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MICRO-ELECTRONICS NEWSLETTER

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I. NEWS AND EVENTS

Telecottages - breaking down barriers

The telecottage is a new phenomenon that has mushroomed into a movement in Scandinavia, and is spreading to other European and developing countries. As well as offering people a wide variety of occupations, such as the chance to work in remote locations, the telecottage is breaking down barriers between ordinary people and information technology.

Proponents of the movement claim that by offering people the chance to use information technology in their everyday lives, the telecottage actually empowers people in remote or rural communities by allowing them to acquire self-awareness and helping them overcome mainstream society's traditional disregard of their concerns.

Typical characteristics of the telecottage have been identified as follows:

- Local activity;
- Mostly in sparsely populated or other rural areas;
- Activities are open to all people, cheaply or free of charge;
- They give access to professionals who can teach people to use the technology;
- The purpose is to lower the ordinary citizen's threshold of resistance to information technology (any telecommunications device, microcomputers or a combination of both);
- The word "cottage" implies a social function; telecottages are also meant as a social gathering point.

Started by a few enthusiasts, the telecottage movement is spreading and attracting national and international attention. The idea seems to have germinated in the Nordic countries - where equal opportunities to use social services as well as new technologies are important political targets. The Organization for Economic Co-operation and Development (OECD), which considers better telecommunication as an important tool for regional equality, has discussed the phenomenon - though without using the world "telecottage".

The idea has spread to other parts of Europe; Portugal is to invest in "Telecentros rurais", and in most countries the postal and telecommunications authorities are keeping a close eye. This kind of activity spreads "telephone culture" and the market for telecommunications suppliers. While the benefits of telecottages are the same to developing countries, the obstacles involved in setting them up are substantial. Infrastructural shortcomings require problem-solving ingenuity, such as replacing cables with satellites. None the less, in Brazil, China and Sri Lanka telecottages already exist, and many other developing countries have them in the pipeline.

The new movement poses a question for information professionals: should they exist inside or outside libraries? Both entities have common purposes and functions, but the raison d'être of a telecottage is to provide telecommunication connections. Libraries are used primarily to obtain information. Both connect remote communities with the outside world, and help break the mental and geographical isolation of rural villages. The answer may be different according to the extent of development of a country's information policy. Those countries which begin with a "blank sheet" may find that combining the two is an important contribution to a balanced information infrastructure. (Source: ACCIS Newsletter, 8(5), January 1991, p. 5)

Satellite links multiple sites in teleconference

Using satellite communiations, a recently developed teleconference system permits free switching of the signal transmission point and is compatible with any teleconference terminal now on the market. Nippon Telegraph and Telephone (NTT) developed the system, which uses the satellite digital communication service (SDCS), offering the multilocation switchers for master and slave stations for Y 2 million each.

Capable of operating over 60km distances, the system automatically adjusts the image and sound transfer rates from 14Kbps to 1.6Mbps.

In operation, the master station links directly with one slave station and the other slave stations in the teleconference monitor the broadcast.

Communications take place between the master station and the designated slave station; users monitoring the proceedings from undesignated slave stations can request communications from a phone line and the master station then will redesignate that station as the new slave station link.

Each station consists of an SDCS earth station, a multilocation switcher and a teleconference terminal. As an option, the master station will retain video images from the slave stations in still picture formats.

When working with four or more stations for at least an hour a day, the system is more economical to operate than the INS Net 1500. It is suitable for regular conferences, employee training sessions, presentation meetings, one-to-one teleconference and as an emergency communications tool. (Source: AEU No.6, 1990)

New European information technology programme

A new European technology programme now being formulated will have its emphasis on ASICs (especially multifunction circuits, high speed circuits and advanced "smart power" circuits.) Measures to promote the uptake of ASIC technology in innovative products, especially by medium and small-sized enterprises, will be initiated. This programme is provisionally known as ESPRIT III.

The UK will collaborate in this programme with work on high density ICs using 0.5 to 0.3 m silicon CMOS technology in conjunction with the JESSI (Joint Europrean Submicron Silicon) work. CAD tools and systems capable of designing and testing at higher complexity levels (between 4 and 8 million transitors of mixed memory and logic) will be developed. Work in high-speed ICs will address both silicon biopolar and III-V technologies for digital and analog circuits. (Reprinted with permission from Semiconductor International Magazine, November 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, Il. USA)

UNCED information network

Electronically accessible information relating to preparations for the United Nations Conference on

Environment and Development is being provided to all interested parties. The UNCED secretariat in Geneva and offices in New York now "post" information on publicly accessible electronic "bulletin boards".

The service consists of background information, such as texts of General Assembly resolutions setting up the conference, and decisions taken by UNCED's Preparatory Committee, as well as information about scheduled meetings and substantive announcements concerning the preparatory process, including, for example, the contents of statements delivered at the organizational session of the Preparatory Committee.

The access to this system is through networks such as Telecommunications Cooperative Network (TCN) and Econet, which have existing arrangements to enable their members to read material posted by the United Nations, with special menus being created for matters related to UNCED. UNCED is facilitating access not only by those already accustomed to this technique, but to broaden access throughout the developing regions of the world, and in languages additional to English. It is also taking advantage of projects supported by the United Nations Development Programme (UNDP) which are designed to promote affordable access for users based in developing countries, and make information available to the UNDP-sponsored "Sustainable Development Network."

In co-ordination with UNDP and the International Maritime Organization UNCED is exploring existing satellite systems, such as Inmarsat and Peacesat, to enable access to its electronic conferences by those located in remote areas of the globe where national data communication systems are scarce.

UNCED user information

By means of a personal computer, a modem and telephone access to an electronic network, users can share information, pool resources and be kept abreast of future events related to UNCED. Users with access to TCN through a United Nations department, agency or mission should contact: Telecommunication Cooperative Network, 505 8th Ave., Suite 1805, New York, NY 10018, (212) 714-9780.

TCN will provide access to the UNISER menu in which the Conference's Bulletin appears.

Users not interconnected with TCN may contact any of the following networks which are designed for easy access:

United States:

Global Education Motivators
Chestnut Hill College
Germantown & Northwestern Avenues
Philadelphia, PA 19118-2695
(215) 248-1150

or

Peacenet/Econet
3228 Sacramento St.
San Francisco, California 94115
Tel. (415) 923-0900
Fax: (415) 923-1665.

United Kingdom:

GreenNet
25, Downham Road
London N1 5AA
Tel: +44 1 923 2624
Fax: +44 1 254 1102

Canada:

The Web
456 Spadina Avenue, Floor 2
Toronto, Ontario, M5T 2G8
Tel: +1 (416) 929-0634
Fax: +1 (416) 461-2886

Sweden:

FredsNaetet, (PeaceNet Sweden; NordNet)
Timmermansgrud 4nb,
116 27 Stockholm
Tel: +46 (8) 7200001
Fax: +46 (8) 7200035

Nicaragua:

Nicarao, CRIES Equipo de Telecommunicaciones
Apartado postal 3516,
Managua
Tel: +505 (2) 26228 or +505 (2) 25137 (ext. 5)

Brazil:

Alternex, c/o IBASE
Rua Vicente de Souza 29
22510 Rio de Janeiro
Tel: +55 (21) 286 0348

Australia:

Pegasus Networks
P.O. Box 201, Byron Bay 2481
Tel: +61 (66) 85 7286

Users on any other system should contact Econet or TCN for information.

Information on local access from other countries can also be obtained from local post, telephone and telgraph facilities. (Source: Development Forum, January/February 1991)

A dynamic move to catch SRAM

The 1991 International Solid State Circuit Conference in San Francisco shows that the chip industry's traditional capacity for coming up with surprises is undiminished.

Although faster chip speeds have been a major industry trend for quite a few years now, few people would ever have thought that the speed of DRAMs would improve to the point where DRAMs approach the speed of SRAMs.

At this year's conference Toshiba and Fujitsu are giving papers on 17ns 4Mbit DRAMs. Toshiba's paper in pure CMOS, Fujitsu's in BiCMOS.

17ns is the speed of current commercial fast SRAMs. If SRAM is to keep its traditonal speed advantage over all other memory chips, SRAM technology is going to have to get down to single figure speeds and low single figures at that.

An evening panel discussion at the 91 ISSCC will dicuss just how the industry can come up with sub-3ns dense SRAM. Various technology options will be competing to be the route to achieve that - gallium arsenide, ECL, BiCMOS and CMOS.

IBM will figure prominently in this session continuing its recent practice of closer involvement in the ISSCC and will also be presenting a fast SRAM paper - a 4ns CMOS 512K.

Another very high profile company in the fast SRAM session will be Fujitsu, which will be presenting three papers: one on a 1.2ns gallium

arsenide HEMT (high electron mobility transistor) 64k SRAM, another on a 10ns BiCMOS 4Mbit with TTL I/O and the third on a 7ns BiCMOS 4Mbit with ECL I/O.

Although faster speeds will be one of the main issues of the 1991 ISSCC, a new density level is always the tag by which an ISSCC is remembered. This year's conference will undoubtedly be dubbed the year of the 64Mbit. Papers on 64Mbit DRAMs will be given by Toshiba, Fujitsu, Mitsubishi and Matsushita.

A significant feature of these 64 Mbits is that they were all made on i-line stepers which indicates that optical processing techniques, rather than electron beams or X-rays, will remain the key technology for chip-making for most of the rest of this decade.

As with last year, the 1991 ISSCC has an emergining technologies session most of which will be devoted to neural networks from Inova, Mitsubishi and Bell. Neural nets are supremely good at implementing one of the key requirements which, it is thought, chips will increasingly need in the 1990s - the ability to self-reprogramme.

Over the years the ISSCC has gradually been expanding its brief from simply discussing chips to look at broader technology issues. This year the conference will have a panel discussion on flat panel displays with participants from some of the key contenders: IBM, Toshiba, NTT, Hitachi and Sharp.

Another example of the ISSCC's spreading scope is a session on technology in the USSR, which will be heavily dominated by the Moscow-based Perceptive Research Centre. The Russians will talk about their approaches to non-volatile RAMs, to flash memory and to minifabs for low volume ASIC.

The keynote speeches will also be looking at wider issues than simply chips. One is on the 21st century theme of microelectronics requirements for interplanetary spacecraft travel and the other addresses the future of notebook computers in terms of the key component technologies required to drive it - better colour LCDs, thinner keyboards, larger DRAMs, faster micros, higher density disks and better batteries.

So the 1991 ISSCC looks like maintaining its shift in emphasis from being the chip industry's annual exercise in navel scrutiny to a showpiece presentation on how changing and evolving technologies will affect the kind of electronics equipment that can be built in the future. (Source: Electronics Weekly, 9 January 1991)

Experimental B-ISDN system transmits hi-vision signals

Faster than the conventional packet exchange format, an experimental wide-band ISDN (B-ISDN) system transmits speech, data and Hi-vision signals, using an asynchronous transfer mode (ATM).

Developed by NTT, the system has an information transmission capacity 100 times greater than present ISDN systems. It operates at 156 Mbps and will serve in multimedia communications systems that combine speech, image and computer communications.

Several European countries and the United States are also developing B-ISDN systems; however, the NTT system is believed to be at a more advanced stage than other systems.

