed a 16-Mbit ultraviolet ray erasable programmable ROM(UVE PROM) that integrates roughly 18 million elements on a 7.1 x 17.1 mm chip.

Like a mask ROM whose contents cannot be rewritten, an EPROM is used for storing data and programs in word processors, game machines, and factory automation equipment. Mass production of 16-Mbit mask ROMs is already in progress, and the same is being demanded for 16-Mbit EPROMs.

The company used new technologies such as (1) element separation technology based on the use of trenches; (2) a multicrystal intersilicon insulation film having an oxide film-nitride film-oxide film (ONO) construction; (3) a self-alignment contact technology of drain; (4) a 0.6 μm CMOS processing technology, by which it succeeded in producing a 3.6 μm^2 memory cell which is about 40 per cent the size of a 4-Mbit EPROM. The new 16-Mbit EPROM was experimentally fabricated by using this trench type memory cell.

This CMOS EPROM's standard access time and power consumption are respectively 85 ns and 90 mW (when working at 8.3 MHz), and the memory construction can be switched over to 1 Mword x 16-bit and 2 Mword x 8-bit by inputting signals. The pin arrangement is compatible with the standard 16-Mbit mask ROM. Further information available from: NEC Corporation, Public Relations Office, 5-33-1, Shiba, Minato-ku, Tokyo. Tel: 03-454-1111, Fax: 03-457-7249 (Source: JETRO, May 1990)

64-Bit RISC microprocessor

Matsushita Electric Industrial Co., Ltd. and Solbourne Computer, Inc. (USA) have jointly developed a reduced-instruction set computer (RISC) microprocessor, the MN10501, compatible with the 64-bit scalable processor architecture (SPARC), and samples are to be distributed this autumn.

Until recently, microprocessors were developed in the form of a chip set due to limitations on their degree of integration by design and processing technologies. Much time was required for interchip data transfer and processing performance was limited, with the result that 1-clock 1-instruction processing, the characteristics of a RISC microprocessor, was difficult in super high-speed processing.

Instruction and data address conversion are executed in parallel by the new microprocessor by providing two translation lookaside buffers (TLBs). By using a register file incorporating a data drive clock system, the number of clock signals necessary for executing data loading/storing instructions, which appear at a frequency of 15-20 per cent in many programs, is reduced to one clock signal. Use of a branching 2-stage evaluation circuit eliminates unnecessary cycles generated when executing branch instructions, by which the number of clock signals required for processing a given instruction is reduced, which, in turn, increases the processor's processing capacity. An open architecture SPARC is used, and the outside and inside buses have a width of 64 bits for better performance.

The 0.8-micrometer rule CMOS process is used to integrate about 1 million transistors on a 14.85 x 15.18 mm chip, such as for the CPU, floating-point processing unit, instruction cache, data cache, and bus controller, and packaged in a 238-pin PGA. The processing performance is up to 40 MIPS (million instructions per second) or 20 MFLOPS (million floating operations per second). By connecting four MN10501 microprocessors, it is possible to perform super high-speed processing at up to 90 MIPS.

Up to now, a 64-bit microprocessor was suitable only for specific fields such as for CG processing, but development of the new versatile microprocessor is expected to clear the way for using it as the main processor for high-performance workstations, various OA equipment, and industrial equipment. Further information available from Matsushita Electric Industrial Co., Ltd., Overseas Publicity, 1006, Kadoma, Kadoma City, Osaka. Tel: 06-908-1471. Fax: 06-906-1507. (Source: JETRO, May 1990)

Dictionary search processor LSI circuit

NEC Corp. has developed a dictionary search processor (DISP) LSI circuit that can use input words and/or idioms for verifying and retrieving 33 million characters (equivalent to roughly 3,300 newspaper pages) from the text of reports, treatises, and/or newspaper articles stored in electronic files.

DISP is a large-capacity processor LSI circuit that integrates 1,208,000 transistors on a 13 x 25 mm chip by using an 0.8 μm CMOS process technology and a 3-layer aluminum printed circuit technology. It was achieved by developing the company's unique 160-kbit large-capacity associative memory capable of storing 2,000 retrievable words, and of verifying these 2,000 words with 33 million characters/s, and the development of a fuzzy word retrieval processor that searches the stored information for the words most closely equivalent to the input word, even if there are one or two erroneous words in the retrieval words.

In addition to word verification in about one second, which used to require about 10 hours, it incorporates a number of distinct functions including a prefix/suffix retrieval function for retrieving words such as Japan XXX and XXX University, a don't care retrieval function for verifying the retrieved information by ignoring a part that is not so important, and a syntax retrieval function for finding specific syntaxes such as if ... then ...

DISP not only enables superhigh-speed information retrieval, but can also be used to create a reasoning function by using its various functions. Thus, the company expects that DISP will be suitable for information retrieval in newspaper companies, libraries, and other fields, including high-speed retrieval of intelligence information in artificial intelligence (AI) systems used for gene information analysis and for high-speed conversion of words in mechanical translation systems. Further information available from: NEC Corporation, Public Relations Office, 5-33-1, Shiba, Minato-ku, Tokyo. Tel: 03-454-1111. Fax: 03-457-7249. (Source: JETRO, May 1990)

1-Mbit Bi-CMOS ECLSRAM

Fujitsu Ltd. has developed a 1-Mbit BiCMOS ECLSRAM. Large-capacity memory chips are generally produced by MOS technology featuring excellent integration and low power consumption. The rapid emergence of superhigh-speed electronic systems demands memory chips having large capacities and superhigh speeds in combination, however. BiCMOS technology enables integration of a bipolar element and a CMOS element on the same chip. Thus, it is attracting attention as a chip combining the superhigh-speed attribute of a bipolar element and the low power consumption attribute of a CMOS element.

With large-scale integration proceeding at a rapid pace, the number of faulty memory cells inside these chips is increasing. As a counter-measure, a method of providing a spare memory cell array, such as an ordinary DRAM, to enable switchover when some defect occurs is used, but this switching part's circuit obstructs the development of superhigh-speed chips.

In this respect, the new SRAM is designed for minimal passage of signals through the switching circuit, by which the delay time for circuit switchover has been made negligible to enable superhigh-speed chip operation. Circuit switchover is performed by the method of polysilicon fuse blowout with a laser beam. Also, noise that obstructs superhigh-speed chip operation is generated when performing superhigh-speed conversion of signals input from small-amplitude ECL chips to large-amplitude Bi-CMOS chips, but this noise has been eliminated by devising a level converter circuit by which smooth superhigh-speed chip operation is possible. As a result, a standard superhigh-speed access time of 6.5 ns has been realized.

By using the 3-layered polysilicon, 2-layered aluminum printed wiring, and 0.8 μm Bi-CMOS technologies, the memory cell size is reduced to 41 μm^2 and the chip size to 90.48 mm^2, which is only about two thirds the size of a conventional 256-kbit ECLSRAM.

The power consumption is 800 mW at 80 MHz, and to realize both low power consumption and high-speed operation, a circuitry technology is incorporated as in connection with the wired OR type sensing amplifier to enable connection of several gates in common. The word construction is 256 kword x 4 bit, the package is of 32 pins of flat or DIP construction, and the company plans to distribute samples in the latter part of this year. Further information available from Fujitsu Limited, Public Relations Dept. 1-6-1, Marunouchi, Chiyoda-ku, Tokyo. Tel: 03-215-5236. Fax: 03-216-9365. (Source: JETRO, May 1990)

Unravelling the facts of life

The quest for a complete picture of the human genetic code is now a matter of time, money and computation, with the experimental issues mostly well understood. This is according to Dr. Ron Catterall, Director of the research computer unit at the Imperial Cancer Research Institute (ICRF), which is at the centre of the international human genome project, with control over construction of the genome data base.

So to a large extent the success of the human genome project, which promises to bring great benefits in the understanding and cure of many diseases, especially inherited diseases, depends on the solution of IT problems.

The raw finished product will be a data base listing the exact sequence of three billion base pairs along a single strand of human genome. This does not present any great problem for present-day data base technology, since it is just a single, albeit long, string of letters.

The far greater problem is in organizing the scientific information during the investigation in such a way that researchers all over the world can readily access it and update it. This second task will culminate in an online library relating the genome to the array of biological functions and diseases.

Although the pace has quickened only in the last few years, investigation of the human genome began as a co-ordinated international exercise during the 1960s, and to begin with information was recorded manually on index cards. Scientists met regularly to discuss the results of experiments, agree where they were at, and then update the record of this common consensus.

From index cards this information progressed to a loose PC environment, and then to a hierarchical IBM mainframe data base held at Yale University.

However, the human genome executive decided it wanted a relational data base. For the last year or so they have been concerned with planning this new data base and deciding what hardware base to run on.

However, the hardware decision turned not so much on technical considerations but on the type of kit already installed at one of the key US partners, US Johns Hopkins University.

"The hardware platform grew out of the fact that Johns Hopkins had workstations installed, and its condition for coming into the project was that it had to be done on Suns," admits Catterall.

Similarly there was pressure from the US to adopt the Sybase relational data base, in preference to rival contenders from Oracle and Ingres.

The project is regarded as a key showpiece for the technology by data base vendors (and to a large extent by other IT suppliers such as IBM), and they are all jostling for a role in the project.

But a more immediate question is how the data base is going to be distributed around the world to enable researchers to access and update the information. Until recently much of the updating work has been concentrated into a one-week annual meeting when up to 1,000 of the key scientists convene. But with modern data base technology it should be possible to have the information updated remotely throughout the year, so that the annual meetings can be freed to some extent from the chores of first deciding what should be recorded in the data base and then entering the data.

So the project is now considering how best to establish a distributed data base reaching well over 1,000 researchers around the world.

The amount of data involved is quite modest compared with many large commercial data bases, but it will grow into one of the world's largest if current projections are correct.

According to Catterall it stood at 23-Mbytes last September, but is expected to double in size every six months for the next 12 or 18 months, and thereafter double every three months over a 10- or 15-year period. On that basis it will end up at least 23 million terabytes in size, which is truly astronomical.

Given the projected growth in the data base and the surrounding applications, Catterall is keen to start using computer-aided systems engineering (Case) tools to ensure that programs are properly written and documented.

One of the key applications surrounding the data base, where Case tools will be applied, is the user interface, which governs how scientists access and update the information.

An obvious target is to enable scientists to work on screen in the same style that they communicate among themselves.

However, the task of developing a wimp environment with the required flexibility and ease of use for such a complex application is not trivial, and it will not be available for the next committee meeting in Oxford. But the project demands some sort of user interface so that scientists will be able to access and key in data during this next meeting, so the aim is to develop a rudimentary version as a first phase.

At the meeting scientists will be offered a choice of Sun Sparc stations, Apple Macs or IBM PCs for their report writing and data access, to cater for different religious affiliations.

These will be linked via an Ethernet LAN to a Sun workstation, providing access to the data base. The data base will be held on a Sun 4/270 server at Oxford, which will be linked by Kilostream circuits with TCP/IP routing to a pair of similar Sun servers at an ICRF building in London.

The same data base will run on both the Oxford and London systems, kept in sequence via the Kilostream links, which are duplicated to provide alternate routing. At the same time the data base in London will be split across the two processors, with mirrored discs as well.

However, during the meeting it is hoped that all work will be carried out locally on the Oxford server, with the London system acting as backup. This arrangement indicates the importance of both fault tolerance and disaster tolerance for the project, and this will increase as the data base grows in size. (Extracted from Computer Weekly, 29 March 1990)

Future office images

In many ways document image processing is perceived in the same way as data processing was about 30 years ago. There is a vague belief that it is probably a good idea, but high initial cost, unfamiliarity and technical risk prevent many organizations from introducing this new technology. It might be argued that DIP is not new, but rather the blending of existing technologies into a novel and potentially fruitful union.