In the system, the ATM switch system houses 256 lines with 156 MB capacity; converters link telephone and computer terminals, while a high-definition video information supply system retrieves high-definition TV images in three seconds. The company also has developed a simulator that grasps and analyzes the flow of information within the network. (Source: AEU, No. 6, 1990)

Opening shots fired in digital tape war

Standard-sized cassette tapes with the sound quality of digital compact discs will be demonstrated in Las Vegas by the Dutch electronics company Philips. And in a major shock to the industry, the company will also announce that it had a Japanese collaborator. Matsushita, the biggest consumer electronics manufacturer in the world and maker of Panasonic and Technics hi-fi equipment, was a co-developer of the new digital compact cassette (DCC) technology.

Until now, all the Japanese manufacturers, backed by the Japanese Government, have supported the digital audio tape (DAT) format. This was pioneered by Sony and was launched in Britain and the US last year. DAT tapes produce CD-quality sound on a small nonstandard-size cassette. Philips's DCC machines and tapes will go on sale in spring 1992. Polygram, a subsidiary of Philips, is now building a DCC duplication factory at Amarsfort in Holland. The company aimed to build a recorder with a single, simple mechanism that works with both conventional analogue and new digital cassettes. Unlike DAT, DCC players will also be able to play conventional analogue tapes.

The DCC system depends on both new hardware and software. Philips and Matsushita expect a lot of interest from the electronics industry so they will ask for a royalty on both the hardware and software, as Philips and Sony do with their CD technology.

The new digital cassette is of similar size to the conventional compact cassette but has a sliding metal plate, like the sliding cover of a 3.5-inch floppy computer disc, which covers the top of the cassette where the tape is exposed. The plate moves back when the cassette is inserted in a DCC machine.

The heads are made like integrated circuits, by lithographic techniques, on a silicon wafer. The first layer has a double strip of so-called magneto-resistive heads. Both analogue and digital signals are recorded on the tape in the form of a magnetic pattern. The pattern produces a changing resistance in a conductor in the head, which can be decoded into the original sound signals.

A second layer of magneto-inductive heads - where magnetic fields in the head induce changes of the magnetic pattern on the tape - is grown on top for digital recording.

The coding technique, known as precision adaptive sub-band coding, or PASC, takes advantage of the masking effect of the human ear. If the ear hears two sounds of similar frequency at the same time, the louder sound masks the quieter sound. In PASC, the sound spectrum is digitally filtered into 32 separate frequency bands, and each coded separately. Bands which contain no sound need no

coding, nor does sound which is masked. This saves on the total number of bits needed per second to reproduce the sound accurately.

The number of bits used in each band varies, from zero to 15, depending on the signal content. On average each digital sample needs only 4 bits, one-quarter the number needed for CD and DAT.

One of the DCC's main drawbacks is that it offers only 90 minutes' playing time, with a short gap halfway as the tape reverses direction. Philips promises 120 minutes from cassettes with thinner tape but DAT already gives at least that length of unbroken playing time.

PASC is likely to be welcomed by the music industry because it cannot make an unlimited number of perfect copies of CDs. DAT has always worried the industry because of its perfect copying. Although the decoded PASC signal sounds as good as CD, it does not look the same when analysed electronically. If a DCC recording is copied and recopied, in each generation PASC will add errors and interpolations. (This first appeared in "New Scientist", London, 21 January 1991, the weekly review of science and technology)

US chip firms want new trade pact

US semiconductor manufacturers are asking the US Government to negotiate a new trade agreement with Japan saying that the Japanese market is still not open enough to foreign competition.

A report prepared by the Semiconductor Industry Association (SIA) for President Bush, states that while the 1986 Semiconductor Trade Agreement has successfully stopped dumping, it has not been completely successful.

In 1986, Japan promised at least 20 per cent of its market to foreign companies. At the moment about 13 per cent of its market is controlled by foreign semiconductor companies.

The Japanese Government has said that it does not want another semiconductor trade agreement. US computer manufacturers have agreed to back US semiconductor manufacturers in a new trade agreement provided it does not include minimum pricing levels for key components such as memory chips. (Source: Electronics Weekly, 5 December 1990)

US companies join European initiative

The Joint European Submicron Silicon Initiative (JESSI), a $5,000 million collaborative semiconductor research programme set up in 1989 to help the struggling European computer industry to compete with the United States and Japan, is opening its doors to US companies. American Semiconductor Manufacturing Technology (SEMATECH), a consortium of 14 US companies, and IBM Europe, are both to join JESSI projects. (Source: Nature, Vol. 348, 6 December 1990)

Fibre optic link

The first direct fibre optic cable link between Germany and the US is being planned by AT&T and Deutsche Bundespost Telekom. The link, called TAT G-1, will carry 100,000 simultaneous telephone calls, and should be complete in 1992 or 1993. (Source: Electronics Weekly, 21 November 1990)

Computer security

The dizzying growth of computer networks in the past decade has meant gaping security holes, primitive software protection and general disregard of the threat of computer crime, warns a report from the US National Academy of Sciences (NAS). (Computers at Risk, National Academy Press, 1991).

Rather than being exceptional, the well-publicized cases of computer virus, break-ins and fraud that have captured headlines over the past few years are just the exposed tip of a growing computer security problem.

The examples cited by the report are sobering: A $259-million fraud in which staff at the car company Volkswagen reprogrammed computers to show false currency exchange transactions; an "almost-successful" attempt to defraud the Pennsylvania lottery out of $15.2 million by breaking into a database of unclaimed winning tickets; and a foiled attempt to make and use thousands of automatic teller machine cards with personal identification numbers pirated from an online database.

The NAS panel calls for the creation of a non-profit consortium of computer users, manufacturers and others in the computer industry to research computer security, track computer crime and promote adherence to an industry-wide set of security standards. The Information Security Foundation could operate on a $15-$20 million annual budget with funding provided by its members, NAS suggests.

Apathy and misguided trust are the most serious obstacles to improved security practices, the report says. Although some computer manufacturers are planning to adopt new protection techniques, others are reluctant to include security features - at extra cost and trouble - without greater customer demand.

The report warns that if US industry does not adapt common security standards soon, it may find it increasingly difficult to compete in the European market, where the European Communities are likely to set continent-wide guidelines for data protection. (Source: Nature, Vol. 348, 13 December 1990)

"Whale" puzzles experts

A computer virus called Whale is engaging the skills of some of the world's most able experts amid fears that the rogue code could be a test run for a wave of pernicious variants able to destablize sensitive computer systems. The code has been termed the "armoured virus" because of its unprecedented ability to defy examination and unravelling. British experts attempting to decode Whale's massive set of instructions, of more than 9,000 bytes, admit that it is the most complicated and challenging rogue programme they have encountered and the first to employ "confusion" instructions. Whale, delivered anonymously to an American virus researcher last September has been written by skilled programmers with funding from an agency or subversive group. This has fueled speculation that the code has been designed to test anti-virus response speed. There is reasonable speculation that groups like the IRA, instead of bombing the London Stock Exchange, could get just as much publicity by bringing down the Exchange's computer with a virus. (Source: The Times, 11 October 1990)

II. NEW DEVELOPMENTS

"Super" transistor claim

The world's first superconducting transistor has been made at Sandia National Laboratories, Albuquerque, according to researchers.

The superconducting flux flow transistor (SFFT) could act as a bridge between ordinary semiconducting electronics and superconducting circuits. This would allow superconductivity, the phenomenon of zero electrical resistance at low temperatures, to be exploited.

The SFFT was made from a so-called high-temperature superconductor, containing thallium, calcium, barium, copper and oxygen.

The Sandia team has made microwave amplifiers, with a gain of 10dB at 4GHz, 35GHz signal mixers, oscillators and phase shifters with the SFFTs.

The SFFT has a high output impedance, making interfacing relatively straightforward. (Source: Electronics Weekly, 29 November 1990)

Faster transistor can switch in 1ps

A transistor that can switch in a picosecond (ps) at room temperature has been made by NTT in Japan.

The velocity modulation transistor (VMT) has a double channel gallium arsenide/aluminium arsenide structure, sandwiched by aluminium arsenide barrier layers.

The VMT differs from an ordinary field effect transistor because the drain current is modulated by changes in the electron velocity, instead of changes in the electron concentration.

The electron concentration under the gate does not change when the VMT switches.

Consequently the switching speed is not limited by the electron transit time. (Source: Electronics Weekly, 20 February 1991)

Penn State's diamond transistor

In an effort to develop electronic applications for diamonds, scientists at Pennsylvania State University (University Park) report making the first high-temperature, thin-film diamond transistors. The single-crystal diamond devices work at 300°C but could be functional in integrated circuits working at temperatures as high as 600°C, according to Professor Gennady Gildenblat. The group grew the thin films from methane gas in the presence of atomic hydrogen, doping the material with boron atoms to improve electrical properties. A year ago, in separate efforts, Penn State and Sumitomo Electric (Tokyo) researchers developed simple, thin-film diamond transistors. But these devices did not function at high temperatures. (Source: Chemical Week, 12 December 1990)

Organic transistor challenges amorphous silicon

Computer displays and flat-screen TVs may soon be controlled by electronics made from organic polymers. French researchers have succeeded in making a transistor out of polymers, which has characteristics comparable to devices made from amorphous silicon. As it is based on polymers, it has the added benefit of being flexible.

Liquid-crystal and other flat screen displays require electronics spread over a large area to control each element of the display. For this purpose manufacturers make thin-film circuits from amorphous silicon, which is much cheaper to process than the mono-crystalline silicon used in silicon chips.

Materials scientists have been working for about five years to develop thin film circuits using polymer semiconductors because they are even cheaper to manufacture. But they have been hampered by poor carrier mobility - the ease with which charge carriers can move through the material.

The French group, from the molecular materials laboratory of the National Centre for Scientific Research (CNRS) in Paris, found that the characteristics of an organic transistor are related to the nature of the interface between the semiconductor and the insulator used. They replaced the silicon dioxide insulator normally used with cyanoethylpullulan (CYEPL), an organic insulator. The resulting all-organic transistor had a carrier mobility of 0.43 $cm^2V^{-1}s^{-1}$, comparable to devices made from amorphous silicon.

The structure of the transistor is similar to a so-called field-effect transistor made from inorganic materials. On a polymer base 25 micrometres thick, the researchers lay a narrow gold or silver contact known at the gate.

On top of the gate goes a layer of the insulating CYEPL polymer and then a 50-nanometre layer of a semiconducting oligomer called α-sexithienylene, or α-6T, a very short polymer of only 6 repeat units. The device is completed with two strips of gold across the top as contacts. The contacts are 5 millimetres long and 50 micrometres apart.

As in a normal transistor, charge carriers move through the semiconducting layer when a voltage is put between the contacts. If, however, a voltage is also put between the gate and one of the top contacts, the electric field produced affects the number of mobile charge carriers in the semiconductor. (This first appeared in New Scientist, London, 15 December 1990, the weekly review of science and technology.)

Biggest, fastest disk drive

Fujitsu America has introduced the biggest, fastest disk drive yet, based on an 8-inch platter with a capacity of 2.6 gigabytes, a transfer rate of 4.78 Mbps, an average access time of 12 milliseconds and a density of 67 Mbytes per square inch. Though the new M2671P is not IBM-compatible, Fujitsu supplies the IBM-compatible disk drives sold by Amdahl, so the technology is likely to show up in the next generation of Amdahl drives. (Extracted from Information Week, 5 November 1990.)

Seagate in fastest disk drive claim

The world's fastest disk drive, which transfers data at up 27 Mbytes/s, is claimed by Seagate Technology. The Sabre PTD parallel transfer disk has nine read/write heads working simultaneously, and is able to store 2.368 Gbytes.

The average seek time is 12ms, and data is transferred at 2.18MHz. Spindle synchronization allows the heads to operate in parallel.