DIP differs primarily from conventional computing in the method by which information is introduced into the system. Most dp staff are used to the idea that information must be keyed in some predefined format before it can be usefully processed electronically. In DIP, paper documents of whatever kind are scanned directly into the system and stored as bit maps representing a pictorial image.

The advantage is obvious. Documents can be entered very quickly and accurately. But the disadvantages are also considerable. The main drawback is that information is not machine processable in the way that, for example, an Ascii file would be. The same technology can be used for the storage and retrieval of technical drawings or any other visual material.

One of the metaphors commonly used to describe computer storage to beginners is the filing cabinet. In fact, we can regard a DIP system as an electronic filing cabinet in a far more literal way. But rather than storing the physical document, it stores a picture of the document. Another disadvantage of the scanning input method is that storing an image takes up far more disk space. DIP would not be a practical possibility without the mammoth storage potential of optical disks which are the second ingredient of the DIP recipe.

The severe limitations of optical disks are probably one of the barriers to widespread adoption of the technology. Being able to write to a medium only once renders it useless for most dp applications where updating information plays such a vital role. (Strictly speaking you can update an optical disk by writing a whole new version of a file and treating the old file as lost space. In most practical applications, it would be prohibitively expensive as you would rapidly use up disks.)

It is a perverse twist of fate that the characteristics of scanned images and optical disks mesh so well with their respective weaknesses, effectively cancelling each other out. Scanned images are virtually useless for normal data processing anyway, so the question of updating them does not arise. DIP relies strongly on human interaction and has found its most obvious applications in helping customer liaison staff interface with the general public.

Scanning and storing huge volumes of data in the form of document images is one thing but finding the relevant document again when it is needed is quite another. When documents are scanned into the system, they have to be tagged in some way. Usually this is done by attaching a conventional dp record with a reference number of some kind.

For some reason this type of indexing is kept very simple in practice, although the full power of ordinary dp could be brought into play with more sophisticated indexing techniques. In principle the image itself could be used as a source of machine usable data by intelligent character recognition. The software to do this is currently complex and expensive. It is also only 99.9 per cent accurate - which may sound quite good, but is hopeless for most conventional dp applications.

Given the difficulties, it may seem remarkable that any organization would have the courage to introduce DIP into its corporate strategy. But, of course, the potential gains are enormous. To understand the main advantages of DIP it is only necessary to consider the disadvantages of paper

itself. It takes up a lot of room, for one thing. It is often difficult to find a file when it is needed, which can have a disastrous impact on efficiency. And where several people may need access to a document, perhaps simultaneously or in an established sequence, the efficiency limitations of passing one copy around are obvious.

However, all else being equal, a new and expensive technology is usually one introduced in an organization as the result of some new external challenge which conventional technology is inadequate to meet. It is surprising how problems seem to appear in response to solutions becoming available.

In spite of the IT revolution, about 90 per cent of business information is still held on paper. The much heralded paperless office has not yet materialized. In fact, the demand for paper is actually increasing by about 5 per cent a year. It was the fear of drowning in paper which motivated British Telecom's Mobile Communications group to implement a DIP system. With over 400,000 documents filed by telephone number a substantial paper problem already existed, but an anticipated threefold increase in business over a three-year period convinced the management that a DIP system was the only answer.

Substantially improved customer service appears to be an experience commonly shared by companies who have bought DIP systems.

The implementation was carefully planned and the anticipated benefits have materialized, but the potential the system has opened up has been something of a surprise. Just like dp, image processing seems to whet the user's appetite for more.

In the excitement of introducing DIP, it is probably easy to forget that automatic processing is where the biggest productivity gains lie and that DIP is best treated as an extension of normal dp operations rather than as a separate entity.

Another major advantage of DIP over physical paper is getting the document around the people and departments necessary in the normal course of business. In this respect the Workflo language which is part of the Filenet system used by BT Mobile Communications is a major boon in controlling the movement of images around the system.

An aspect of DIP which can catch people out who are used to thinking in conventional dp terms is the response time when retrieving an image.

It was the stimulus of a massively expanding workload which caused Brentwood District Council to introduce a DIP system in order to cope with the United Kingdom's newly introduced poll tax. Instead of keeping records of 20,000 properties under the old rating system, the council would have to cope with 56,000 adults - an almost threefold increase in filing workload.

Other local authorities may follow the lead of Brentwood and introduce DIP to cope with the mass administrative burden of the poll tax.

Maybe in 10 years DIP will be as common as dp is today. (Extracted from Computing, 10 May 1990)

V. COMPUTER EDUCATION

Long distance training

The Open University (UK) proved that students can study from home as successfully as their campus-bound colleagues. Now a number of teaching and training organizations are exploiting advances in technology to make distance learning more attractive.

The requirement that students have to relocate to the centre of learning is rapidly becoming outdated as tutoring is delivered to the home via computer conferencing, cable television and video conferencing. Companies are also beginning to exploit their corporate network to deliver training to employees, whether locally or internationally.

There are two sides to the distance learning medium. While interactive training can refer to students or trainees using a PC combined with, say, video features, to work at their own pace, a number of organizations are attempting to overcome the problem of remote students feeling isolated, and to exploit their resources over a wider geographical area.

Two British universities have adopted video-conferencing technology to link their diversely located tutors and students at remote colleges. Video-conferencing is seen as the most advanced version of distance learning although others are relying on electronic mail as a cheaper option.

The University of Wales has recently installed British Telecom's video-conferencing system - due to go live in May - to connect the colleges of Cardiff, Bangor, Lampeter, Swansea and Aberystwyth and will later provide international links to industry and other universities.

Tutors and students at the different locations in Wales can view and talk to each other in real time over the BT network, saving travelling costs and time.

The system is thought to be the first of its kind in Europe - if not the world - according to BT and allows lectures and seminars to be interactively conducted from studios at each site.

The system will cost the university £1.5 million over five years after discounts from BT.

The concept has its origins in the University of London's Livenet demonstration system, a jointly funded project with BT which was installed in 1986.

Although the concept is the same, the technology is not. Livenet is based on a fibre optic system which was not cost effective for Wales with its vast distances. Instead, the Welsh system uses the cheaper and leased BT Megastream lines using compressed video techniques to carry the vast amount of data needed to transmit moving pictures in real time.

Although many companies have spare capacity in their Megastream leased lines, many are not yet exploiting the capacity for new applications such as video and particularly to reduce the cost of training.

But video technology, although getting cheaper all the time, is expensive and there are cheaper ways of introducing technology-based distance learning options.

As hardware manufacturers such as IBM begin to market digital video boards for PCs, the market for interactive PC-based training will lead to a revolution in the training market.

But one problem with current distance learning courses is that there is a long communications gap between the tutor and student. One approach to overcoming this problem is to link remote students to the university through computer conferencing, although not with video links.

The University of London's Birkbeck College, where students are mostly part-time, is using computer conferencing to take part-time M.Sc. degrees from home or the office using a PC. The first intake using computer conferencing, or network learning as they term it, is due to graduate this year. Students do not have to relocate to London and the interest from candidates elsewhere in the country has been very high.

The College says the technology enables a large number of students from all over the UK to "study the same material and learn from each others' experience and understanding, avoiding many of the problems of learning in isolation encountered in other distance and open learning courses".

Universities cite the interactive feature of the technology as a primary benefit and now commercial training providers are looking to offer similar facilities in the home.

A pilot project is currently under way to exploit cable television to deliver IT training interactively. The consultancy firm IT World, in conjunction with Westminster Cable Television, is looking to "test the effectiveness of cable television as an interactive tutoring/monitoring medium in combination with other distance learning methods".

The system is interactive because students can phone in with questions during the live transmission which can be answered immediately on screen. This will overcome the problem of students feeling isolated as they do with non-interactive distance learning programmes. Teletext material will also be sent to the student's system via the cable network.

The first intake got off the ground in June 1990. The course will deliver 200 hours of validated IT training to 50 remote students. Trainees will be loaned a PC and will be offered word processing, data base, spreadsheet and telecommunications courses. Optional modules include computerized graphic design and accounting. They see it as an advantage to women returners and other home-based staff wishing to update their skills without having to commute to the course.

But there is no reason for companies wishing to implement distance learning in the workplace to invest in new technology. For example, DEC uses many training mediums such as regular field training, self-paced learning, computer-based and interactive video training. Now it is moving to exploit its existing investment in networking to create international training classes and is currently conducting a pilot programme.

The aim is to let trainees, regardless of location but at a similar skills level, to interact with one another and a single tutor. In this way, the tutor can immediately tailor the course depending on the feedback from the class.
(Extracted from Computer Weekly, 17 May 1990)

Teaching by the tube

If you are looking for a way to continue studying without the hassle of getting to and from school - especially during wintry weather - your search may be over with the publication of a listing of 282 videotape courses offered through a consortium of 34 US universities' engineering schools.

The group, the Association for Media-based Continuing Education for Engineers Inc. (Amcee), has produced a 1990-91 catalogue, "Amcee Videotape Courses for Engineers, Scientists, and Technical Managers", which describes courses in 14 disciplines, such as general engineering, electrical and electronics engineering, mathematics, computer science and engineering, statistics, business administration, and safety.

Included in the 28 electrical and electronics engineering courses are adaptive filtering and control, future trends in chip- and board-level IC packaging, Japanese advanced sensor technology, modern spectral analysis, optical-fibre communication systems, and very large-scale integrated devices and technology.

Preview packages, many of which are free, are available for most courses. The catalogue is free. Contact: Amcee, 613 Cherry St., Suite 307, Swann Building, Atlanta, Ga., 30332-0210; Tel.: 1-800-338-9344; Fax: 404-894-8714.
(Source: Spectron, March 1990)

VI. SOFTWARE

Modular approach to software

A modular approach can enable software to be written faster and make computers simpler to use. Software has generally been customized for certain tasks, similar to the way that handcrafted furniture is made. Now more software is being written in modular or prefabricated pieces that can be joined together in various combinations to create complete programs tailored for a specific task. B.J. Cox of Stepstone (Sandy Hook, CT) called the change a "software industrial revolution". The change has been brought about by the amount of time it takes to write programs from scratch and the complexity of large programs. The modular approach to programming could enable computer users who are not skilled in programming to develop their own customized programs by combining individual modules or "objects". The modular approach to software design is also known as object-oriented programming.

Hewlett-Packard's New Wave computing strategy is based on object-oriented concepts. Microsoft is introducing object-oriented features in its operating systems software for IBM and compatible computers. Almost every other software company is jumping on the "object-oriented" bandwagon. Ordinary computer programs contain thousands or even millions of lines of instructions, which frequently are intelligible only to the original programmers. Replacing one set of instructions with another can often foul up the program elsewhere. Traditional programs also have separated data and instructions from each other, but object-oriented programs combine both data and instructions into a single software module or object. The modular approach could facilitate the exchange of data among various programs.
(Extracted from New York Times, 23 April 1990)

Microsoft eases DOS migration

Microsoft has opened the way for a mass of DOS-based windowing applications to move to OS/2 and Presentation Manager with a software migration kit.

The new kit provides a layer of code that makes converted MS-Windows applications look, feel and work like OS/2 Presentation Manager applications and enables them to use OS/2 features. Microsoft is also promising to bundle the system into the next release of OS/2.

Given the popularity of Windows among software developers, this should lead to a massive increase in sophisticated applications becoming available on OS/2.

The converted applications will run only 5 to 10 per cent slower than if written native under Presentation Manager, says Microsoft.

Microsoft has also made a significant assault on the Apple Mac market, launching a series of electronic mail utilities with Touch Communications and Farallon. The products build on Microsoft mail and add transparent use of the native Applelink local area network software, X.100 messaging, fax gateways and a voice messaging facility which incorporates sounding recording, compression and playback.

Microsoft has also provided software development kits both for building gateways to Microsoft mail and for e-mail applications to be triggered from within Apple's Hypercard. Gateways expected to come on line shortly from the gateway development kit are IBM Profs, VMS Mail, DEC Message Router (for All-in-One), MCI Mail, Unix simplified message transfer protocol and Wang Office. (Source: Computing, 10 May 1990)

Omnivirus

After the disinfectant which kills all known germs comes the software which kills all known viruses.

Sounding rather like a Saturday night video, Virus Terminator has been produced by MoS Technology and, like its X-rated namesake, not only identifies known viruses but destroys them without losing any data.

The package works, say its originators, by checking for the 82 currently known viruses and also making a backup of all clean files, thus keeping valuable data safe.

As well as finding the dangerous viruses, the program is said to be able to detect 66 of the most common trojans which are potentially damaging.

MSS says it has sold "several thousand" copies of the program to office equipment suppliers and dealers for bundling with hardware. (Source: Computing, 10 May 1990)

A treasure trove

Now you can check out which software package you need and which vendors produce them. The third edition of The Engineering & Industrial Software Directory describes 5,480 software packages for engineering, industrial, and manufacturing applications.

Each entry describes the program and the operating environment. Also included are the names of persons responsible for developing the programs, documentation, source code language, updates planned, quoted purchase price, and reference to any reviews.

The hardbound directory, which costs $175, is cross-referenced by vendor, subject, program name, hardware, and operating system. Contact: Marcia Kaufman, Engineering Information Inc., 345 East 47th St., New York, N.Y. 10017; Tel.: 212-705-7600. (Source: Spectrum, March 1990)

Word association software

Management Information Technologies' (MITI) (Washington, DC) new software enables a personal computer to recognize associations between words. Called readware, the Research Assistant calculates the relationship between words with similar roots to aid in text retrieval. It allows users to retrieve information about a topic without constraining them to use specific words or syntax. The new software package searches a data base to find information that relates to a specific idea or point of fact. Data bases in any alphabetic language can be searched with the new software, which works on IBM PCs and compatibles. (Extracted from Computerworld, 5 February 1990)

IBM offers Next software

IBM will offer software from Next for use on workstations and PS/2 personal computers. Next step will be available for machines run on AIX, which is IBM's version of Unix. IBM will also offer OSF/Motif developed by Open Software Foundation for use on Unix machines. Observers say the IBM announcement is good news for Next, but software developers will now have to produce the programs to work with Nextstep. Nextstep will make programming for Unix operating systems much easier. IBM will introduce its new workstations in mid-1990. Nextstep will give IBM users an alternative to OS/2 and Presentation Manager for workstations, but not for PCs. (Extracted from New York Times, 6 February 1990)

New spreadsheet

Lotus Development and IBM have unveiled the 1-2-3/M spreadsheet. The companies say the new product will assist MIS and micro managers in jointly constructing and porting spreadsheet applications across hardware platforms. It is mainly targeted at multi-division corporate accounts. Several 1-2-3/M capabilities are seen with 1-2-3, Release 3, including: 3-D worksheets; an online relational data base capable of accessing host data bases via Lotus' Data Lens; and the power to link files in memory. Buyers of 1-2-3/M will enjoy advanced editing and printing capabilities and will be able to mix various charts thanks to IBM's GDDM interactive Chart Utility. The 1-2-3/M product can be used on a variety of IBM MVS- and VM-compatible mainframes. Italian, German, and French versions will be issued in September 1990. Marketing will be performed by IBM only. Lotus will maintain and support 1-2-3/M. (Extracted from Information World, 5 March 1990)

New program to "teach" robots

Sandia Laboratories (Albuquerque, NM) has developed a new computer program that aids robots in

assembly procedures. Called Archimedes, it automatically figures out how parts should be assembled. With this latest innovation, robots can "teach" themselves to put together even the most complex mechanical products. When given a 3-dimensional model created with a computer-aided design (CAD) system the oftware tries out various step-by-step routines until it finds the one that is correct. This assembly plan is then fed into a compiler, which changes the plan into specific instructions that are needed by a certain brand of robot. Archimedes is being developed for use in nuclear weapon plants. (Extracted from Business Week, 12 March 1990)

Artificial life science used to develop software

Artificial life science is being used to develop software that acts like living creatures so that computer programs can evolve into more powerful programs through their own interaction. A computer runs several programs simultaneously and then chooses which ones are most efficient. Those are merged with other efficient programs to create a more evolved program. Work in this area is being done by Thinking Machines (Cambridge, MA), a parallel supercomputer maker; Borland International (Scotts Valley, CA), a software publisher and the University of California at Los Angeles (UCLA). Thinking Machines has developed a program to sort a list of numbers using artificial life techniques. UCLA researchers have developed a program that mimics mosquito behaviour; the program is being used to assist in getting rid of mosquitoes in Alameda and Orange Counties in California. Borland International's redesigns of three of its programs has allowed small software module interaction to control the programs. (Extracted from New York Times, 28 February 1990)

Computer assisted "shorthand-to-text" system

A computer program has been developed at the Microprocessor Systems Lab., CSD, to recognize the shorthand strokes and produce text in the desired script. A shorthand system known as "Saney's shorthand" has been used, which records only the sounds and is thus language independent. Once the computer is informed about the language in which the dictation has been taken, the appropriate "phonetics-to-text dictionary" is invoked to produce text in the designated script.

The program has been written in "C" programming language and the software runs on the IBM PC/XT/AT. The work has been carried out as part of the DOE project "Computer Assisted Text Generation from Phonetic Shorthand". The main features are given below:

(a) The software is user trainable; thus rather than the user having to learn a new system of shorthand, the computer system learns from the user the meaning of specific shorthand strokes;

(b) For phonemes to word, three dictionaries: (i) "primary", (ii) standard phrase and (iii) user defined phrases, are used;

(c) The software was tested for "Saney's Shorthand". It is however equally valid for any shorthand system;

(d) The technique can be used as a fast data entry system.

The software consists of two main modules: one for recognition and the other for subsequent transcription.

RECOGNITION: To begin with, samples of each class of strokes are entered, which are used by the program to calculate the linear boundaries for each class. The unknown patterns are then processed using these boundaries. While taking dictation, the shorthand strokes are entered manually using a joystick. Each user can have a boundary file for him/herself, which is used to recognize the strokes entered by that individual. This module has a self-learning feature too. If a stroke is not recognizable, the program interacts with the user and "learns" the unknown stroke by putting it along with previously recorded samples.

TRANSCRIPTION: The strokes entered are recognized and sent as a set of key codes, to search the phonetic dictionary for the appropriate language and thus find the exact spelling. When the exact word for each code is obtained, the text string consisting of these codes is formed, which can be examined and edited using a multilingual text editor. The software is now being adapted for Pitman's shorthand, which is the most popular shorthand system.

The following future work is proposed:

(a) Development of neural model for high-speed signal processing;

(b) Development of Braille input/output system with computer interface, for visually handicapped;

(c) Development of BRAILLE SHORTHAND system;

(d) Enlarging the phonemes-to-word dictionaries. (Source: Research and Consultancy at IIT, Madras, April 1990)

The friendly face of the industry

The computer industry is not simply the environment villain of the world. A growing number of environmentally concerned organizations and agencies are turning to computerized data bases to help serve and save the earth.

Computer suppliers are eager to make a positive, rather than a negative, contribution to the environment, and are helping to fund several projects.

At the London Zoo, the Institute of Zoology runs a data base for the National Federation of Zoos, called Noah - the National Online Animal History data base. The aptly named Noah maintains a list of all rare species in 15 to 20 UK zoos, which send the data in to the institute on disk.

Once the data is in the system, zoos can dial up the data base and ask for information about a particular species.

The data held on Noah is also sent to the International Special Information System (ISIS) in Minnesota to which several hundred zoos world wide send similar information.

Noah runs on an IBM PC AT, and is being converted to Informix Unix from MS-DOS.

That is not something that the World Conservation Monitoring Centre in Cambridge has found to be a problem. Its computer centre in London's Kew Gardens has been the recipient of a large amount of both hardware and software to support its conservation data base.

The centre acts as a unique repository for a wide range of data on environmentally sensitive issues, such as lists of details of endangered species in the world - Peter Scott's Red Books - national parks, habitats of special interest, and grimmer concerns such as tracking the ivory poaching industry.

In addition, IBM donated PCs, Ingres donated its relational data base to run the centre's core data base, and Santa Cruz Organization donated its open desktop system which has a built-in Ingres data base.

Almost more valuable than the computers and software is the training and staff time which the sponsors have given the centre, which will move from Kew to Cambridge shortly.

The original Wang-based system is now old and proving a constraint to the centre's activities. By implementing an open systems strategy the centre also has the advantage of being able to use kit donated from a variety of suppliers.

But not all environmental organizations are as ready as World Conservation Monitoring Centre to attract industry sponsorship.

At Greenpeace, the environmental lobbying pressure group, Kris Thornton, computer manager, is more wary of companies' enthusiasm for high profile sponsorship of the green cause.

He believes it is important for Greenpeace not to be seen to be endorsing particular commercial products by engaging in publicity enterprises.

It was for this reason that Greenpeace turned down the offer recently of a Portable Macintosh laptop, because Apple wanted to make the presentation at one of its awards ceremonies.

Without the publicity deal, Greenpeace is not offered much computing kit.

Greenpeace is expanding its computerization, however, but its use of IT remains modest.

If Greenpeace takes a particularly purist line on sponsorship, that does not deter the suppliers. Computer giant IBM has become increasingly conscious of its role in the environment, both for good and bad.

UK boss Tony Cleaver is chairman of the Business in the Environment target team which is conducting a two-year study of some major companies. It will look at the extent to which they affect the environment as a whole, from CFCs to the integrated circuits to choice of wood for the desks.

The company has also appointed a main board director with responsibility to look at all of IBM - from property maintenance to manufacturing, and see how current practices can be improved to make them environmentally friendly.

Such in-house cleansing is also matched by outward-looking sponsorship in a large variety of environmental charities and research organizations. One of IBM'S flagship projects is the £3.6 million donation of a 4341 mainframe and PS2 PCs, plus software and seconded employees to Grid, the United Nations Geographic Referencing Information Database in Geneva. (Extracted from Computer Weekly, 26 April 1990)

VII. COUNTRY REPORTS

CSFR

Czechs look at E-beam projection

Engineers at the Institute of Scientific Instruments, Czechoslovak Academy of Science, Královopolaká, Czechoslovakia, have constructed an experimental 1:1 electron projection stepper. Their first experiments with this instrument yielded 0.2 μm resolution of 20 mm by 20 mm chips. They exposed the chips in 0.1 seconds in PMMA resist.

Electron projection lithography is not new, but the technology has not matured because it lacks a high photoemission source

The Czechoslovak group has been working with electron emission from a metal-insulator-metal (MIM) cathode - an aluminium, aluminium oxide and resist, and gold structure fabricated on sapphire. When a voltage potential is applied to the metal layers, electrons flow through the dielectric and some of these electrons are emitted into the surrounding vacuum.

The initial exposures were done with a current density of 100 $\mu A/cm^2$. (Reprinted with permission from Semiconductor International Magazine, February 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Il., USA)

European Community

ESPRIT ASIC initiative

Europe's ability to make leading-edge sub-micron application specific integrated circuits (ASICs) should be bolstered by the latest initiative to emerge from the ESPRIT high-technology research programme.

If all goes to plan, complex ASICs should be running off fully qualified 0.7-micron CMOS chip-making lines by the end of next year, with devices being produced on a 0.5-micron CMOS process some time in 1992.

Four European ASIC makers and three research centres have been brought together in the European Community-funded ESPRIT project 5048.

Chip makers ES2 based in France, Matra MHS of France, Mietec of Belgium and STC of the UK will be working alongside Britain's Plessey Research, France's CNET telecommunications research laboratory and Belgium's IMEC chip research centre. (Source: Electronics Weekly, 23 May 1990)

Europe votes yes to £260 million network plan

EC ministers have voted to spend £260 million on linking member governments' computing systems together in preparation for the single European market.