The parallel transfer disk drive has an IPI-2 interface, which conforms to the ANSI Enhanced Intelligent Peripheral Interface specification, using a single cable.

The Sabre PID uses Seagate's Micropositioning technology, which continuously corrects for changes in the position of the data heads, caused by mechanical and thermal stresses.

The drive was developed with Cray Research, which will put a proprietary version in its forthcoming Y-MP2E supercomputer. (Source: Electronics Weekly, 28 November 1990)

Physicists X-ray bid

Physicists in California are well up on the way to making an X-ray laser, or Xraser, which is powerful enough to be used for ultrafine lithography for chips.

The Xraser, made by a team at the Lawrence Livermore National Laboratory, has a wavelength of visible light, but its efficiency is only one part in 100 million, giving a power output of a few megajoules.

Now the researchers are developing X-ray reflectors, to make a reflecting cavity where the rays can be amplified. They want to produce X-rays more cheaply than sources such as synchrotrons. (Source: Electronics Weekly, 27 February 1991)

ASIC design time cut by Scots firm

A custom chip whose funtion can be changed in software has been developed by Algotronix, a young company based in Edinburgh.

The chip, the CAL1024, is an application specific integrated circuit (ASIC). Because it can be reconfigured, it can be optimized for every task it does, so should process very quickly.

It is made of an array of 32 x 32 cells of configurable array logic (CAL), fabricated from 1.5µ CMOS - so would cost as little as £20 if made in volume. Each cell can be used as memory or logic, and as a connection wire.

The cells contain 18-bits of SRAM each, and can be connected to their nearest neighbours for parallel processing. Applications include signal and image processing and supercomputing. A novel multiplexing method, voltage domain multiplexing, speeds up communications between the chips.

Algotronix is selling the CAL1024 chip, and boards based on it, to developers. The company was founded in 1989 by John Gray who has worked for Lattice and ES2. (Source: Electronic Weekly, 20 February 1991)

Analogue chip stores signals

The industry's first integrated circuit to store analogue signals was unveiled at the International Solid State Circuits Conference in San Francisco. The device, which has been invented by the small Silicon Valley start up Integrated Storage Devices Corp, has up to 20 seconds of audio message storage.

The ability, for the first time, to store voltage in a non-volatile memory cell, has been developed by a team led by Dick Simko, ISD's chairman and a pioneer of EPROM and EEPROM technology. He moved from Intel to Xicor, where he was a co-founder.

The technology as now implemented, stores a voltage in a floating-gate cell that is the size of a standard EPROM cell. However, it would take 8-bits of digital memory to contain the same amount of information with addition of a DAC and an ADC to convert the signals in and out. The technique therefore provides an eight-times advantage in silicon area over digital techniques now used in analogue signal storage. Simko indicated that advantage will grow, making the recording of analogue signals highly efficient of silicon area and competing with many applications that now use magnetic media and mechanical drives.

Amplifiers, timing and sampling circuitry are also included. To make a complete miniature message recording and enunciating systems only a microphone, speaker, 3 capacitors, two resistors, two SPDT switches and a 5V voltage supply are required, besides the 15-pin ISD device.

All preamplification, filtering, storage and power amplification are on the chip. Devices may be cascaded for longer duration and multiple recordings can be made on each device, with digital addressing of the starting points.

Simko claimed that the memory will last for "tens of years," and that it can be "played back" repeatedly. (Source: Electronics Weekly, 13 February 1991)

GEC Plessey advance with memory chips

Memory chips from a UK company are a rarity so there will be a good deal of interest in the non-volatile RAMs and EEP ROMs now being sampled by GEC-Plessey Semiconductors (GPS).

The GPS non-volatile RAM or NVRAM represents a significant technological advance on all previous efforts to make NVRAMs.

Previous efforts have stuck at about the 4k density level with a slow read speed of around 90ns.

GPS has achieved significant improvements on conventional performance by perfecting a technology called metal nitride oxide on silicon, which has been around for a long time but which most of the world's semiconductor companies rejected as too difficult to manufacture.

Density of the GPS NVRAM is 64k and its speed is 25ns - 16 times denser and nearly four times faster than competing products. The chip comes in two versions called the PNC10C68A and the PNC11C68 and costs £16.34.

The 256k EEPROM guarantees ten years memory retention and 100,000 erase/write cycles. It can be read in 70ns, written in 160ns per byte and erased in 10ms.

Unusually for EEPROM, the chip is made in the GPS version of MNOS which it calls SNOS, or silicon nitride oxide on silicon, instead of the conventional EEPROM floating gate technology. Organized x8 and designed PN28C256, the chip costs £32.58.

The GPS EEPROM technology uses a single transisitor cell with three gates. Both the EEPROM and the NVRAM are JEDEC standard parts. (Source: Electronics Weekly, 6 February 1991)

Multichip modules star at MicroTech

Multichip modules (MMCs) are increasingly filling the gap between hybrids, circuits and ASICs. This was one conclusion that was apparent at this year's MicroTech 91, which was held at the NEC, Birmingham (January 28, 29, and 30, 1991)

"The pressure on pincounts, speed, and the demand for smaller, more portable equipment are all forcing the pace for the introduction of MCMs," said Dr. Alistair Trigg of Hirst Research Centre, who presented a paper at the event.

Stephen Wadsworth of Newmarket Microsystems gave several examples of the use of hybrid circuit technologies in applications where no other technique could provide the required performance.

John Gingell who works for Mitel Telecom described how thick film hybrid circuits offered the most cost effective construction for subscriber line cards. (Source: Electronics Weekly, 6 February 1991)

Sandia solves MOS mystery

A puzzling 30-year-old mystery of why MOS semi-conductors have a characteristic electrical interference has been solved by researchers at the US Government-funded Sandia National Laboratory.

The electrical interference has been accepted as part of MOS chips and a limit on their performance and a reason for occasional failures of MOS chips. It is sometimes referred to as 1/f or "flicker" noise. Sandia researchers say that they have tracked down the cause of the interference and say that interference-free MOS chips can now be built.

The source of the interference has been discovered to be a defect in MOS chips' silicon dioxide insulating layer.

Sandia has developed a manufacturing technique that it says can be applied to manufacturing commercial MOS chips that will eliminate most of the interference. The technique improves the performance of MOS chips and can make computers and other devices more reliable. (Source: Electronics Weekly, 6 February 1991)

Chip makers turn in power-packed show

Advanced semiconductor devices were previewed at a major conference, promising more powerful systems as manufacturers continue to produce faster and smaller chips.

Among the new devices at the International Solid States Circuit Conference in San Francisco was a super fast digital signal processor from National Semiconductor, capable of 100 million instructions per second. The chip will be used in advanced peripherals such as fast laser printers and in multimedia video applications.

Intel revealed its 100MHz 80486 microprocessor, which promises PC systems operating several times faster than today's high-end machines. PCs using the chip will rival powerful RISC workstations.

IBM delegates claimed to have developed the world's fastest memory chip, capable of sending or receiving 8 billion bits of data per second.

The chip will help to increase the speed of super-computers. The 512Kbps static random access memory is the world's fastest in terms of access and cycle time. It has an access time of just 4 nanoseconds compared with about 25 nanoseconds for regular srams.

A key feature of the new IBM chip is that it can operate with slower chips, allowing it a wider use.

Semiconductor devices shown at the conference have to be close to production, meaning that the chips are likely to be available by the end of this year.

Rivals jostle for lead in super chips

Japanese companies are edging ahead in the race to make the next generation of high-capacity computer memory chips. Last year Hitachi reported making the first DRAM memory chip capable of storing 64 million bits of data at its Central Research Laboratory in Tokyo. But, four other Japanese electronics giants - Fujitsu, Matsushita, Mitsubishi and Toshiba - announced their own versions at the International Solid State Circuits Conference in San Francisco in February 1991.

American companies tried to downplay the apparent Japanese lead. Some observers claimed that the high-capacity Japanese chips are not fully functional, and are far from ready for production.

DRAM chips are vital to the computer industry because they store data for instant access. They account for about one-quarter of the world semiconductor market. DRAM capacity has increased steadily as component size has shrunk. The most widely used chips now hold 1 million bits, but 4-million bit chips - first introduced in 1989 - are readily available.

Mass production of 16-megabit DRAMs has yet to begin, but several companies, including Texas Instruments and Hitachi, are supplying a few prototype chips to engineers. The 64-megabit chips are capable of storing the equivalent of 6400 typewritten pages. Commercial production of 64-megabit DRAMs is not expected until the mid-1990s

It takes a few years after the first chip is made in the laboratory before similar chips can be mass produced economically. The manufacturing technology must first be adapted for the factory. It takes yet more time to perfect it for production with reasonable yield. In all chip production, a proportion of the chips have errors so must be discarded.

To make higher capacity chips it is necessary to shrink the size of components on the chips. The finest lines on Hitachi's 64-megabit chip are only 0.3 micrometres across, compared to 0.5 micrometres on 16-megabit chips and 0.8 micrometres on 4-megabit chips. The lines are drawn on the surface of the chip using an optical lithography technique that involves shining light through a template, or mask, which carries the circuit pattern.

Hitachi made its fine lines by modifying the optical lithography technique used for its lower-capacity chips. This flies in the face of

conventional wisdom in the electronics industry that the long wavelengths of visible light would be diffracted by the edges of the pattern on the mask and make the pattern on the chip too fuzzy. It had been assumed that the much shorter wavelengths of X-rays would be needed to expose such thin lines.

Companies in the US, Japan and the UK have invested heavily in equipment for X-ray lithography, such as synchrotrons and X-ray lasers. However, the four Japanese companies reporting 64-megabit chips all used optical lithography. (This first appeared in the "New Scientist", London, 2 March 1991, the weekly review of science and technology.)

Fast RAM

NEC has developed 1 megabit random access memory (SRAM) chips with 20 nanosecond access time, according to a company spokesman. The access time was said to be the quickest available for commercial use. The complimentary-metal-oxide chips have 0.8-micron-wide circuits and are 85.72 mm^2. NEC will manufacture 10,000 chips/month at first and will boost production to 70,000-80,000/month in the next business year. (Extracted from Japan Economic Journal, 24 November 1990)

Dawn of the light fantastic microchips

A "significant breakthrough" in the worldwide attempt to make small, super-fast computers that are operated by light is being claimed by UK Ministry of Defence scientists. Researchers at the Royal Signals and Radar Establishment (RSRE), at Malvern in Worcestershire, have made a novel silicon microchip, which, when hit by a laser beam, emits large amounts of light, even at room temperature. The effect, known as photoflourescence, may be the key researchers and electronics companies around the world have been seeking in the race to develop advanced, low-cost optoelectrical devices. Such devices, a fusion of light and electronics, include advanced flat-panel televisions and neural network computers that aim to mimic the functions of the human brain and may be capable of solving the complex processing problems of high-speed speech and pattern recognition. Conventional computers have silicon microchips, the tiny processing components of the machines' electronic brains, linked by electrical wires. Researchers in several countries are attempting to develop computers in which information is passed from chip to chip by light. The pace of such machines, in which data is passed around as tiny pulsed pictures, could reach speeds of a billion operations a second, far faster than today's computers. The new silicon chip devised by the RSRE contains tiny "quantum wires" less than five nanometres thick or 15,000 times thinner than a human hair. Tests with a low-powered green laser beam have found that the wires turn the chip into an emitter of red light, even at room temperature. The team is to launch tests to see if the same effect can be repeated when an electrical current is passed through the new chip. This may be the breakthrough needed for combining optics with electronics ... and ultimately optical interconnects in crystalline silicon. (Extracted from The Times, 13 September 1990)

Japan develops self-learning chip

A "self-learning" optical neural computing chip has been made by Mitsubishi Electric in Japan. Other neurochips depend on external computers to do the learning. Mitsubishi says the new device could be the basis of a genuine optical neurocomputer.