The UK Government opposed the plan, arguing that it will strengthen the European Commission's civil service by giving them access to government data.

The plan covers six areas. The most important projects are seen as those involving the linking of customs, social security and indirect taxation (vat) systems from the 12 member countries.

The Commission says the linking of these systems will be essential once border controls are removed in 1993, both for chasing criminals and to replace physical checks on customs and value-added tax documentation.

Other projects include a pan-European environmental monitoring system and the linking of medical records data bases for the sharing of information.

The plan was approved under the majority voting scheme in the council of ministers, which was introduced to speed up progress on single market measures.

Opposition is also expected from civil rights groups over the plans to link police and customs intelligence data bases.

The ministers also awarded a further £345 million to telecommunications research, including aid to Europe's telecommunications administrations to introduce a pan-European ISDN digital service by 1992 and in the longer run to set up an integrated broadband network running at 150-Mbytes a second or faster. These networks will be needed to support the pan-European administrative systems.

In addition, £290 million has been awarded for new ESPRIT research into advanced technologies such as optical computing and very large capacity memory chips. (Source: Computer Weekly, 3 May 1990)

More interest in Europe's chip initiative JESSI

Europe's semiconductor equipment and materials companies are particularly enthusiastic over the EC's sub-micron chip initiative despite a second depressingly flat year for the semiconductor business as a whole.

The European Sub-micron Silicon Initiative (JESSI) is a £2.5 billion programme jointly funded by industry and the European Commission. It was launched under the Eureka programme umbrella, with some extra money coming from the EC's largest IT programme, ESPRIT.

It encompasses three major areas of activity: applications technology, materials and equipment, and long-term research. The four subprogrammes represent 41 per cent, 13 per cent, 32 per cent and 14 per cent of the total cost.

Twenty-two projects have now been approved, with seven in the materials and equipment side of the business. The reaction of attendees to the European semiconductor show, Semicon Europa 90, held in Zurich in March, indicated that the eight-year initiative is increasingly attracting the attention of non-European companies.

The prospect of an enlarged European Community and a bigger market has not been lost on US and Japanese companies in the materials and equipment business.

The 50 per cent stake by the Japanese process materials company, JSR, in the Belgium high-tech chemicals company, UCB Electronics, is just the beginning. UCB Electronics is involved in ESPRIT and JESSI programmes.

The policy of excluding non-European companies, except where there is a crucial technology need, has already been breached by the associate membership of IBM in JESSI. The American computer company is not receiving EC funding for any research it undertakes.

Done to 0.5-micron feature sizes, European participants in JESSI are obliged to use US and Japanese technology in some instances. It is below 0.5-microns that the Europeans anticipate achieving independence from overseas companies.

One particular hopeful based in the US is Applied Materials. In the UK, the company has a facility in Horsham, Sussex.

Another spin-off in self-sufficiency in submicron technology is the fact that it could lead to European independence from US-dominated CoCom. In fact, the international trade organization representing equipment and materials companies, SEMI, is urging its members to lobby their own governments on this very issue.

As to which non-European companies might be allowed to join JESSI, the decision very much rests in the hands of the big three - SGS-Thomson, Siemens, and Philips. The rules are being deliberately vague, so as to allow "horse trading" with America's Sematech initiative. American attitudes have changed considerably since the demise of the US Memories venture.

What makes JESSI so interesting compared with the other Community chip venture ESPRIT (which is long-term, precompetitive, and widely diffused), is that JESSI's goals are short term, the ownership of work undertaken is apparent, and it is easier to get a product onto the market.

Philips Analytical Division is working on the JESSI programme with other partners to produce a metallurgy system, capable of measuring 0.5-micron feature resist lines.

The French company, Alcatel, has a seat on the equipment and materials board. The company intends working on vacuum and related technology products. Its semiconductor subsidiary, Mietec, is working on the production of 0.5-micron CMOS devices.

The German optical specialist Carl Zeiss is participating in JESSI to pursue the use of optical lithography methods to make memory chips with features of 0.3-microns, so enabling Europe to produce 64-Mbit memory parts in volume quantities.

It appears that Europe has a lot to offer right now. (Source: Electronics Weekly, 21 March 1990)

Federal Republic of Germany

Joint research project with Japan

BASF will be the first foreign concern to take part in a national research project set up by MITI, the Japanese trade and industry ministry. The project will cover eight Japanese concerns and research institutes, and aims to develop optically operating materials for extremely rapid switching processes in electronic networks. Researchers believe that plastics will be particularly suitable for this purpose. (Extracted from Aussenhandel, 14 March 1990)

France

CAD installations in France

Experts estimate that there were 25k-30k microcomputer-based workstations for computer-aided design and production applications installed at the end of 1989. According to IDC, over 13k of the 20k computer-aided design workstations in France at the end of 1988 were micro-computer based. Autodesk France sells between 200 and 650 licences per month in France, with some 12k legitimate copies of Autocad currently in use. The improvements in the performance of both microcomputers and software makes microcomputer-based computer-aided design an affordable solution for smaller companies. Apple offers a wide range of CAD (Computer Aided Design) programs for industrial applications and companies such as IBM have introduced CAD software. Currently 90 per cent of research consultancies' CAD requirements can be met by microcomputer-based solutions. It is estimated that the world market for microcomputer-based CAD will grow by over 35 per cent per year, compared to a 10 per cent per year growth for workstation-based products. Sales of the Versacad program will increase by 70 per cent in 1989. A number of new CAD products are being developed for microcomputers, and details of these as well as a table of available CAD programs are included in the article. (Source: Technology Update, 12 February 1990)

Technopoles fly the flag for France

The French have also gone in for science parks - or technopoles - in a big way. About 30 towns now belong to the Club des Technopoles.

The principle of the technopole, literally a city of technology, is in many ways similar to the old mediaeval pattern in which each industry was concentrated in a single street within the town - clothiers, leatherworkers, goldsmiths and so on. By creating a common devotion to a particular industry - microelectronics, computing or telecommunications - the technopole can assemble commercial companies and research establishments for their mutual benefit.

Technopoles offer many advantages to commercial companies looking for a new site.

To begin with, there is the value of being associated with a thriving and successful technopole with a reputation for excellence. Having a presence in a fashionable technopole is good for a company's image.

A more tangible benefit is the high concentration of skilled workers and highly qualified personnel in a technopole, some because of the proximity of universities and research establishments and some from neighbouring firms.

The Cite Scientifique in the Ile de France Sud, just south of Paris, boasts that 60 per cent of France's grandes ecoles of engineering and business administration, as well as 40 per cent of all research centres, are concentrated in this zone.

This "city without walls", which runs in a band from St. Quentin en Yvelines to Melun, was conceived as an integral part of the economic development of the region. The concentration of human skills in the Cite Scientifique is crucial to its success.

There are roughly three times as many senior executives and professionals living in the region than the national average, and having the capital, Paris, close by is another obvious asset.

Companies locating in technopoles also receive financial assistance from the local authorities, although there are no hard and fast rules regarding the sums available.

The granting organizations are reluctant to name precise figures, saying it depends on individual circumstances, such as the impact the incoming company will make, its national and international reputation, and the particular local economy of the technopole.

Companies are chosen for technopoles by a selection committee made up of industrialists, scientists and the local authority. Criteria can vary from one place to another, depending on the particular emphasis of each technopole.

At Zirst (Zone pour l'Innovation et les Realisations Scientifiques et Techniques) at Meylan outside Grenoble, access to the science park is strictly limited to innovative start-up firms.

Zirst's success, however, is based upon the economic environment of the entire Grenoble area. Its 174 member companies, employing about 4,000 people, form only a quarter of all the high-tech companies in the area - almost a technopole within a technopole.

Several of the major computer companies situated outside the official technopole, such as SGS-Thomson, Hewlett-Packard, Bull and Cap Gemini Sogeti, also have small research centres within the science park.

Founded around 20 years ago, Zirst was one of the first technopoles to be set up in France. From the start there was a strong association with microelectronics and information technology, because of the proximity of IMAG (the Institute of Applied Mathematics), CNET, a French Telecommunications research centre, and the CENG nuclear research centre, as well as the presence of existing IT and microelectronics companies.

Zirst was inspired by Silicon Valley and Route 128, the US East Coast high-tech zone around the Massachusetts Institute of Technology and Harvard. Initial hopes that France might grow its own Apples and Suns have sobered, however.

Whether innovative start-ups can grow into industrial heavyweights is a hot topic of debate in France, but one limitation generally acknowledged is the scarcity of venture capital funds.

Perhaps the best known of the technopoles outside France is Sophia-Antipolis, sited on the French Riviera, not least because the prospect of relocating to the Côte d'Azur can seem mightily appealing to computer professionals battling with M25 traffic jams or wincing against the Scottish climate.

The weather was in fact a key factor in the choice of the south of France for a technopole.

Unlike its rival, Zirst, Sophia-Antipolis was not founded in an existing high-tech environment. It is largely the product of one man's dream. At

the beginning of the 1960s Pierre Laffitte, a professor at the French School of Mining, formulated the idea of transposing the Parisian Latin Quarter to the countryside.

He argued that the key to creativity, as well as attracting highly-qualified people, lay in facilitating the exchange and development of ideas in a warm and pleasant environment.

The beginning of the 1970s heralded the construction of the city of wisdom (Sophia) on the maquis above the town of Antibes (Antipolis) on the French Riviera.

There was no established industry in the area and scarcely any centres of higher education. Everything had to be imported or created on the spot. However, several Paris-based universities opened departments in the new technopole, including the Institut National de Recherche Informatique et Automatique (INRIA) and, naturally, Latitte's School of Mining.

Educational establishments were followed by French and international companies, such as Digital Equipment, Thomson-Sintra, Rockwell International, Phoenix Technology and the Air France Worldwide Computer Reservation Centre, which set up first research centres and then production units in the area.

IBM set up a research centre in nearby La Gaude, and Texas Instruments has also installed its European headquarters, research and production units in the vicinity.

Twenty years after its foundation, Sophia-Antipolis has attracted 400 companies employing 9,500 people, of whom about 4,000 work in research.

Not surprisingly Sophia-Antipolis has had a significant impact on the surrounding area, both in terms of generating ancillary activities and, above all, in the change of attitude towards setting up a company in areas previously reserved for tourism. The dream of creating a Latin Quarter in the fields has become a reality.

The park is probably now at the limits of its development. To surmount this, the idea of launching satellite technopoles around nearby towns is under discussion. The move is contentious, however, because of the overburden on resources, exacerbated during the summer by holidaymakers.

Still in the Midi, the technopole at Montpelier was boosted by the presence of INSA (Institut National des Sciences Appliquées), which specialized in agronomy and contributed to Montpelier's Agropolis. Since then Communicatique and Antenna have been added as technopoles, devoted respectively to IT, cybernetics and artificial intelligence, and to new media and interactive cable television.

Further north, the science park of Rennes Atalante in western France has already established a reputation in image processing and telecommunications, largely through the proximity of the Centre Commun d'Etudes de Telédiffusion et Télecommunications, which belongs to French software house Cap Sesa (now part of CGS), where much of the development work on Minitel, France's electronic videotext telephone directory, was done. Aerospace and military electronics research establishments have also contributed to the Rennes Atalante technopole. (Reprinted from Computer Weekly, 22 March 1990)

Hungary

Hungarians develop defences against viruses

After last year's attack of the Friday the Thirteenth virus the New Wave Foundation recognized what a need there was for the protection of domestic computer culture and especially the information stored in the computers. So they made it possible for the two developers of the PRGDOKI system, Imre Szegedi and Istvan Farmosi, to collect several experts as a non-profit undertaking and organize and operate the ANTIVIR group within the framework of the foundation.

The developers have not written their programs for the internationally known viruses. They discovered that unique "viral strains" have developed in Hungary, including subsets entirely unknown abroad. For example, one anonymous domestic program author changed the source code for Friday the Thirteenth so that detectors and killers based on the traditional code elements do not notice it. The situation could be reviewed easily in the first two years, 1987 and 1988, of the appearance of program viruses. Only two viruses spread here, both were so-called file viruses, relatively simple to detect. But last year there was a technological leap. The first members of new virus generations appeared, including virus programs of domestic origin. Indeed, a new type of virus program, the boot virus, introduced itself into computers. This changes the information in the boot sector to virus code so that blank disks formatted with the infected system can become sources for further infection.

Within the framework of the New Wave Foundation they prepared the PRGDOKI virus protection system which is effective against two versions of the dropping virus, two versions of the reboot virus, Friday the Thirteenth and all its rewrites, the Eddie virus of Bulgarian origin and the new viruses known as Music and Five O'Clock Tea. In the area of boot viruses they have developed protection against the Disk Killer which came in with Disk Manager and the "ping-pong" virus which infects only XT computers.

One of their programs effectively frees most applications software of append type viruses. Special auxiliary programs check the integrity of CMOS RAM versions, the boot sector and the partition table; with these, in the event of any illegal change, the earlier pure version can be reloaded.

They have just released their Potomkin program for beta testing. This is memory resident software which prevents the activation of viruses slipping into memory by known means and warns of their presence with a system message.

At the end of last year, within barely a month and a half, six new viruses appeared in domestic software. So the programmers of the ANTIVIR group had to have a developmental environment with the aid of which they could develop special counter-software against new viruses within a very short time.

A highly intelligent virus of Soviet origin similar to Eddie has appeared. It is 2,442 bytes long, part stays in memory and erases on every uneven hour. It is active from 0800 to 1600 daily. It has textual and binary identifiers. (Extracted from Computer World, 1 March 1990)

India

New cybernetics plant

Kerala State Electronics Development (Keltron) (India) started building its new plant of cybernetics concern on 16 February 1990. The division's activities include intelligent traffic controllers, energy management systems, paperless operation systems for trunk exchanges and news-scan systems. Its main contractor is the Department of Technology and Defence, and the firm is involved in a co-operation deal with Serge Dassault (France) for the development of automatic fare collection and passenger control systems to be installed in the Calcutta, India, underground. It also has telematics interests. (Extracted from Financial Express, 15 February 1990)

Policy pays off for components

Planning and policy-making appear to be paying healthy dividends for the country's components business.

Last autumn's report on the Indian electronics industry from the components task force put in black and white what most in the industry have accepted for years.

Components hold the key for the whole of the Indian electronics business and self-reliance is a necessity for its success. As with so many plans, identification of the problem is the easy bit, as Om Wadhwa said in his chairman's introduction to the task force's report.

India's component makers have been making progress. Since 1985 when electronic component turnover reached Rs 320 crores (£106.6 million; a crore is Rs 10 million), the industry has grown to produce Rs 1,125 crores (£375 million) last year and if all goes to plan that growth will push the industry on to Rs 1,600 (£535 million) during this year.

As with much of the Indian electronics business most component manufacturing is done on an uneconomically small scale and performed with imported parts. At some stages of the more complex components parts anything up to 75 per cent of the materials can come from overseas.

This has forced Indian manufacturers to retreat into two niches. The first long-term niche is in areas where India has a natural advantage, such as mica capacitors. As one major mica capacitor maker said, when you are sitting on 90 per cent of the world's capacitor grade mica it is the obvious place to make them. The other area is slightly more transitory. As the nature of electronics has moved around the world, India has spent a lot of its time filling in the gaps where other countries have left.

The high costs of raw materials (because of import duties) means the industry has to rely on design-orientated added value or where it has absorbed the technology.

In the meantime, the Electronics Components Industries Association (ELCINA) has put into motion its view of how things could be improved. It has identified a range of products that are exportable and aims to identify exactly where they can be sold. The companies that make these parts should then be treated in a sympathetic way to help them prosper. Doing this through the electronics and computer software promotion council would allow the country to export Rs 1,000 crores (£333.3 million) by 1995.

Investment in components over the four years between 1984 and 1988 totalled Rs 975 crores (£325 million) of which 40 per cent went on television tubes and magnetic media.

The real weak point has been microelectronics. This has stayed small despite some major investment. The main project was based at the Semiconductor Complex Ltd. (SCL) in which Rs 900 million (£30 million) had been invested to produce a range of integrated circuits including application specific integrated circuits (ASICs) and codec chips.

The facility had also managed to arrange exports deals with Thailand and Hong Kong and was prototying geometries down to 2 m. Last year the plant's manufacturing and process R&D facilities were ravaged by fire and i is unlikely that the plant will begin to start catching up with its work before the end of this year.

Microelectronic capacity left includes products from Bharat Electronics Ltd. (BEL), Hindustan Conductors, Greaves Semiconductors and SPIC Electronics Ltd. (SPEL). SPIC, however, does assembly rather than true fabrication. Scale again poses the main problem for the industry.

As there is no volume production of chips equipment, manufacturers do designs using a wide range of foreign parts, so there are no volume markets. No volume markets means no economy of scale, and that means no interest in making chips. In 1983, 80 per cent of chips were imported from abroad.

Demand for chips outstrips both the real and perceived levels of home supply, and electronics chiefs in India have resigned themselves to the fact that even in the best case just 50 per cent of microelectronic parts will still be imported by the end of the century.

Om Wadhwa and his task force have decided that other lower-technology exports of parts up to the value of Rs 1,600 crores (£533.3 million) should be possible to make the industry self-sufficient in foreign exchange if not in technology.

But to achieve this there must be investment. The task force has estimated that cumulative investment of Rs 2,000 crores (£666.6 million) between now and 1995 and double that up to the end of the century will be needed.

Working on a core of SCL as the country's silicon foundry for standard parts and ASICs down to 1.25 m, BEL as a bipolar foundry down to 1.5 m, and ITI prototyping CMOS down to 1.5 m, India hopes to grow its chip making capacity through inward investment and slow indigenization in much the same way as the Pacific Rim countries.

As the pressure for changes on raw material duties and other fiscal incentives to possible overseas investors are put in place, India's position looks set to improve. Texas Instruments has already set up a silicon design centre in Bangalore dedicated to overseas sales back to the US-based parent under the 100 per cent export rule.

SGS Thomson has applied to do the same while SPIC at Madras packages ready-diffused wafers for overseas clients. In the pipeline is yet another US chip maker, BIC Integrated Circuits, which intends to invest Rs 40 crores (£13.5 million).

As Indian engineers become familiar with silicon and home-grown start-ups emerge under more liberal fiscal and trading regimes, it is possible that the next benefactor of the silicon dream could be India. (Source: Electronics Weekly, 11 April 1990)

Japan

Japanese-to-German translation system

Fujitsu and ARIS Software-Entwicklung (Stuttgart, FRG) are collaborating on a Japanese-to-German computer translation system. The system is able to estimate word or sentence meanings before translations are done. The dictionary includes about 50,000 often-used Japanese words, 50,000 often-used English words, and 250,000 technical and scientific phrases (in both Japanese and English). A maximum of 6,000 words/hour can be translated, and it operates on the S Family of workstations from Sun Microsystems (Mountain View, CA). (Extracted from Telephone, 1 February 1990)

Parallel processing computer technology

The Government is making a major effort to develop massively parallel processing computer technology. The US now has a definite edge in massively parallel processing, in which tens of thousands of individual processors are connected in a single machine. The technology can be used to solve image recognition problems, translate spoken languages and track incoming missiles. Supercomputers using one or several processors can solve some complex problems, but massively parallel systems could speed up computations significantly, since thousands of processors would be operating simultaneously. Japan's research programme will be one of the nation's largest high-tech programmes for the 1990s.

Most of the advanced research on massively parallel processing has been conducted in the US so far under the Strategic Computing Initiative, a project funded by the Pentagon. Several Japanese firms are developing parallel processors, including the Fifth Generation project machine, which has 64 processors. However, the Japanese Government is considering applications for a computer with millions of processors, a technology that is till far ahead of either the US' or Japan's capabilities. The major challenge is developing software that will enable the operations of many processors to be co-ordinated effectively. (Extracted from New York Times, 30 April 1990)

Republic of Korea

Forecast of electronic goods production

Production of electronic goods, including parts and components, will grow 11 per cent in 1990 over 1989, according to a forecast by the Electronic Industries Association of Korea (EIAK).

EIAK officials said they expect production of electronic goods in 1990 to reach $31.28 billion, up 11.4 per cent from $28.07 billion in 1989. The association also forecasts that exports in 1990 will reach $18.28 billion, up 9.5 per cent from the estimated exports of $16.6 billion in 1989.

The forecast was made as a result of a comprehensive survey on the 1990 business prospects for EIAK's member companies.

By sector, production of industrial electronics will grow by 23.1 per cent to $7.94 billion, compared with a growth rate of 30.9 per cent in 1989. Production of electric home appliances, which is expected to register a growth rate of minus 0.8 per cent in 1989, will rise 7.1 per cent to $10.66 billion in 1990. In electronic parts, growth in production will remain at 7.9 per cent with a value of $12.68 billion in 1990, compared with an estimated growth rate of 10 per cent in 1989.

The EIAK said it expects investment in facilities to decrease 23.9 per cent in 1990 from a year earlier, while outlays in research and development will rise only 5.2 per cent. The sharp decrease in facility investment is largely attributable to a poor business environment in the electronics industry and electronics producers' financial woes, the EIAK reported. (Extracted from Electronic World News, 19 March 1990)

United Kingdom

UK chips look "brighter"

The UK semiconductor market looks to have come through the worst of the recession. Annual figures released by the Electronics Components Industry Federation (ECIF) augur "prospects a little bit brighter", according to Ray Ambrose, chairman of the ECIF semiconductor group.

Growth in 1990 is still forecast well in single digits at 5 per cent, but the computer market is still expanding on the back of ramped-up output from inward investors, especially Japanese printer makers, and firm prices for 1-Mbit DRAM memory chips. This time last year ECIF was predicting zero growth in 1990.

The prospects are even brighter in the following years. ECIF is forecasting 11 per cent growth in the UK semiconductor market in 1991, and 22 per cent growth in 1992.

Increasing consumer demand in Europe, much of which is met by colour televisions and videos from UK-based facilities, the upsurge in mobile communications, and continuing growth in the computer market will drive this growth. By contrast some market sectors are gloomier. Military contractors' spending on semiconductors is likely to be flat, and ECIF is still anxiously awaiting a return to more normal levels of British Telecom business.

Key products in years to come will be MOS memory devices, consumption of which will rise in the UK from £350 million in 1989 to £605 million in 1992. The average selling price of memory has increased over the last three years. In 1987 the ASP of DRAMs, SRAMs and EPROMs was £1.90, in 1988 it was £2.82, and last year it was £4.04. (Source: Electronics Weekly, 18 April 1990)

United States of America

High-temperature superconductivity

A report from the congressional Office of Technology Assessment (OTA), on high-temperature superconductivity says research is going well but the policy derailed some time ago.

Total spending on high-temperature superconductivity research in the United States and Japan is about the same. In 1989, the US Government spent $130 million, and the Japanese about $70 million, but for spending by industry the figures are almost reversed. The quality of research seems to be on a par: the OTA report describes US research as "second to none". But although equal now, differences are set to emerge.

Almost half the high-temperature superconductivity money from the US Government has gone to the Department of Defense, while Japan's spending is all aimed at commercial, not military, application. In addition, the remainder of the US federal research support goes predominantly to the national laboratories, which have a poor track record in technology transfer to industry.

In Japan, a big success by MITI (Ministry of International Trade and Industry) was the establishment in 1988 of ISTEC (the International Superconductivity Technology Center), a consortium of industrial contributors (including a handful of US and European companies) who each pay about $100,000 annually to support high-temperature superconductivity research. Although ISTEC is the kind of government-led effort that generally inspires fear and envy in the United States, the OTA report plays down its significance, arguing that it is occupied entirely with basic research of the kind that is adequately supported, but in different ways, by the US Government.