Neural computers are modelled on the brain. The output of each neuron depends on the sum of its inputs. Each input is weighted according to its importance, and the weighting can be updated - so the neuron can "learn".

In Mitsubishi's chip the weighting function is part of the neurons. It consists of eight long, narrow LEDs laid over an 8 x 8 array of photo-detectors. The detectors have adjustable sensitivity, and this is used as the weighting.

The neurochip fits onto a gallium arsenide substrate. It learns at 600 million connection updates per second, over 2,000 times faster than a conventional neurocomputer. (Source: Electronics Weekly, 30 January 1991)

UK scientists unveil video on a chip

Research scientists at Edinburgh University have announced that they had succeeded in programming all the standard functions of a video camera onto a silicon chip.

The prototype - the size of a 20p piece - was unveiled by Professor Peter Denyer and David Renshaw, of the university's department of engineering.

The camera, located in the centre of the chip, is made of 84,000 light-sensitive pixels, which can produce a fully-formatted, composite video signal. It requires only a 5-volt power source to produce a picture on television screens.

Roy Warrender, managing director of the university's commercial unit, which is marketing the new device, said: "The chip converts light signals into electronic signals. The beauty of it is that you can actually process on the chip. We believe we can develop a camera for domestic security operations to retail at a cost of no more than £30."

Royalties from the invention are expected to earn at least £1 million a year for Edinburgh University. They have applied for five patents world wide. (Source: Computing, 31 January 1991)

Ceramic chip could write off discs

An Australian company has launched an erasable computer memory chip that retains data when its power source is switched off. The chip could revolutionize the design of computers and other electronic devices by doing away with the bulky magnetic disc memories that are currently used to store data permanently.

Current computers rely on a selection of memory devices. These include chips known as read-only memories or ROMs that store preprogrammed data without power but cannot be erased, and instantly erasable chips that require constant power, known as random access memories or RAMs. To store more data and programs when the power is off, most computers use magnetic discs.

The new chip is known as a ferroelectric random-access memory or FRAM. If it proves as successful as its developer, Ramtron, claims, it could replace all other types of data storage.

Data stored in RAM chips while the computer is on must be moved to a disc before the power is switched off. That requires a large software overhead that must contain instructions to handle

all the communication between the chip and the disc. Such data management operations take up a lot of the computer's operating time; in a computer based on FRAMs they would be reduced to a minimum.

Programs stored in normal ROMs cannot be changed. Data in erasable programmable read only memory (EPROM) chips can be updated many times, but only by removing the chip, erasing the original program with ultraviolet light, and then reprogramming.

Ramtron claims that mass-storage FRAMs could make hard and floppy discs unnecessary in smaller computers, especially laptops, making them more compact. Batteries will last longer because they will not need to drive the discs or maintain data when the mains current has been switched off.

In current FRAMs, Ramtron have deposited a layer of a ferroelectric ceramic on top of a conventional silicon memory chip known as a static RAM, or SRAM. Ramtron use a ceramic called PZT, which consists mainly of lead, zircon and titanium oxides, with traces of other elements. The ceramic's crystals polarize in one of two alternate states when energized by an electric field.

SRAMs store data by circulating a current through one of two circuits of transistors. A small amount of power is needed - such as from a battery - to keep the current moving. In a FRAM chip based on a SRAM, the current provides an electric field to switch the state of the ceramic. When the power is switched off, the ceramic above each memory cell is switched to a state representing the digital "one" or "zero" of the cell.

The polarity of the crystal is preserved for at least a year and, in theory, as long as 10 years after power to the cell is switched off.

In the more widely used dynamic RAM chips, or DRAMs, the bits of digital code are represented by the presence or absence of static electric charge in a capacitor on the chip's surface. The charge is let in or out of each capacitor by its own switch but the charge continually drains away so it needs to be constantly topped up from the mains or battery.

But the capacitors on DRAM chips take up a large amount of space; the ceramic of a FRAM chip is capable of storing data in a much smaller space. Ramtron aims in future to actually replace the capacitor with a small amount of ceramic embedded in the chip.

The ferroelectric effect exploited in the FRAM chip was discovered in the 1920s. An American electronics engineer, George Rohrer, first conceived the idea of a ferroelectric memory chip in the 1960s, but could not find commercial backing for its development. However, Ramtron formed a partnership with Rohrer in 1983.

At the end of January the company launched a commercial version of the chip. The first chip is very limited in capacity but Ramtron announced that a prototype 256-kilobit chip is already in limited production at its factory in Colorado Springs in the US, and will be released for evaluation by mid-1991. A commercial version will follow early in 1992. (This first appeared in New Scientist, London, 16 February 1991, the weekly review of science and technology.)

The biggest array yet

BiCMOS arrays of 100,000-gates are in development at a few major semiconductor manufacturers, but Texas Instruments Inc. is nearing introduction of an application-specific integrated circuit family that includes a sea-of-gates design offering up to 150,000 available (112,000 usable) gates. The device is believed to be the highest-density biCMOS gate array to date. It offers clock speeds greater than 180 MHz plus the ability to drive long, heavily loaded internal networks. The high drive ability stems from a novel core-logic cell design that incorporates an internal bipolar drive capability instead of limiting that ability to the chip's periphery, as most CMOS gate arrays do.

Developers at TI's ASIC Division in Dallas say members of the 0.8-μm family could show up in 1991 as central processors, glue logic, or as companion devices to reduced-instruction-set-computing CPUs in supercomputers or engineering workstations. Another application might be in telecommunications systems, where speeds greater than 180 MHz are required. (Source: Electronics, December 1990)

High storage capacity

Bellcore researchers have found a technique that may lead to holographic computer memory. They were able to recover a page of text image in under 1 ns from a crystal. It opens possiblities of extremely high speed and high storage capacity in low-cost multimedia computers. The researchers used tiny photoreactive crystals and micron-size lasers to store and retrieve 3-dimensional holographic images. A prototype that handles full-motion images is planned. (Extracted from Computerworld, 26 November 1990)

Device to etch semiconductor circuits

A compact synchrotron to generate X-rays to etch semiconductor circuits could help the US regain the lead from Japan in the race to put more circuits onto computer chips. The device, developed at the Brookhaven National Laboratory is only 13 feet long and 7 feet wide. The $32 million device began operating in October 1990. The X-rays can etch circuit lines only 0.1 micron across, against standard etching of circuit lines 1 micron across. Many experts say that X-rays are superior to other technologies being developed for chip etching, including ion beams and electron beams. Production of X-ray generating devices is thus critical to the semiconductor industry in the US. Congress doubled funding for the project for 1991, over the $30 million allocated for 1990. The research is co-ordinated by the Defense Advanced Research Projects Agency.

Visible light etching has just about reached its limits and shorter-wavelength energy is now needed to increase chip capacity. The Japanese have already built 3 small synchrotrons for making X-rays, but they apparently trail the US in efforts to use the X-rays for etching chips. IBM hopes to have a small synchrotron at its research centre in East Fishkill, NY, in 1991. IBM and Motorola say that a single synchrotron could make 6 times more computer memory than was used world wide in 1989. The IBM synchrotron will have a power of 0.135 amperes. The new Brookhaven machine, by contrast, will have a power of 0.5 amperes when

superconducting magnets are installed in 1992 or 1993. Each device will produce X-rays with a wavelength of 0.001 microns. Application of the synchrotrons is being researched at the University of Wisconsin. The major obstacle may however be financial rather than technical. (Extracted from New York Times News, 4 December 1990)

Polymer like gold

A polymer as conductive as pure gold has been synthesized in Japan. The Research Association for Basic Polymer Technology has produced a polymeric polyacetylene with a conductivity of 400,000 s/cm, high enough for it to replace copper (600,000s/cm) in some applications. The previous record was 170,000s/cm for an oriented polyacetylene film made in Germany. (Source: Electronics Weekly, 30 January 1991)

Mips leads way with RISC micro

Mips Computer Systems unveiled details of its new RISC processor in London. The device will be used at the heart of minicomputers, workstations and sophisticated control systems made by companies like DEC, Siemens-Nixdorf, Bull, Wang and NEC.

The R4000 will be the first of a number of new RISC micros produced over the coming months. Inmos expects to describe its next generation transputer (H1) in April and Motorola should begin shipping an advanced 88000 micro in the summer.

Mips's new device is designed to be compatible with its current R3000 chip. It will talk to the outside world at 50MHz but will process instructions at 100MHz internally. Its buses will be able to transfer data from one part of the micro to another at 200Mbyte/s.

The real increase in computing power comes from changing the way in which the device breaks up tasks into processing instructions. The earlier chip split each line of code into five pieces and processed them in turn.

The new device breaks the code down into 16 pieces and processes it in eight stages. Each stage processes the last half of one instruction and the first half of the next. This allows it to be passing two instructions through the stages, or pipeline, at the same time, effectively doubling the computing power.

Mips will not actually make the devices itself. NEC, Siemens, IDT, LSI Logic and BIT will produce the chips as part of a partnership with the computer company. (Source: Electronics Weekly, 30 January 1991)

Hitachi unveils world-beating neural computer

Using wafer scale technology, Hitachi has developed a neural computer with the world's fastest learning and processing capability. The neural mainframe is only 30cms high, 21cms wide and 23cms deep, but has learning and processing speeds several times faster than those of other neural computers so far built to date. Notably, it is also ten times faster than can be achieved by simulation on a supercomputer.

A neural computer uses a neural network modelled on the human brain. Although the human brain contains about 10 million neurons, useful results can be achieved with as few as 1,000 electronic neurons, especially as they are around 1,000 times faster than organic neurons. Hitachi's neural computer has 1,152 neurons and achieves a processing speed of 2.3 billion coefficient updates per second.

Unlike conventional von Neumann-type computers, neural computers can provide heuristic solutions in pattern recognition, predictions, optimization and similar areas where problems cannot be easily described in algorithmic terms.

Already, Hitachi has developed stock price prediction and signature verification applications that can be run on the new neural system.

The neural computer is said to take only about 10 seconds to forecast 10-day stock price movements from data for the past 20 days, with an average error rate of as low as 5 per cent. (Source: Hitachi Report, January 1991)

Fastest silicon claim

Cypress Semiconductor believes its 7.5ns BiCMOS PAL22V10C and PAL22VP10C are twice as fast as most CMOS logic devices and 25 per cent faster than bipolar 22V10s.

In PLCC packages, ground bounce is held to 1.1V using programmable edge rates on output transitions and the option of JEDEC-standard 28-pin packages with isolated ground pins for outputs.

On the chip, the ECL core is surrounded by bipolar level-conversion circuits. Control logic is made in CMOS for low current. The standard package is plastic.

Output time constants can be matched to packages and loads. Parts in lower-inductance PLCC packages can be programmed for faster edge rates than parts in DIP packages.

The PAL22V10C and PAL22VP10C can be programmed using standard Data I/O, Stag, Logical Devices, and Sprint programmers, as well as Cypress's own Quick-Pro programmers. (Source: Electronics Weekly, 30 January 1991)

Will optical fibres become obsolete?

In certain circumstances, light beams will spiral round each other, like strands of DNA, according to Australian physicists. The phenomenon opens up the possibility of guiding one light beam with another, making optical fibres obsolete.

Allan Snyder, head of the Optical Sciences Centre at the Australian National University, and his colleagues John Mitchell and Leon Poladium have developed a theory of guided light. The theory predicts that intense light beams can attract, repel or bend each other. Snyder presented his results at the seventh international conference on optical fibre sensors, held in Sydney (Australia) in December 1990.

An intense light beam can guide another light beam because it modifies the "refractive index" of the materials through which it passes. Light travels more slowly through materials of high refractive index. And when its speed changes - for instance, at the boundary between two materials whose refractive index differs - it bends.

An intense beam of light actually raises the refractive index of the material surrounding its path, although the change drops off rapidly with

distance from the beam. Because of this change in refractive index, the speed of the beam changes. In fact, the speed of the beam is related to its intensity.

The new theory predicts that if two intense beams of light are brought close enough together, each will modify the other's speed, and so bend it from its original track. In the case of parallel beams, each having a circular cross-section, Snyder and his colleagues predict that they may attract or repel each other. Precisely which of these processes happens depends on whether the two beams are in or out of phase with each other. The phase of a light wave is a label denoting the precise position of its peaks and troughs.

According to Snyder and his colleagues, if the beams are locked in phase - that is, their peaks and troughs are in step - each beam will spiral around the other. Effectively, each beam will behave as if it is trapped within an optical fibre.

Light beams are better than electric currents for computing and communications because they travel faster, have no mass and suffer less from the effect of interference. They can even pass through one another without distortion.

According to Snyder, the new optical theory has practical applications. In the past few months, scientists at Bell Laboratories in the US have demonstrated that one light beam can become self-guiding in glass, creating its own optical fibre as it propagates through the material.

Snyder says that the search is now on for materials that will make all-optical devices. Within such materials, light beams may be switched and directed by other beams which change the refractive indices in their path. These could become the building blocks for the optical switches and logic gates from which optical computers could be constructed. (This first appeared in New Scientist, London, 12 January 1991, the weekly review of science and technology)

Silicon films get new look

Taking advantage of well-known powder coatings technology, researchers at the University of Arkansas (Little Rock) have developed a method to apply thin films of silicon that could significantly reduce the cost of producing solar panels and electronic devices. Arkansas scientist Roger Hawk says the system relies on conventional corona discharge gun technology - a powder coatings process commonly used in automobile and applicance applications - to apply silicon layers that are then sintered. The Arkansas process produces films from 1 to 10 microns thick. Hawk says the technology can dramatically cut basic equipment costs of standard industrial systems, which use silane gas to create silicon films. The university is seeking a patent on the technology, but has not decided on commercialization plans. (Source: Chemical Week, 5 December 1990)

IBM cuts cost of lasers

IBM says it has found a way to halve the cost of producing semiconductor lasers, the tiny devices found in CD reading heads, bar code readers and laser printers.

The process is similar to the one used in chip production, and IBM says its existing chip-making factories could now be used to mass-produce semiconductor lasers with only slight modification.

Traditionally, the reflecting surfaces of a semiconductor laser are simply the cleaved edges formed when a disk of laser material is broken up. The secret of the new process is to make these mirrors while the disk is still in one piece, by etching troughs in the wafer of laser material and then depositing reflective material in the troughs.

The biggest advantage of the new technique is that it means the lasers can be tested while still on the wafer, in batches of up to 20,000 at a time.

As well as being cheaper, IBM claims the new technique is faster and more efficient. (Source: Electronics Weekly, 6 February 1991)

World's fastest computer

No longer content to limp along at only one to two billion calculations per second - the typical speed of today's fastest supercomputers - researchers from 14 institutions have formed a consortium to build the fastest and most powerful computational engine on the planet: a machine that should do 5 to 15 billion calculations per second on the average and 32 billion per second on the straightaway.

The new machine is called Touchstone Delta, and is being built by the Intel Corporation based on an existing supercomputer design. It will achieve its power in two ways: by harnessing 528 individual processors to work in parallel, and by incorporating "mesh-routing" chips developed at Caltech to help the processors communicate with one another. If all goes as planned, it should be up and running at Intel by January 1991. It will be installed at Caltech by the following April, ready to tackle such problems as better modelling of global climate change, processing data from the Magellan and Galileo spacecraft, recognizing DNA patterns within the human genome, and searching for radio signals from binary pulsars.

Headquartered at Caltech, the consortium includes Intel, NASA, NSF, DARPA, and most the US Energy Department's national laboratories. (Source: Science, 30 November 1990)

SQUIDs probe the rhythms of disease

Extremely sensitive magnetic sensors based on superconductors may soon revolutionise the diagnosis and treatment of epilepsy, irregularities of the heartbeat and other diseases.

Doctors in Germany, Finland and Italy have begun using arrays of the sensors, called superconducting quantum interference devices or SQUIDs, to map the flow of currents of ions in the body. These currents produce minute magnetic fields, which are picked up by the sensors even though they are 100 million times weaker than the Earth's magnetic field.

Diseases such as epilepsy are thought to be caused by damage to parts of the brain. The damage causes an increase in electrical activity, which can be spotted using the sensors. This could enable doctors to treat the disease surgically or provide a better understanding of the way epileptic fits develop. The technology has already been used to treat about 100 epilepsy sufferers and may also be used to treat mental disorders.

The new technology offers doctors details of how the brain functions rather than anatomical information.

For some time researchers have been able to monitor such biomagnetic signals using devices with one magnetic sensor and one monitoring channel. But because only one sensor was used, investigations often took hours to complete - which made the technology impractical.

Recently the European companies Siemens, Philips and Dornier, and the American firm Biomagnetic Technologies, have developed devices with up to 37 SQUID sensors and monitoring channels. With an array of sensors it is possible to obtain images from different angles simultaneously and compare them to pinpoint the location of particular functions more quickly. This has shortened examination times from hours to between 5 and 30 minutes.

At the Neurological Clinic of the University of Erlangen in Germany, Hermann Stefan is testing the new technique by comparing the SQUID sensor technology with other imaging techniques to locate the epileptic foci (or sites) in the brain.

In Rome, Riccardo Fenici, associate professor of clinical physiology and cardiology at the Catholic University, has been using a single channel device to locate the source of heartbeat irregularities for the past five years. A multi-channel device, he says, could be used to guide surgeons who are performing catheter surgery on patients suffering from a type of heart arrhythmia called Wolf-Parkinson-White syndrome.

Like Stefan, Fenici has also found the technology to be an accurate tool in finding the places in the heart where arrhythmia originates. The electrical wave which moves around the heart to trigger it to contract can become short-circuited causing the heart to beat irregularly. The site of the short circuit will have a different arrangement of currents, so it can be spotted with SQUIDs. "The accuracy range is from 5 to 12 millimetres", Fenici says. The device has also been useful in locating the tip of the catheter during surgery.

But despite the recent advances in technology, speed is still a problem. "The new systems are very fast" Fenici says, "but sometimes you need a few minutes, and that is too long if you are in surgery". Cost is another problem. "You need a magnetically shielded room to use them, which is one of the things which makes the device expensive". The Siemens Krenickon system used in Erlangen costs around £1.5 million. The SQUIDs need to be cooled to -269°C with liquid helium, which requires expensive refrigeration and insulation. (This first appeared in New Scientist, London, 26 January 1991, the weekly review of science and technology.)

Alkaline etching of silicon plates

Etching of silicon plates is one of the four basic operations employed in their manufacture, i.e. cutting, grinding, chemical etching, and mechanical and chemical polishing. During the etching step the layers of material damaged or contaminated on cutting or grinding are removed.

The Institute of Electronic Materials Technology, UNITRA-CEMAT (ul. Wolczyńska 133, PL-01-919 Warsaw) has developed a new technology of alkaline etching of silica plates. This technology features a number of advantages over etching in acidic solutions. It reduces ecological problems, improves the geometric parameters of the etched plates, and the cost of chemicals used for etching is likewise decreased.

The wastes produced in the new process are not harmful to the environment (the hydrogen evolved is distributed rapidly in the atmosphere), the spent etching mixture being subsequently utilized in the washing and cleaning agents industry.

The etching solution contains sodium or potassium hydroxide, and sodium or potassium hypochlorite. The etching solution temperature during the process is about 370 K, that operation lasting for some 4 minutes. Differences in the thickness of the etched plate (i.e. over its entire surface) do not exceed 1 μm. The surface of the etched plates is uniform and is free from differences in colour, shade and brightening. This new technology is protected by Polish Patent No. 147571 and has been implemented in the industrial practice of the UNITRA-CEMAT Scientific and Production Centre, Warsaw. (Source: Polish Technical Review, No. 6, 1990)

Superconductors

Researchers at ICI Advanced Materials have developed a process to make thick films of the high-temperature superconductor yttrium barium copper oxide. These cause much lower signal loss in mobile communication systems than normal metals.

The researchers say their work was motivated by the need to provide an inexpensive, rapid and effective alternative to thin films for certain applications.

By sintering thick films of $YBa_2Cu_3O_x$ inks for six minutes in flowing oxygen at temperatures above the peritectic for the compound, followed by cooling at 1°C/min to room temperature, the researchers found the films were essentially melt-processed, resulting in a very large grain size and hence a low surface resistance. At frequencies used for mobile communications superconductor losses are two orders of magnitude lower than those of normal metals.

They conclude that the main advantages of the thick-film route are its speed, low cost and ability to apply the films on curved and large areas, the largest so far being greater than 200cm^2. (Source: European Chemical News, 25 February 1991)

Tiny cathodes make a flat screen

A team of Californian researchers has reinvented the cathode-ray tube, the heart of every computer screen and TV except portable ones. They have come up with a flat screen that relies on thousands of tiny electron emitters rather than the usual single electron gun.

Cathode-ray tubes (CRTs) have a hot filament called a cathode that emits electrons. A so-called electron gun then accelerates and steers the electrons, using electric fields, towards the fluorescent screen at the front of the tube where they create the image on the outside of the tube.

The problem with CRTs is that they are large and heavy and use high voltages to accelerate the beams. They also emit radiation from the front of the screen, believed to cause health problems. For 20 years, Capp Spindt and colleagues at the Stanford Research Institute in California, now known as SRI International, have been developing flat arrays of tiny cathodes.

The company Coloray, in Fremont, California, and Robert Duboc, its vice-president, say they have

demonstrated very small displays in both colour and monochorme.

The cathodes in their field emission display are tiny cones manufactured using methods developed in the semiconductor industry. Each cone is about one micrometre across and its small size means that electrons can tunnel out of the tip encouraged simply by an electric field - without heating. The array of cone cathodes is mounted on a glass base plate and a second glass plate, coated with fluorescent dots, is held about 0.1 millimetres away from the array by supporting pillars. The space between the plates is a vacuum.

The outer plate also carries a transparent conductor so that an electric field can be applied between the cathodes and this plate. This field accelerates the electrons emitted from the tiny cones to excite the fluorescent dots.

Circuits at the edge of the display and beneath the bottom plate control the field applied at each dot so that an image can be formed. Each dot, which is 0.1 millimetres across, has between ten and a hundred cones beneath it so that if some emitters fail there are many more available.

Duboc predicts that it will take four or five years to perfect displays large enough for portable computers. But, he says, the price of the new displays will be about 30 per cent less than that of CRTs, and they will use 30 per cent less power. They will also have lower emissions of radiation than CRTs because lower voltages are used than in electron guns. (This first appeared in New Scientist, London, 2 March 1991, the weekly review of science and technology)

AT&T uses erbium to boost fibre amplifiers

Researchers at AT&T's Bell Laboratories have developed a means of boosting the power of optical signals without using electricity. Their erbium-doped fibre amplifier is being used in a trial undersea cable running across the Pacific to Tokyo.