The bigger threat to US supremacy, according to OTA, is the much greater level of support by Japanese industry, and the more patient thinking that lies behind it. In a survey of US and Japanese industries doing high-temperature superconductivity research, US respondents said, on average, that they expected to see the first commercial products on the market in 1992, whereas the Japanese companies saw the likely date as 2000. Given the fairly equal base of research in the two countries, the difference is presumed to reflect more favourably on Japanese persistence than US optimism. (Source: Nature, Vol. 345, 10 May 1990)

USSR

Soviets look West for chip aid

Semiconductors are under pressure: Siliconix, one of Silicon Valley's oldest chip manufacturers filed for Chapter 11 bankruptcy this month, and in the same week Pasquale Pistorio, president of SGS-Thomson, predicted that in 1990 there would be zero growth in the world's semiconductor market. Yet demand for microprocessors in the Soviet Union could reverse this situation virtually overnight.

The reason for this huge potential demand is that the Soviets have largely failed in their attempts to copy the designs of Western microprocessors themselves. Bound by no copyright laws they have been attempting to manufacture versions of CMOS and NMOS processors throughout the 1980s. The most widely used Soviet-made personal computer, the Iskra, uses a processor called the K1810VM8. To all intents and purpose this is a domestically produced Intel 8086 chip.

The Co-ordinating Committee on Export Controls (CoCom) bans the export of all chip technology to the Soviet Union. This shadowy body does not publish its own lists. "The CoCom list" is what companies can glean from published material put out by their own governments who get their advice from CoCom.

The reasoning behind the ban is to prevent the sale of products which could have military uses. Since virtually all electronics components could have military applications CoCom also decides on how "bundled" the technology is. Thus IBM is able to sell some of its AS/400 departmental computers to the Soviet Union whilst Intel is still prevented from selling its 8080 chips there.

Western microprocessors do get into the Soviet Union, and have done so for decades. The countries of the Pacific ring are not bound by CoCom and a Soviet can buy virtually anything on the streets of Singapore or Taipei. The problem has not been one of access but of cash. To buy chips this way a Soviet organization not only takes a big risk but needs large amounts of hard currency. This makes any kind of volume sales unrealistic. Hence the Soviet decision to make its own versions.

The policy of wholesale duplication took hold in the 1970s during the premiership of Leonid Brezhnev. Since the war the Academy of Sciences had been at the forefront of non-military research and development. Under Brezhnev it lost influence to the industrial ministries. Sometime in the late 1960s a high-level decision was taken to abandon domestic designs and copy western products.

Not only were there savings on expensive research and development but ripping off American computers meant there was also a large body of software written for them which could also be stolen.

Taking this path the Soviet Union was effectively admitting defeat in its technology rivalry with the West. Not only did it imply the inferiority of Soviet technology, it sentenced much of it to oblivion. Production of domestically designed computers like the BESM mainframes ceased. Ironically Soviet users regard the Soviet manufactured western clones as little better than the 30-year-old BESM.

Today the whole of Eastern Europe is full of cloned versions of IBM, Digital and Hewlett-Packard computers. To the detriment of the long-term development of the economy, domestic research and development for civilian applications was cut right back.

In line with the Soviet penchant for massive economic plans, electronics production has been organized to embrace the whole of Eastern Europe. Poland, Czechoslovakia, Bulgaria, and East Germany all made different contributions to the socialist grand plan as part of Comecon - the socialist equivalent of the EC.

Since the Soviet Union does not release production figures for microprocessor technology it is difficult to measure the extent of the cloning operation which has taken place.

Extremely sophisticated electronics do exist in limited quantities, but these are triumphs of the military and appear not to generate great benefits for civilian projects.

Factories are not automated and a lack of CAD tools means R&D is very slow.

The biggest problem is an inadequate industrial infrastructure. There is a desperate need for processors of the power of the Intel 80286 or 80386 for CAD applictions, yet only recently has volume production of 64k memory chips begun.

There is a universal shortage of all microprocessors. The Soviets can competently produce 16k and 64k chips but have yet to manufacture 256k chips in quantity. Kombinat-Robotron has managed to produce 1-Mb chips but only in limited quantities.

Concentration in the past on defence and space has left the civilian industrial infrastructure in . y poor shape. Plant in the USSR is so antiquated that it has very little to offer a prospective joint venture partner in return for western expertise.

CoCom is due to review its restrictions in June. It will base its decisior partly on what is already in use in the Soviet Union so a relaxation of current controls is very likely. When this does happen the Soviet electronics industry will pay the price for its past piracy because no one will want second-rate copies when they can buy the real thing. (Source: Electronics Weekly, 2 May 1990)

VIII. FACTORY AUTOMATION

Activities of artificial intelligence and robotics laboratory

The current activities of the AI and Robotics Laboratory, IIT, Madras are towards building a task-based distributed AI programming environment for planning, and scheduling of activities of a robot colony. The activities are divided into three major categories:

(a) Theoretical research;

(b) Software tool development;

(c) Application.

Theoretical research is going on in the areas of truth maintenance in AI knowledge bases, temporal reasoning for planning and problem solving, knowledge representation, action representation and distributed problem solving. A temporal data base manager and a non-monotonic reasoning system have already been developed and are being test run.

Under software tool development, a distributed version of the programming language PARLOG (tentatively called DISP) is being designed and implemented in C, currently running on a network of SUN workstations.

Interfaces with various computers and simulators are being developed for a robot colony consisting of 4 RHINO XR-III robot arms and their auxiliary devices. Interfaces were written in Turbo Prolog (for IBM-PC compatibles), in C (for UNIX machines), in SMALLTALK (for Tektronix AI workstation). Primitive Graphic and logic simulators were written in SMALLTALK and are being upgraded. In addition, some studies were conducted on SCORPION and HERO mobile robots, in world modelling and learning. (Source: Research and Consultancy at IIT, Madras, April 1990)

Factory robots

Robots are not all they are cracked up to be, at least in the car business. The only clear advantages they have over people is that robots work longer hours and make fewer mistakes. In other ways, they are rather a disappointment. Instead of becoming better at a task as they get used to it, robots are liable to become progressively less accurate as the unequal load on their mechanical parts wears down some bits of them faster than others. They are also harder to teach and less flexible than people. Many assembly robots can deal with only two different car models. This sits uneasily with the motor industry's trend towards "flexible production" - making smaller numbers of lots of different models.

Many of these problems boil down to something simple. Although the robots may be full of clever computer chips, they have to be programmed and configured for each task, which is a laborious business. Car makers have discovered that before they can be really useful, the robots have to become easier to talk to and to teach.

Nissan has demonstrated how far it has got towards making its car-building robots more helpful. The company's new scheme, which is in operation at its Tochigi and Zama plants near Tokyo, is called the Intelligent Body Assembly System (IBAS). Developed over the past five years by the company's own programmers and production engineers, the idea has cost somewhere between ¥ 1 billion ($86.3 million) and ¥ 2 billion to bring to fruition.

The system is at work in the "white body assembly" part of the production process, in which the eight basic unpainted parts of each car are lined up and welded together. The hardware is relatively simple. It consists of a jumble of arms and wires known as a numerically controlled locator, which contains some 50 robot jigs and 30 sensors. After another machine has assembled the eight pieces temporarily, the locator's sensors check that they are precisely in place. Then, with a touch that is accurate to within half a millimetre, the robots make 68 spot welds and send the completed car shell on its way to the next stage of the production process.

The clever part is what happens next. The system's control unit uses the information gleaned from its first attempt at assembling the shell - a few fractions of a millimetre too high here, or too much to the right there - to adjust the jigs when the next set of pieces rolls along the production line. Thus the system can assemble a shell much more accurately than before, without any change in the design of the jigs themselves. It is such small details of precision engineering that make the difference between a high-quality car and a nasty box.

There is another, perhaps more significant, advantage. Traditional robots must be physically reconfigured before the factory can start to make a new model. Making the robot part of a bigger computer system changes all that. Once the instructions for assembling a given model and body shell are recorded in the system, the machinery can be "retooled" simply by changing its software. Nissan says that retooling its body assembly for a single new model used to cost ¥ 4 billion and take 11 months. Now it takes a quarter of the time and costs only about a third as much. What is more, the software can be transfered between different plants. That allows the company to decide at short notice, and at little cost, to transfer the production of a model from one factory to another.

Further benefits should follow. Nissan will be able to look at new designs and work out how hard they will be to assemble before making anything. It will be able to build up a data base of conditions on the production line, which should help the company to develop robots that are less likely to make mistakes. In the longer run, the promise of such systems is that they will merge the two stages of bringing a new car to market, namely designing it and working out how to build it. But a car company will have to automate the rest of its production lines - from panel-pressing to final assembly - before it can pull off that trick. (Source: The Economist, 21 April 1990)

Software for assembly-line robots

Sandia National Laboratories (Albuquerque, NM) has developed a software program capable of programming assembly-line robots without human intervention. The programme uses a CAD model of the product that will be manufactured to develop an assembly plan that is converted by a compiler into language understood by the robots' control system. The software can in one second teach a robot an assembly routine that would require a full day of manual instruction. The technology is applicable to most industrial assembly processes. (Extracted from Research and Development, April 1990)

IX. STANDARDIZATION AND LEGISLATION

Standardization

DCE standard being developed

The Open Software Foundation is developing a standard Distributed Computing Environment (DCE). Currently, single vendor networks as well as multivendor networks using the same protocols can share resources over networks while appearing to the user as a single system. But there is no standard for how resources, such as files and computing power, will be shared by disparate systems. OSF had previously solicited submissions from the industry to establish a core set of services that will allow distributed applications to be created and used. The set includes remote procedure calls, distributed file system, and security and presentation services. The main contenders for the DCE are Decorum, which was submitted by a group of vendors that includes IBM and Hewlett-Packard, and portions of Sun Microsystems' Open Network Environment. The article further discusses the two contenders. (Extracted from Computerworld, 5 February 1990)

EC may limit building of compatible products

The European Commission may limit computer firms in deciphering software interfaces and building compatible products. A primary concern is the interfaces used to connect new computers to the central data networks installed at most large companies by IBM and Digital Equipment. These two firms, and Apple Computer, are part of the Software Action Group for Europe (SAGE), which believes computer industry standardization would eliminate the need to inspect competing products in order to write compatible programs. The net result would be a reduction in software piracy. Taking the opposing view is the European Committee for Interchangeable Systems (ECIS), which includes Amdahl, Fujitsu, NCR and Unisys. The group wants software interfaces excluded from copyright protection. It also wants any new law to permit analysis of software products for the purpose of extracting interface information. ECIS argues that it is asking for nothing more than what current law provides - protection of lists of program instructions but not the ideas embedded in them. It also argues that restrictive laws could kill the "open systems" movement, which depends on a set of standard software interfaces. (Extracted from Business Week, 7 May 1990)

PC card standard

A personal computer (PC) card standard allowing users to access software and storage from any computer is forthcoming from US and Japanese developers involved in the laptop business. This capability is now prohibited by incompatible connectors and formats used by the credit-card size memory devices. This standardization is expected to allow specially designed programs for portables and decrease even more the size of all PCs. The price of PCs will be lowered as their size decreases, resulting in hand-held XT-class boxes in the $500 range within a year, according to J. Prelack, president of the PC Memory Card International Association (PCMCIA) and marketing manager for Lotus Development. PCMCIA chairman J. Reimer says travelling PC users will see longer battery life with portables based on low-power storage know-how. PCMCIA members have held talks with representatives of the Japan Electronic Industries Design Association (JEIDA) to achieve a satisfactory definition for a PC card standard. Onlookers included Compaq and IBM. It is hoped that a PC card standard will be issued in early 1990. (Extracted from Information World, 5 February 1990)

No deal for SMD standard

An international committee has failed to agree a set of standards for the quality of surface mount devices (SMDs).

The standards were intended to help buyers specify the quality of components required from a supplier. The European Committee for Electrotechnical Standardization (Cenelec) met in Frankfurt at the end of March to discuss the proposals. The British Standards Institute was confident that an agreement would provide a widely accepted set of European rules.

The 15 members of the committee voted five in favour of the proposals and five against, with five abstentions. The document to be published during the next two months can be used as a guideline but not quoted as the basis of approval. The main sticking point, according to Cenelec, was the prospect of manufacturers having to make changes to their production lines to meet the requirements.

UK purchasers of SMDs were sceptical about the usefulness of the standard, even before its non-approval. (Source: Electronics Weekly, 28 March 1990)

DOS memory extension standard

A standard for extending DOS memory under multitasking environments will be developed by a standards committee to be formed by such vendors as Rational Systems, Microsoft, IBM, Intel, Lotus Development, Borland International, and Phar Lap Software. A working specification of DOS Protected Mode Interface (DPMI) is scheduled to be available

by mid-1990, with the final specification expected by late in 1990. The current de facto DOS extender standard, known as Virtual Control Program Interface, is not supported by either Intel or Microsoft. It also does not support multitasking or virtual memory. Applications for DPMI may be available by the end of 1990. (Extracted from Computerworld, 26 February 1990)

Test instrument firms sign standards pact

Users of programmable test instruments will be able to control devices from different manufacturers with the same commands, thanks to an agreement announced at the end of April.

Nine companies from Europe and the US have drawn up a set of Standard Commands for Programmable Instruments (SCPI).

The commands are the result of a marriage of Hewlett-Packard's Test and Measurement Systems Language and Tektronix's Analog Data Interchange Format. These two sets of software were written to help different pieces of equipment produced by the companies to talk to each other.

A consortium, which also includes Breul & Kjaer, Fluke, Keithley, National Instruments, Philips, Racal Dana and Wavetek, has adapted the code to handle all their equipment.

SCPI covers instruments which meet the IEC 625-1 (IEEE 488) or VXIbus protocols. Engineers will only have to learn one set of commands to be able to take measurements using any such equipment.

The commands will still not allow engineers to swap an instrument from one manufacturer with a device from another.

The accuracy and stability of equipment from different companies varies. A low cost instrument could be replaced by a device with higher accuracy and stability but not vice versa. (Extracted from Electronics Weekly, 25 April 1990)

US develops expert systems standard

US computer and manufacturing companies have joined forces in a consortium to develop an open software standard to boost use of expert systems in large corporations.

The Carnegie Group, DEC, Texas Instruments, Ford Motor and US West will help develop the open standard which will be released later this year.

The standard will define how large expert systems are developed so they are compatible with each other.

The five companies have invested $10 million to define how large knowledge bases can be used across different types of computers.

The consortium is called Initiative for Managing Knowledge Assets and it was set up in secret in 1988.

Imka says it has begun writing expert system software which could help in creating a new generation of expert systems.

It is taking an open systems approach so future expert systems can run on computer platforms ranging from large IBM mainframes to DEC VAX minicomputers and pc systems.

Imka has chosen C and C++ to develop its expert systems and the X-Windows user interface.

The first Imka product is aimed at companies in the manufacturing sector and will be beta tested at Ford towards the end of this year. (Source: Computing, 3 May 1990)

France beats UK to international adoption

French proposals for an applications portability standard have ousted UK and US plans and are set to be adopted as the basis for ISO's international standard.

The International Standards Organization met in Copenhagen to vote on the first stage of adopting a single all-embracing model for applications portability.

According to the French Unix users group, Affu, a recently established ISO joint technical study group for application portability met in Denmark and voted to adopt a conceptual model. The model will now be refined and put to the ISO for adoption in September at its Ottawa meeting.

If the model is adopted, then an internationally ratified set of specifications for applications portability in systems and software design will be available to developers and manufacturers.

The model was devised by French consultant Jean-Michel Cornu, president of the French Standards Institute, in collaboration with Affu and was one of a number of proposals tabled at the Copenhagen session, including a joint UK and US submission based around the CCTA's Gosip guide for open systems.

The French model won the day, according to Cornu, because it deals with incompatibilities between the various national standards.

European standards organizations are meeting ahead of the ISO Ottawa session to work out a joint strategy. The Canadian meeting is expected to adopt a model which will take in existing guides such as X/Open's XPG3 model. (Source: Computing, 26 April 1990)

Last round in battle of CD video giants

The technical muddle which is stifling the market for compact discs that can store both video and sound looks like coming to an end. The International Standards Organization (ISO) is studying systems for storing up to 75 minutes of moving video and stereo sound on a 12-centimetre compact disc. There is a straight fight between the leading two systems on offer. Philips, with collaboration from Motorola and the Japanese giants Sony and Matsushita, is developing one system. Intel, backed by IBM, is developing the other.

The Philips system is known as CD Interactive, or CD-I for short. Intel's system is called Digital Video Interactive (DVI). At a computer industry conference held in London recently, Intel said that DVI will cover whatever the International Standards Organization adopts as the world standard. The ISO's decision is expected this autumn, and the Philips system is the hot favourite.

Whichever system the ISO adopts, it will not be able to read more than 150 kilobytes per second from the disc. This limit is set by the speed at which all compact discs spin - about 500 times a minute.

Both Philips and Intel have had to employ sophisticated technology to compress the pictures so that they are contained in a data rate of 150 kilobytes per second.

Rather than wait for the ISO to set a standard, Intel is now offering two circuit boards which plug into an IBM or compatible computer. One board, costing $2,500, converts video into digital code; the second board, costing $2,000, decodes a stored image to display moving video on a computer screen. The boards work for both of Intel's methods for storing video and sound on compact disc. The company promises that, with appropriate software, it will cope with whatever standard the ISO sets. Intel says that its technology will begin to appear in domestic products as well as office and laboratory systems.

Philips is shy to disclose its technology, because video on compact discs could make the company's existing analogue video disc systems obsolete, but promises a domestic system to unravel the video and sound signal next year. The company says that the machine will cost $1,000, which is about one fifth of the price of the system that Intel is selling. (Extracted from New Scientist, 9 June 1990)

Possible single screen and printer font standard

Microsoft's jointly developed Royal outline font could set a single screen and printer font standard if it is fully compatible with Adobe Systems' Postscript standard. Microsoft and Apple Computer are jointly developing Royal, which will apply to both Macintosh computers and computers based on Intel microprocessors. If Royal is not fully compatible with Postscript, a single font standard may not be available for several more product generations. A single screen and printer font standard allows screen images and printed documents to be exchanged between machines or even between Intel-based personal computers and Macintoshes. Currently, the same font technology has to be used by computers and output devices for them to exchange formatted information and graphics. One of the main obstacles to the creation of a single screen and printer font standard is Hewlett-Packard, which has its own fonts, has not committed itself to supporting Royal and is the leading seller of laser printers. (Extracted from Computerworld, 5 March 1990)

Standard initiatives for SQL

Imagine being able to use the same application to access and update information on any relational data base manipulated by the Structured Query Language, SQL.

A standard for SQL has already been published by Ansi and the International Standards Organization. In addition, ISO is working on a standard set for access to remote data bases, including those that comply with SQL.

But a line-up of powerful computer vendors and data base system suppliers are not satisfied that these standards initiatives are moving fast enough or far enough to provide future SQL application portability and interoperability.

They set up an organization last year called the SQL Access Group and are determined to move industry standards in the direction of their own technical specification. They want standards that will allow applications and tool builders to construct and market their software independently of the relational data base management system it works with. The same tool or application should be able to access multiple heterogeneous rdbms systems simultaneously. Likewise rdbms' vendors should be able to build, package and market data base servers independently of applications.

A look at the SQL Access Group membership suggests the initiative might succeed. It takes in the major suppliers like Oracle, Ingres, Informix and Unify on the data base software side, and Hewlett-Packard, Bull, Sun, Tandem and Digital Equipment Corporation as leaders of the computer manufacturer vendor faction.

Another key participant is X/Open, the industry consortium defining a common application environment for vendors of Unix based systems to comply with. The group plans an interoperability demonstration later in 1990.

The SQL Access Group's technical specification comes in two main parts. One is an SQL program interface, API and the other defines remote data base access, formats and protocols.

The aim is to overcome two technical barriers identified by the group as preventing intervendor SQL access. One barrier takes the form of the different vendors' implementations of the SQL standard. They differ enough for them not to be capable of accessing data on each others' SQL servers. SQL dialects are mutually incomprehensible.

The other barrier is presented by the different message formats and communications protocols employed by the industry. One vendor's SQL client cannot connect to others' SQL servers.

The group has adopted X/Open's SQL definition as the basis for its specification and the two organizations are working together to produce something that facilitates interoperability. (Source: Computer Weekly, 26 April 1990)

The standard object of a group's desire

Object-oriented technology looks like taking off in a big way during the 1990s and a powerful computer industry consortium is determined to establish standards before any proprietary methods get a chance to dominate the market.

Founded just over a year ago in the US, the Open Management Group wants open systems to rule the world of object-oriented technology right from the start, rather than having to be imposed retrospectively, as has been the case with communications and operating environments.

Membership already takes in most of the leading systems suppliers and software houses promoting object-oriented technology. In the next few weeks it is expected to set up a European office in the UK, to co-ordinate activities on this side of the Atlantic and extend a European member list that already includes ICL, Bull, Nixdorf, Philips and Olivetti.

US-based members include AT&T, Hewlett-Packard, NCR, Sun and Unisys.

Traditional software design describes a system, a set of procedures, and separates those procedures from data. Object-oriented design describes a system as a set of objects. Each object encapsulates data along with procedures and can be shared by different applications.

One of OMG's five main objectives is to establish a reference model, definitions and terms for the entities that characterize an object-oriented system. These include the object class and sub class and the instance - an object created by instantiating a class. Instantiation generates multiple objects with the same initial behaviour.

If electronic mail represents an object class then memos could be one type of sub class.

Inheritance is another feature of object-oriented systems, where one object can inherit characteristics from others. So is the request, an operation which along with maybe one or more parameters causes a service to be performed. The results are returned from the object server to the client issuing the request.

Another objective is defining application program interface (API) commands for object-oriented software across three main operating environments - DOS, OS2, and Unix. A third aim is the definition of common services for object-oriented systems, including features like security authentication and system management.

A fourth objective is to define standard interfaces to object-oriented data base management systems which will also accommodate existing dbms. The fifth area of activity focuses on APIs for distributed object management. These should enable objects to be distributed across heterogeneous network topologies.

OMG is providing input to an initiative aimed at defining a series of standard object classes that should make it easier to develop applications for multivendor, heterogeneous networks using the C++ object-oriented language.

The two prime movers here are the AT&T Unix Software Operation, which markets the C++ Language System, and Netwise of Boulder, Colorado, which sells a remote procedure call tool for client/server applications.

Another important accord is with X/open, under which the latter will add OMG standards where applicable to its Common Applications Environment (CAE) and incorporate them into its portability guides.

Closer collaboration with the European arm of X/open will be one of the roles of OMG's office in the UK, according to the group's vice-president of European operations, Peter Shaw. The new office will also liaise with the International Standards Organization, the European Commission's ESPRIT R&D programme and the Advanced Network Systems Architecture (ANSA) project. This is in addition to recruiting new members.

Organizations that want to join OMG with full voting rights on its technical committee need corporate membership, where annual fees range from $5,000 for members with annual revenues under $9 million to $50,000 for organizations chalking up revenues in excess of $500 million a year. End-user organizations pay between $5,000 and $25,000 a year to belong to a users' sub-committee within the technical committee.