The new device amplifies the light signal passing along the fibre without drawing power from batteries. This means that the operating companies can leave the cables alone for longer periods because the routine maintenance does not include changing the batteries.

Bell Laboratory's light-driven amplifier is based on a silicon fibre doped with erbium. The pump laser is used to create population inversion in the energy levels of the erbium-doped fibre. The photons of the incoming signal cause the electrons to drop to the lower energy levels when the two collide, producing an output signal.

The US researchers' breakthrough is in using a structure that produces inversion at 1,480nm. The erbium doping introduces an extra energy level into the process, so that the pump laser does not force electrons directly to the energy at which stable inversion occurs. The electrons are allowed to decay naturally into the stable state from which the incoming signal forces them.

John Zyskind, one of the team that developed the amplifier, said that erbium doping also allowed them to build a more compact device.

Bell Laboratories uses a molecular chemical vapour deposition (MCVD) technique to dope the silicon fibre.

In the long term, Bell Laboratories believes that the light driven repeaters will be less complicated than today's devices. The use of dispersion shifted fibres will also help, by allowing even more compact waveguides to be used. (Source: Electronics Weekly, 6 February 1991)

Changing face of computers

When is a computer not a computer? When it is an oscilloscope, a picture library, fax machine or clipboard. In the past year the computer has begun to change its clothes. It is casting off the robes of the dull but indispensable calculating machine, and putting on more glamorous garb.

The change has been made possible by the dramatic increase in the amounts of processing power and memory which you get for your money. A modest PC can turn into all sorts of other things just by the addition of a plug-in card, some software and an extra device such as a modem or video camera.

Computers pretending to be other things have given rise to one of the best new jargon phrases of 1990 - virtual reality. Instead of using acid, you can now achieve something approaching an altered state of consciousness by strapping on a helmet and a glove and "steering" your way through a computer-generated adventure.

Rather more down-to-earth, but based on similar principles, are virtual instruments. National Instruments (NI) is one of the most active companies in this field, selling plug-in boards and software to make PCs imitate instruments such as oscilloscopes, Fourier analysers and multimeters.

If you use any instrument regularly, chances are that you control it by computer. Combining the instrument and the computer is a logical step - this reduces the wire spaghetti on the bench (which also removes the problems of wires acting as aerials), reduces interfacing problems, and gives you a much more versatile display than most instruments have. For example, NI's EISA-A2000 data acquisition system looks like a four-channel oscilloscope, with the channels displayed in four different colours.

Another major development of 1990, which should translate to the commercial market in 1991, is multimedia - the computer-controlled co-ordination of sound, video and computer graphics. A lot of work was done on the hardware last year, though standards have yet to be published.

Most multimedia programs will be interactive - viewers can move through the information presented in any order they choose, by selecting on-screen "buttons" with a mouse.

Multimedia has obvious applications as an education or training tool. Programs could replace manuals - imagine how much easier it would be to fit that fiddly widget if the manual included a video of someone actually doing it.

But are engineers sophisticated enough to write the software themselves? It is difficult enough to write instructions and reports in the conventional way. Software to help you write multimedia software should be popular in 1991.

Cristie Electronics, the data recording firm, has come up with a simpler alternative to the conventional instruction manual. TechAid is a terminate-and-stay-resident database program, which contains instructions for installing Cristie products.

Information can also be disseminated using Hasler's add-on subsystem, which turns a computer into a remote-control information dispatcher. The ActiveFax receives phone calls, then sends faxes selected by the caller. The caller selects faxes by tapping a code out on the phone keypad. Fax links and even LANs could be radio-based in the 1990s.

If you have a computer, you do not need a separate fax machine any more. During 1990 several board manufacturers produced an add-in modem and fax decoder, making the standalone fax machine unnecessary. This equipment converts incoming fax messages to text files, which can be printed out if required. In effect, this turns an isolated PC into one with an e-mail facility, able to communicate with any other computer which has a modem.

GRiD Computer Systems have even computerised the humble clipboard, with its GRiDPad, which recognizes handwriting and can store text, graphics and programs. The first videophones could well appear before the end of this year. They are likely to be computer-based too.

Taking away market share from the conventional laptop PCs will be new generations of mobiles from the luggable "transportables" to the laptop "portables" to the pocketable "notebooks".

The other things into which computers are metamorphosing are many and varied. Kodak has turned a computer's CD-ROM disk into a packet of holiday snaps. The company's Photo CD system turns ordinary photographic negatives into digital files, which are stored on CDs and played back onto a TV screen.

The CD-ROM could become one of the most important enabling technologies of the decade and only awaits the availability of cheap rewritable versions for them to become used in a large variety of applications connected with computers.

However the companies that are capable of producing them have been bitten more than once, by producing rewritable memory vehicles which then turn into a licence to rip-off non-rewritable products which can attract higher margins.

Accordingly, although companies like Sony, Matsushita and Philips have been able to produce rewritable CD-ROMs for a couple of years now, there is a possibility they would not hit the market as a low-priced high volume product until problems such as data protectability and standards are agreed.

The effect of CD-ROM technology is therefore difficult to predict because like many component technologies it does not begin to have a very general effect until the cost benefits of mass-production are tapped.

That is also true of another of the key technologies of the 1990s which has always been on the point of "emerging", but never quite has - liquid crystal displays big enough to provide full colour flat panel screens for TVs and computers.

The Holy Grail for flat panel displays is a 20cm X 15cm LCD panel which can handle 60 lines of text in full colour. At the moment, a screen half that size is costing $70 and clearly the larger screen size will not become available at a sufficiently cheap price until very large production volumes are available.

Most of the American companies capable of making such a product look too small and under-funded to build factories to make them. Already they are talking about forming consortia and asking for government support.

The EC is also worried about the possibility of being held to ransom by Japanese suppliers of flat panels and is seeking to find potential manufacturers. Thomson of France is said to be interested.

One rule of thumb about the timing of the emergence of affordable new technology is to see whether the US or Europe can produce it. Just as that happens, the Japanese tend to turn on their production taps and flood the market with appropriately priced, readily available product.

The most predictable advance in technology is always in microchips, which have rarely deviated from the rule that a new technology generation comes along every three years. 1990 was the year of the 4Mbit; 1993 should be the year of the 16Mbit; 1996 the year of the 64 Mbit and 1999 the year of the 256Mbit when 250 million transistors will be put on a chip.

There is, however, some excitement in this predictable progress. The new memory technology flash is coming in to challenge DRAM as the industry's technology driver offering ever-denser chip memory.

Flash memories could get to the 16Mbit stage before DRAMs and they have the further advantage over DRAMs of non-volatility. That makes them both an EPROM replacement technology, and a candidate for slow SRAM applications. Furthermore, when technical advances in the manufacturability and endurance of flash chips are secured, they will be a potential disk-replacement technology.

That could have a great influence on portable equipment like computers and cameras where flash technology, used in the form of a solid state memory card, has considerable power and weight reduction advantages over the revolving mechanisms required for disk drives and the heavy batteries needed to power them.

So the key words to describe the emerging technologies of the 1990s are "wire-less" and "portability". The new chip technologies will make significant equipment like video cameras, computers and fax machines pocketable items, and new radio capabilities will see these machines linked globally without the need for wires. (Source: Electronics Weekly, 9 January 1991)

III. MARKET TRENDS AND COMPANY NEWS

Market trends

1991 world market forecast

It is a bad year for forecasters. "We tried [to project growth figures for 1991] and could not come up with any consensus," says Mark Rosenker, vice president of public affairs at the Electronic Industries Association in Washington (EIA). And that pretty much sums up the uncertainty surrounding the market forecast. In almost every market category, in almost every country surveyed by the

annual Electronics market forecast, analysts and executives alike are hedging their bets. Everyone is anticipating growth in world-wide consumption of electronic equipment and components in 1991, but no one is predicting just how much.

Recession has struck parts of the world, including the UK, Canada and Australia, and first-quarter results on top of a down final quarter of 1990 will undoubtedly show the US is technically in recession, too. Japan is slowing, and a Europe poised on the brink of economic unification also has the recessionary jitters. Add to this the Persian Gulf crisis and the forecast becomes still cloudier.

The wobbly forecasts for 1991 come on the heels of very modest growth in 1990. Based on eight-month figures, the Electronic Industries Association shows a 3.5 per cent growth rate for the US electronics industry last year. American Electronics Association numbers are slightly better: 4 per cent. Japanese growth was 6.2 per cent, and Europe also had a year of generally low growth.

Each of the five broad categories Electronics surveyed this year - computers, communications, consumer electronics, semiconductors, and capital equipment - shows fast-growing segments that will help boost overall 1991 sales figures. But in many other segments, especially the traditional market drivers, most bets are off. The uncertainty is such that in one critical business - semiconductors - analysts' growth projections go from 15 per cent to 3 per cent for 1991.

Taking all these considerations into account, the Electronics forecast projects growth of 9.5 per cent overall in 1991, bringing world-wide electronic equipment and components markets to $635 billion. The computer sector will rise a healthy 12.4 per cent, to $200 billion, led by brisk sales of workstations. Communications will post gains of 12 per cent to 15 per cent, to $76 billion, with the greatest growth anticipated in Europe as the newly liberated Eastern-bloc countries scramble to modernize their communications infrastructures.

Semiconductors are a tougher call. Buffeted by a free-fall in the price of dynamic random-access memories, vendors find themselves unsure of how much production to bring on line until they have a better sense of what the Office Equipment Manufacturers are going to do. For their part, the Office Equipment Manufacturers are wavering between two choices: combining several cheap 1-Mbit DRAMs or holding out for a single 4-Mbit part, in the hope that prices for the larger devices will likewise plummet once they move into volume production.

The best guess is growth rate of about 6 per cent, bringing the semiconductor industry to $46 billion world-wide.

Consumer electronics will be at low-single-digit growth world-wide, to $64 billion. In the US, sales of a few items, such as camcorders, will fuel an overall 4 per cent market rise. The outlook is better in Europe, where Eastern consumers hungry for electronic playthings will help propel 6 to 8 per cent growth. Japan should see just 3 per cent growth as the next generation of products, such as digital-audio-tape players, reach for a toehold in the market.

Finally, the weakest performer is capital equipment, a category that embraces the engineering tools and high-priced machines needed to build integrated circuits and other electronic products. This sector - which includes semiconductor production equipment, test gear, and design-automation tools - always suffers in recessionary times, as the industry postpones big-ticket purchases. It will remain essentially flat at $20 billion. The remaining $229 billion is in such areas as industrial and military electronics and components.

All the clouds in this year's crystal ball underscore the fact that the globalization of the electronics industry is more than just a buzzword. Softness in any one geographic market sends shivers down the spines of producers halfway around the world. (Extracted from Electronics, January 1991)

Computers are the survivors

It may be doom and gloom in the economy, but the computer industry can look forward to considerably better times ahead says Ovum Consultants. The computer industry will grow by an average of 11 per cent a year through the 1990s. By the year 2000 the industry's sales will be three times what they are today in real times. The best news is for the software, services and data communications sectors - demand for their products will rise sharply. The demand for computer hardware will not grow so rapidly. The report was compiled following interviews with major computer users in both Europe and the US. (Source: Financial Times, 9 November 1990)

US electronics industry trends

US industry analysts predict that there will be a major shakeout in the engineering workstation market this year as a cut-throat price war erupts.