Organizations wishing to attend committee meetings without voting can be associate members, paying between $1,000 and $15,000 a year. Another category, subscribing members, pay $1,000 for a quarterly newsletter, access to all documents and discounts on OMG-sponsored events. (Extracted from Computer Weekly, 10 May 1990)

What the directive on EMC means

The European Council Directive on electromagnetic compatibility will be implemented on 1 January 1992. Its impact upon the electronics industry in terms of extra cost for testing and EMI shielding materials to ensure compliance has yet to be estimated.

The legislation will apply to all types of apparatus placed on the market or taken into service. This potentially includes capital equipment, such as integrated production lines or telephone exchanges, as well as small-scale components, such as brake light assemblies for automobiles or aerials and co-axial cables.

The testing of large systems may have to be done in-situ, which could present technical difficulties that have to be taken into account in the harmonized standards.

The Directive does not go into detail about exactly what is meant by "apparatus", nor does it clarify the dividing line between appliances, or whether components count as "apparatus".

However, Annex III of the Directive lists equipment earmarked for special attention. This includes: domestic radio and TVs, mobile radios and telephone equipment, medical and scientific apparatus, IT equipment, domestic appliances, telecommunications networks and equipment, radio and TV broadcast transmitters, lights and fluorescent lamps.

The Directive does not distinguish explicitly between components or sub-assemblies, which are supplied to manufacturers for incorporation into equipment for onwards sale. It is believed that EMC legislation will be limited to components that have a special purpose.

Overseeing the EMI regulations is the International Electrotechnical Commission. The Sub-Committee, CISPR (Comité International Special des Pertubations Radioelectriques) passes on its recommendations to national standards bodies in each country and to the EC.

The standards for EMC are being drafted by the European Committee for Electrical Standardization (CENELEC). CENELEC is drawing up a set of generic standards, covering both emissions and immunity.

The content of Directive 89/336/EEC will therefore not set actual standard figures, but it will set "norms" based upon individual national standards. Taking into account the political climate in Europe, this will probably mean compliance with the German VDE figures.

Where there is no European "norm", the manufacturer of a piece of equipment has to build up a technical file, containing a report or certificate from a competent body appointed by the Secretary of State or by the authorities of another member State. In the UK, the competent body is taken as meaning a test house appointed by the DTI.

Upon completion of a successful test, the EC conformity mark "CE", followed by the year, can then be affixed to the equipment, manual or guarantee certificate.

Apart from putting up the cost of a component or a piece of equipment, the new Directive will mean a more stringent level of test, with measurements of average and quasi-peak RFI limits, specially for pulse repetition frequencies between 2 kHz and 10 kHz.

In arriving at at-cost to the manufacturer to implement the EMC requirements it should be borne in mind that good design practice costs no extra in terms of ensuring correct board and cable layout. Failure to get it right will mean the added cost of post-production modifications.

Another consequence is that test receivers must be capable of undertaking these measurements and have a high overload capability. In order to undertake these tests within a suitably short period of time, companies will be obliged to buy automatic test equipment, if they have not already done so. (Source: Electronics Weekly, 21 March 1990)

Safety-critical systems

The increasing use of computers to control critical operations in industry and the public domain is pushing government and standards bodies into urgent action. Their task is to find common reliability principles for both hardware and software - and a framework is now in sight.

In March experts at the Institute of Electrical Engineering (IEE) in London gave their support for two draft standards that are likely to form the cornerstone for future safety guidelines.

Following the warm reception at the IEE, the drafts will go before North American IEC Committees for acceptance as full standards.

One standard covers functional safety in programmable electronic systems. The other covers software for "industrial safety-related systems". Both are products of working groups in the International Electrotechnical Commission (IEC).

Behind the red tape lies a critical need. Computer and software control are taking more and more responsibility for safety in potentially hazardous situations.

Nuclear power stations, aircraft control radars, industrial robots and the chemical industry are the more obvious candidates for standards. Yet even the domestic appliances will one day be hosts to software, so standards are needed now.

The standards work will have to address design as well as function, otherwise vital factors could be ignored. For example, last year in the Federal Republic of Germany a lorry, with software controls on the gears to stop the driver changing down too early, was travelling downhill. Its brakes failed and when the desperate driver tried to slow down using the gearbox, the program stopped him. Its designers had not taken every possible scenario into account.

The sheer diversity of the computer industry and the drive towards open systems is forcing the authorities to look for early answers to the safety issue.

In the UK, the Inter-Departmental Committee on Software Engineering (ESCE) is looking for a strategy to cover all safety-related software. Backed heavily by the MoD bodies such as the Civil Aviation Authority, the Ministry of Health, and the Health and Safety Executive (HSE) also contribute to this forum.

Last October the British Computer Society (BCS) joined the push for standards and a joint report with the IEE, calling for urgent and stricter safeguards for software safety-critical systems.

Work on hardware safety also began in earnest last year in a bid to catch up with the more progressive software investigations. This was highlighted by an HSE field enquiry into faulty versions of Intel's 80286 processor. The rogue devices had an interrupt bug and the HSE was alerted following press statements from software and systems company Alsys.

The 286 faults were discovered by Alsys engineers working on a real time system.

Problems with microprocessors do crop up occasionally and, although the specification levels set by the chip industry are fairly demanding, an international set of standards must control chip design and manufacture to match similar work on software.

The UK's HSE is collaborating with the industry in this quest for standards and their practical application.

One of the key areas the IEC standard must set out is the certification process. Incorporating safety in design must be backed up with proof to users that critical computer controls are made to the same quality. (Extracted from Computer Weekly, 19 April 1990)

SAA begins to make its presence felt

The first part of IBM's Systems Application Architecture, Common User Access, seems to be winning acceptance as a useful "look and feel" standard for developers and users, reports Michael Powell.

When IBM announced SAA in 1987 it instigated a new set of standards, which some argue will have as much impact on the data processing industry as did the introduction of the PC in 1981.

Whether or not one accepts that, there is no doubt that the first tangible signs of SAA (Systems Application Architecture) are appearing, and that suppliers are making their products conform to its standard for "look and feel", CUA (Common User Access). The result should be to make new or unfamiliar systems easier for users to understand, which has to be good for the industry.

The CUA standard is currently defined in two manuals published by IBM, relating to advanced and basic applications interfaces.

The former is based on the Windows/Presentation Manager interface, familiar to users of those systems. In many ways it is actually the poorer of the standards, since it relates mostly to the types of applications that can benefit from a graphical user interface, text and graphics processing, for instance. These are assumed mainly to involve the selection of files from lists for access and viewing.

The basic interface is more interesting. It is intended for systems that will run on non-graphical terminals, or that do not need any graphical capabilities. Although the manual is clearly aimed at systems developed on AS400 and 370 architecture machines, IBM says other candidates are, for instance, systems involving data entry - in other words the types that are more structured and data processing-oriented.

These sorts of systems - which must represent the majority in the "serious" end of data processing - suffer more than most from a lack of standard- ization. As such, they should benefit most from IBM's efforts.

CUA also makes some recommendations on the use of colours on screens. Perhaps the most helpful is to avoid mixing too many. Users rapidly become tired of screens with a polychromatic mix of colours that serve no useful purpose. The recommendations, in the basic interface guide, cover only mini and mainframe terminals, and it is suggested that the colours recommended may be changed by the user if desired (which makes the standard pretty irrelevant).

In an appendix IBM gives some thoughts about laying out a system around an object-action oriented approach, which it claims can supplant the older action-object approach.

AS400 software suppliers are certainly embracing the standards with a will.

Those that are most modern show a very clean user interface, with pop-up windows, positional item selection and, of course, the standard use of function keys in evidence.

If SAA is to be the prime mover in the 1990s, it is clear that its first portion, CUA, must establish itself as a valuable standard for developer and user alike.

Perhaps the days of users gazing at a screen wondering what on earth to do next, and then phoning the IT department for help, will soon be numbered - and not before time. (Extracted from Computer Weekly, 22 March 1990)

Legislation

Brussels seeks to cool copyright row

The European Commission is trying to defuse the row over how tightly to draw software copyright law.

The industry is split between such companies as IBM and Ashton Tate that want their software protected in the way books are, and Olivetti and other producers who want more code in the public domain - the so-called decompiling option.

The EC has set up an internal working party to resolve the issue - but there is a question mark over whether such a group of Eurocrats are qualified for the job. (Extracted from Computing, 24 May 1990)

Anti-dumping laws

Trade groups representing the US and European semiconductor industries have reached an agreement on improved principles to ensure effective enforcement of anti-dumping laws - the practice of selling semiconductor products below cost to secure a market.

The Semiconductor Policy Board of the European Electronic Components Manufacturers Association (EECA), based in Brussels, and the Semiconductor Industry Association (SIA), based in Cupertino, California, reached the agreement after a year-long effort between the two groups.

Speaking for the SIA, Wilfred Corrigan, chairman of LSI Logic, and chairman of the SIA board of directors, said, "Competitive conditions in the semiconductor industry enable companies to essentially buy out their trade partners' market by exporting high volumes of chips at below-cost prices, eliminating competition and allowing high cartel pricing."

Jurgen Knorr, senior vice-president of Siemens AG Semiconductor Division and chairman of the EECA semiconductor board, added, "With the high volatility, short product life cycles and extreme price elasticity of the semiconductor industry, dumping is a practice that simply cannot be tolerated."

The joint principle to govern anti-dumping enforcement will be presented to respective governments for consideration in revising anti-dumping laws.

In another agreement, the two groups have set plans to discuss future co-operation of high definition television (HDTV). The chairmen appointed a working group of experts to explore areas of potential co-operation in the emerging HDTV market.

The two trade organizations agreed that continued co-operation and dialogue would be valuable because of the technological, economic and political challenges of the 1990s, and the flagship status of microelectronics in shaping the 21st century world economy.

Recommendations, on anti-dumping laws, from the European Electronic Component Manufacturers Association and the US Semiconductor Industry Association:

Principle I: Anti-dumping laws should be designed and implemented to deter injurious dumping, not merely to identify and proscribe dumping after it has occurred.

Principle II: Anti-dumping laws should be designed and implemented to prevent evasion through third market sales.

Principle III: Anti-dumping laws should assure that all costs are included in fair calculations for semiconductors. (Reprinted with permission from Semiconductor International Magazine, February 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, IL., USA)

X. RECENT PUBLICATIONS

New computer science publications from North-Holland

Electronics, computers and telephone switching

A Book of Technological History
by R.J. Chapuis and A.E. Joel

(North-Holland Studies in Telecommunication, 12)
1990, 428 pages
Price: $US 90.00/Dfl. 175.00
ISBN 0-444-88042-9

The purpose of this book lies outside the usual framework of studies devoted to technology in a given branch of industry. Its main objective is to show how, in only two decades, the highly specialized telephone switching industry was completely transformed and how it revolutionized its manufacturing processes and its products. The second aim of the book is to show how the change occurred within the context of the major electronic revolution of recent decades, following the inventions of the transistor and integrated circuits.

The series "Machine Intelligence and Pattern Recognition" covers the theory and applications of pattern recognition, computer vision, image processing and artificial intelligence.

Volume 4:
Uncertainty in Artificial Intelligence
edited by L.N. Kanal and J.F. Lemmer

(Machine Intelligence and Pattern Recognition, 4)
1986. 1st repr. as a paperback 1990
xii + 510 pages
Paperback price: US$ 47.75/Dfl. 95.00
ISBN 0-444-88745-8

Volume 9:
Uncertainty in Artificial Intelligence 4
edited by R.D. Shachter, T.S. Levitt, L.N. Kanal and J.F. Lemmer

(Machine Intelligence and Pattern Recognition, 9)
1990. xii + 422 pages
Hardbound Price: $US 92.25/Dfl. 180.00
ISBN 0-444-88650-8
Paperback price: US$ 48.75/Dfl. 95.00
ISBN 0-444-88737-7

Available from: North-Holland, P.O. Box 103
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