The good news for the user is that powerful workstations will be available at much lower prices. The main problem, however, is choosing the right system from a company that will still be in business and able to offer support and upgrades after the price war and shakeout is over.

Market research company International Data Corporation (IDC), recently released its analysis of the work station market showing that US workstation sales did not grow as fast in 1990 as they did in 1989. Unit shipments grew by 33 per cent while the market value of those sales rose 19 per cent.

IDC's figures and analysis closely match a recent report from market research company Dataquest, which shows unit workstation shipments in 1990 grew by 33 per cent compared with 40 per cent growth in 1989. Value of shipments grew by 21 per cent in 1990 compared with 40 per cent growth in 1989.

Price competition is certain to take a toll on several companies in the increasingly crowded workstation market as six major workstation vendors, Sun Microsystems, Hewlett-Packard, DEC, Intergraph, Silicon Graphics and IBM battle for larger shares. Both IDC and Dataquest agree that Sun is the current market leader with almost 30 per cent of the market. H-P is second with 22 per cent and is struggling to make up a slight loss of market share during 1990. Some of H-P's problems were caused by a lack of Motorola 68040 microprocessors and in producing a low-priced RISC workstation line.

DEC also lost market share, falling to just under 18 per cent in 1990 compared with 21 per cent in 1989. DEC and Silicon Graphics ran into problems when Mips Computer Systems could not produce enough of its R4000 RISC chip and performance of the chip did not meet design specifications.

IBM did well with its powerful RS/6000 workstation, which grabbed 3.5 per cent of the market in 1990. IBM is expected to drive much of the price competition this year by lowering workstation prices.

Who will survive the price war? Both IDC and Dataquest have their money on Sun to keep its number one position by selling more than 200,000 workstations this year. In 1990, several companies, including Intel, were forced out of the workstation market and others are expected to follow this year.

With RISC-based systems dominating workstation systems, it is interesting to note that Sun's SPARC and Mips RISC microprocessors are the top RISC microprocessors. Intel and Motorola are struggling to find workstation customers for their RISC microprocessors.

With workstation systems becoming cheaper and more powerful, 1991 should bring these technologies into easier reach for more users. (Source: Electronics Weekly, 6 February 1991)

Europe's way with chips

European prices for memory chips, a key component of computers and other electronic equipment, are about to rise by 10-15 per cent, according to estimates by Dataquest, a firm of analysts. Memory-chip prices are falling in most other parts of the world.

Early in 1990 the European Commission began setting minimum prices for Japanese memory chips sold in Europe. Because Japanese firms supply the vast majority of the world's memory chips, these prices are in effect a floor price for all memory chips. To prevent the Japanese from "dumping", the Commission estimates Japanese production costs every quarter and then forces the Japanese to price above these estimated costs.

Most of the costs of producing a memory chip are fixed, because of the elaborate factories and equipment needed. So when the Japanese cut production in a slumping market, as they are doing this year, these high overhead costs are spread over fewer chips. Normally the Japanese would have to accept the squeeze on profit margins resulting from higher costs per chip and lower prices - and indeed memory-chip prices are falling in most markets as producers chase slumping demand. In Europe, however, the Commission's cost-based price-fixing formula forces prices up.

Jim Eastlake, an analyst at Dataquest, reckons that most chip consumers were expecting memory-chip prices to fall by 5-10 per cent in the first three months of 1991. Instead, European buyers could pay some $23 million more than the $200 million their chips would probably have cost them if the market had been left to itself. America is abandoning a similar price-fixing arrangement for memory chips. (Source: The Economist, 26 January 1991)

Trends in information technology

For most of the 1980s, growth in the computer industry outstripped even the most optimistic predictions. By 1990, when slowing growth brought bad results to many producers, most pessimists had given up waiting to say "we told you so". With growth in computer markets set to slow further this year, the industry is gripped by pessimism. But the biggest problems for computer makers will come after the recession. When growth returns, some firms will find that the market has left them behind.

Slowing sales come as a nasty shock to firms accustomed to double-digit annual growth in their markets. A survey by the Index Group, a firm of information-technology consultants, shows a steady tightening of information-technology budgets by big American companies. In 1990 the 400 or so companies surveyed by Index reported that spending on information technology grew by 7 per cent. In 1991 budgets are set to rise by only about 5 per cent. Preliminary results from an Index survey of big European firms suggest that they too are now restraining spending on computers.

This may look generous compared with real drops in demand faced by many manufacturers, but it has hit the computer industry hard. Some companies have recently announced plans to cut thousands from work forces swollen by the hope of never-ending growth. More job losses will come.

Yet recession itself should be the least of computer executives' worries. Today at most a third of European white-collar workers have computers on their desks and half of Americans. Someday computer and desk will probably be synonymous. Making them so will give the computer industry another boom. The challenge of computer makers today is to position themselves to benefit from that boom when it arrives.

The snag is that tomorrow's computer markets will look quite different from today's, and recession is accelerating the change. With fewer new toys to distract them, companies are becoming determined to make better use of the computer equipment they already own. The managers surveyed by Index say their most pressing goal is to reshape the way they do business to exploit the new opportunities offered by information technology. Chief among these is that of sharing information among networks of computers.

The products that would do best in such a boom are easy to spot: communications equipment and software to build computer networks, desktop computers armed with the more sophisticated operating-system software needed to manage networks, mainframe computers at the network's hub, and a variety of niche markets for specialised equipment to crunch numbers or speed database searches. For individual companies, though, success lies in details: which operating system, which technical standard for computer networks, what kind of database for the mainframe.

The need to convince others of their technological vision will keep computer companies selling hard and investing heavily through bad times and good alike. (Source: The Economist, 12 January 1991)

Memories are made of this

Flash, the new memory chip technology, is beginning to draw the attention of a large number of suppliers and potential suppliers.

Flash chips are basically EPROMs that can be erased by an electrical signal. They are therefore useful in equipment where the contents of the memory need to be regularly changed.

If you can remove the need for disks in computers you remove the need for the revolving mechanisms that drive them and the heavy batteries that power them.

Accordingly computers become significantly smaller and lighter.

As a floppy disk replacement, flash technology is expected to be used in 50 million memory cards a year by 1995, according to the Stanford Research Institute. However if technical advances are forthcoming, flash could also replace hard disks. The main technical advance required for that is a doubling of a flash chip's lifetime. At the moment 10^5 erase/write cycles are the maximum that flash chips can endure. If that can be increased to 10^{10} then flash qualifies as a hard disk replacement.

On top of these applications could be a big market for flash simply as an EPROM-replacement technology. If flash EPROMs can be made as cheaply as EPROMs then they would take over most EPROM applications.

Furthermore it looks as if EPROM technology could be coming to the end of its useful life.

As EPROM memory cells shrink to produce larger density chips, so the erasure time increases. Today's EPROMs require 30 minutes to be wiped clean. For that reason Mitsubishi reckons that EPROMs will not be made in densities higher than 4Mbit and Intel reckons 8Mbit is the ceiling. By comparison a flash chip is erased in a second.

Although at the moment the density of commercial flash chips lags behind the density of EPROM, it is expected to catch up quickly. Both Mitsubishi and Intel are expecting to sample 4Mbit chips in 1991 and 16Mbit chips in 1993.

So future uses for flash are seen to lie in three areas: in adding additional features to products like the call-logging functions on telephone exchanges; as a replacement for disks in computers; and as an EPROM replacement technology.

At the moment Intel's flash technology is the de facto world standard, with six companies providing Intel-compatible flash chips: Toshiba (which invented the concept), AMD, Mitsubishi, Catalyst, SGS-Thomson, and NMB Semiconductor.

Flash products based on a different technological approach to Intel's are being sold by Seeq Technology and Philips/Signetics. A third technological approach is that of Atmel, which has a two-transistor memory cell approach compared to the single transistor cell of the Intel and Seeq camps.

Still in the process of developing their own flash technology are Samsung of Korea, Fujitsu and Sharp of Japan and Simtek of the US (with which Plessey Semiconductors has a technology exchange deal).

Companies actually in flash chip production are: Intel, Seeq, Atmel, Toshiba and Philips. Companies sampling flash chips are AMD, Catalyst, Hitachi, Mitsubishi, SGS-Thomson and Texas Instruments. Another rumoured participant is AT&T of the US which is thought to be supplying flash chips to Western Digital.

For the time being, then, Intel is making all the running, supplying over 90 per cent of the market and seemingly content to see others follow its technology in the hope that unofficial second-sourcing of its technology will help develop the overall flash market. (Source: Electronics Weekly, 5 December 1990)

Out with ASICs, in with standard chips

Late in the 1990s the semiconductor industry pendulum will swing back towards standard products and away from the custom product trend, according to one of Japan's top thinkers on the industry - Dr. Tsugio Makimoto, the director and general manager of Hitachi's Semiconductor Design and Development Centre.

What the standardization/customization cycle means is that the industry veers from a focus on making semiconductors, which are specific to the needs of particular customers, to a focus on making semiconductors generally used by many customers.

In the chip business, products made for the needs of specific customers are called custom or semi-custom products, generically known as ASICs - Application Specific Integrated Circuits.

On the other hand, products made for general purpose are chips such as microprocessors - standard devices that can be programmed to their purposes by a vast number of customers, and memory chips - chips which can store whatever a customer wants to put in them.

So the "Makimoto Wave" tracks the shifts in industry emphasis between the custom or semi-custom ASIC device and the standard programmable part. Makimoto reckons that the shift in focus is part of a ten-year cycle and that we are currently bang in the middle of an ASIC cycle.

The present cycle was preceded by a decade (1977-1987) of focus on standard products when the move to microprocessors and memories was the dominant trend in the industry. Before that, the 1967-1977 decade focused on custom chips for manufacturers wanting special purpose designs made for their calculators, watches, clocks and TVs.

Makimoto, a 30-year veteran of the semiconductor industry, reckons that the two catalysts which bring about the end of one cycle and the beginning of the next are on the one hand lack of resources, and on the other a price was followed by market collapse.

For instance, after a decade of focusing on ASIC the industry typically suffers a lack of resources as a result of dependence on too narrow a customer base. Consequently it looks to develop general purpose products to widen the customer base which it can address and so attract more revenue.

On the other hand, after a decade of increasing standardization, so many companies are making compatible products that the result is a price war followed by a market collapse and a move towards custom and semi-custom ASIC chips which are a more predictable and controllable source of revenue.

Now, in the middle of the ASIC cycle, Makimoto reckons: "The standardization of post 1997 will be very different from the standardization of 1977-1987 and it is very important to see how this decade of standardization will be achieved. User programmability will be the key to the post-1997 semiconductor industry." (Source: Electronics Weekly, 30 January 1991)

Company news

Computer companies join to develop new chip

Acorn and Apple, Britain's and North America's best-known home computer companies, are joining forces to develop a new computer chip with wide applications in business and industry by launching a new chip design company, Advanced Risc Machines (ARM), based in Cambridge. Acorn, which developed the best-selling BBC computer range and is a leading

supplier to British schools, will hold 46 per cent of the equity; VLSI Logic, a US semiconductor manufacturer, will also hold 46 per cent; and Apple will hold 8 per cent. Acorn is 80 per cent owned by Olivetti of Italy. The new company will continue to develop Acorn's "reduced instruction set computing" (RISC) chip designs. These are inexpensive and small but powerful microprocessors that consume little power and are ideal as industrial controllers or as the heart of portable computers. The company is seeking further financial backing, with a view to Acorn's and Apple's eventually each holding 30 per cent of the equity and VLSI Technology 5 per cent, with the balance held by new investors.

It may also find funding from the European Commission through its Open Microsystems Initiative, which provides resources for European developments in microcomputer technology. (Extracted from The Financial Times, 28 November 1990)

Siemens 16Mbit chip plans may scupper JESSI project

Industry sources suggest that Siemens may not now put the 16Mbit DRAM it has developed into production but is looking at the possibility of reselling parts which have been made by IBM and badged with the Siemens name.

"Our plans to produce the 16Mbit device are still waiting", said a Siemens spokesman, "because the DRAM market is not inspiring much confidence and there is a big gap between the 4Mbit and the 16Mbit technology. It makes sense to wait as long as possible before deciding on whether to build a new facility".

As to badging IBM chips, the spokesman said: "The IBM 4Mbit DRAM could not be sold on the merchant market because it does not comply with the JEDEC standard. It may be that it is not a market-orientated device. The 64Mbit is the first design that will be compatible with JEDEC".

If Siemens decides not to go with its own 16Mbit manufacturing, that would effectively dispel the aspirations of the most prestigious section of the European EUREKA programme - the $4 billion JESSI chip project aimed at developing and manufacturing 16 Mbit and 64Mbit DRAMs and 4Mbit and 16Mbit SRAMs.

The SRAMs were to have been developed by Philips but the company pulled out of the JESSI SRAM project last year and Europe's third force in chips, the Franco-Italian SGS-Thomson did not take up Philips' place in JESSI'S SRAM project and has failed to find a partner with which to make DRAMs. (Source: Electronics Weekly, 6 February 1991)

Broux to buy Honeywell subsidiary

Broux HN Information Systems of France will buy Honeywell Federal Systems, Inc. (HFS), a Honeywell subsidiary.

Honeywell, a minority Broux stockholder based in Minneapolis in the United States, sold most of its ownership in the now-named Broux HN Information Systems to the French Broux group and to NEC of Japan in 1987. Since then, the company has steadily pulled out of the computer industry. With the sale of HFS, the US firm will no longer own any computer-related businesses. (Source: AEU, No. 6, 1990)

Matsushita establishes US avionics company

Matsushita Electric Industrial has started Matsushita Avionics Development Co. (MADC) in Anaheim, California, to help develop the avionics industry in the United States.

Avionics (aircraft information transmission equipment and services) encompasses on-board audio, television and video systems, as well as electronic information transmission equipment. As the number of airline passengers has grown and as airlines have retired older aircraft, there has been a rise in the production of aircraft. Accompanying this production growth has been an expanding demand for avionics.

The new company will co-ordinate with US aircraft builders and airline companies in the development of avionic systems. Systems developed by MADC in the United States will be produced in Japan. (Source: AEU, No. 6, 1990)

Mitsubishi plans flash offensive

Before the end of this year Mitsubishi will enter the flash memory market pioneered by Toshiba and Intel.

In 1991 the company intends to introduce a 4Mbit device and, in the middle of 1992, a 16Mbit. That is the same schedule for flash as is being pursued by market leader Intel.

One of Mitsubishi's intentions is to put down a marker on the market for memory cards used in the new breed of tiny computers.

However a subsidiary intention at Mitsubishi is to get into flash as an EPROM replacement technology.

Inventor of the EPROM, Intel, also believes that EPROM technology is coming to the end of its useful life, but believes it has an extra generation to go - the 8Mbit state. That is because it takes 30 minutes to erase an EPROM today using ultra-violet light and that will increase as cell sizes get smaller. By contrast you can erase a flash memory in one second.

Mitsubishi's 1Mbit flash is organized X8 and accesses in 120ns. It can perform 10,000 erase/write cycles. Flash can be made in the same factories as are used for DRAM production. Mitsubishi proved itself capable of world class DRAM production capability at the 1Mbit generation becoming the world's number two producer. It has a 4Mbit plant built and ready to run. (Source: Electronics Weekly, 21 November 1990)

Flash race pace quickens

A race is on between the world's top semiconductor companies to get a flash memory chip that can be part-erased to market. Major potential users are now demanding this feature in new generations of the chip.

Intel, Toshiba and Texas Instruments are all expecting to have part-erasable flash memory in the market within a year. None of them are prepared to say how much more they will charge for part-erasable flash chips, but all of them concede that there will be an increase in manufacturing cost. Top users see part-erasability as essential if flash memory is to fulfil its market potential.

The only company currently offering part-erase on flash is the Colorado start-up company Atmel, which has a 256kbit flash that can be erased 512-bits at a time and is expecting to add a 1Mbit, also with 512-bit erase. The Atmel part will be about two-and-a-half times more expensive than whole-erase chips. (Source: Electronics Weekly, 13 February 1991)

Three companies collaborate on sophisticated switch

Siemens, GEC Plessey Telecommunications (GPT) and Stromberg-Carlscon are embarking on a joint venture to produce advanced electronic switches.

The project involves development of a switch with a capacity three times that of presently available switches for transmitting voice, data and image signals. Costs are estimated at US$1 billion to $1.2 billion.

The switch under development will be compatible with the EWSD from Siemens, the system X from GPT and the DCO from Stromberg-Carlscon. Siemens will dedicate 500 engineers to the project, while the other two companies will provide 1,000 engineers apiece. The project is scheduled to be completed in 1995. (Source: AEU, No. 6, 1990)

IBM'91 prepares for business

Over 20,000 visitors are expected at the IBM'91 show at the National Exhibition Centre in Birmingham.

The show is focusing on business, and there will be over 360 exhibitors showing applications systems for manufacturing, retail distribution, financial and the public sector.

The exhibitors at the show argue that in the current economic recession it is even more important for companies to invest in computer solutions which enable them to reduce costs and increase productivity.

Some exhibitors are showing new products for the first time. Many of these are application packages for vertical markets like the motor industry. Datawork Computer Services will be launching an enhanced version of its motor dealership systems. Its transport division, Datawork Logistics, is launching a fleet management system Profleet which works under the Unix operating system.

JBS and Chorous Software are showing the Q/Flex manufacturing control system, running on an IBM RS6000, which can be used in just-in-time and Kanban manufacturing techniques.

As the recession continues to bite and the number of bad debts increases, AST Transact is launching a debt recovery management system. It runs online on an IBM mainframe, AS400 or PC and focuses users' attention on debt management as a source of revenue, identifying accounts with a high recovery potential, speeding up allocation of debts and tracking charge-offs automatically.

Several accounting and financial packages are being demonstrated including Coda, which is launching version 2 of its Integrated Accounting Systems for AS400s. In 1990 the company signed up 40 new name accounts, and more recently has received orders from Prudential Holborn and Unilever.

Hoskyns Insight is launching its first RS6000 products at the show, including a financial management system and a retail and distribution system.

IMI Computing is launching its software product for image processing, Correspondence Manager, which coordinates, captures and monitors correspondence of all types whether drawn, typed or even handwritten.

Applications development environments and tools are also on show including Universal Software's new release of Lansa for AS400s, and an AS400 version of Powerhouse from Cognos.

IBM business partner Synon will be announcing Synon/2G, a modification to its computer-aided systems engineering (CASE) tool, which adds a frontend graphical user interface (GUI). Ryan McFarland will be launching its RM/CO* applications development environment for the IBM RS6000. (Source: Computer Weekly, 21 February 1991)

US GaAs giants merge

US semiconductor manufacturers Triquint Semiconductor and Gigabit Logic will merge to form the world's largest commercial manufacturer of gallium arsenide components.

The merged company will be called Triquint Semiconductor and will be owned by large corporate investors that include Tektronix, DEC, Analog Devices and Danish company NKT. Some of the gallium arsenide components will still be sold under the Gigabit Logic name. The merger is expected to be completed by the second quarter of 1991.

The company will produce gallium arsenide-based components for microwave and telecommunications applications. (Source: Electronics Weekly, 30 January 1991)

Toshiba in merchant RISC MPU market

Toshiba is to enter the merchant RISC microprocessor market with its own derivatives of the Mips RISC architecture.

Although Toshiba has a half-share in a joint venture factory, which makes the Motorola 68020 microprocessor, and although it has second sourced US micros and is a co-developer of the Japanese TRON micros, it has never before developed its own general-purpose microprocessor.

Although Toshiba is trying to negotiate the rights to make and sell Motorola's 68020 and 68030 micros on its own account, a deal has so far failed to materialize.

Mips has closed the door to prospective direct licensees of its chip, meaning Toshiba will have to develop versions which are very much its own design. (Source: Electronics Weekly, 30 January 1991)

Siemens invests in DRAMs despite lack of profit

Siemens of Germany is investing approximately $1 billion on a plant scheduled to produce 64Mb DRAMs by about 1994, although its 16Mb DRAM has not yet reached the volume production stage.

The company blames falling prices and the delicate balance between supply and demand for its lack of profit from the DRAM business. Even worse times are expected for the DRAM market, but optimistic for the long-term future, since memories remain one of the fastest growing market segments with a market potential of $7.5 million.

It is predicted that each three-year period will result in the appearance of a new generation of memory devices with four times the number of elements employed in the previous generation, with designers moving from standard to application-oriented products.

The European Commission has made little change to the reference price for 1Mb DRAMs for the last quarter of this year and had reduced the 4Mb device floor price. Toshiba expects this to result in a deluge of orders from those who have been waiting for the Commission's announcement. (Reprinted with permission from Semiconductor International Magazine, December 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, IL, USA)

Go beats Microsoft to pen-based market

US start-up company Go has beaten Microsoft to announce software for notebook computers that are operated by a pen rather than a keyboard.

Go will ship the first general-purpose operating system for pen-based computers to developers this month. The software, called Penpoint, has already won endorsements from 40 software vendors and 13 hardware companies, including IBM.

Robert Carr, Go vice-president and co-founder, said: "We designed Penpoint around the idea of a pen and paper, rather than taking an existing keyboard-oriented system and merely adding a pen. Users are able to use the pen in a natural, seamless way, similar to the way they would on paper".

Microsoft, the largest supplier of PC operating systems, is not expected to ship a pen-based version of its Windows graphical user interface until later this year.

Brian Pearce, analyst with market researcher Dataquest, said although the market size has yet to be determined, demand for pen-based computers could be tremendous. Software vendors supporting Penpoint include WordPerfect and Lotus. (Source: Computing, 7 February 1991)

IBM joins two JESSI projects

IBM has joined in two JESSI (Joint European Submicron Silicon Initiative) projects and is expected to become increasingly involved in other collaborative European R&D projects.

The two projects IBM has joined are: the deep UV lithography project for getting chip processing down to 0.3-micron and the project for the preparation of gate dielectrics by rapid thermal processing.

This is just the start of IBM's involvement in European semiconductor research. An IBM spokesman in Paris commented: "We have made four project proposals to JESSI and so far JESSI has accepted two of them".

This is IBM's first official involvement with JESSI but it is involved with Siemens on jointly developing a 64Mbit DRAM, which for Siemens is a JESSI project. This has been considered as a back-door entry by IBM into JESSI, which will seemingly benefit from technology developed at the expense of the EC taxpayer.

The quid pro quo for IBM getting into JESSI was said by JESSI in the past to be JESSI involvement in the US equivalent programme, called Sematech.

After over a year of talking it has been agreed in principle that JESSI should be allowed into Sematech.

Now the two sides are talking about which projects they will cooperate on and it looks as though the first one will be a joint analysis of the competitive capability of themselves and the competition. (Source: Electronics Weekly, 5 December 1990)

Soviet link

A contract to complete the first leg of the Trans-Soviet fibre optics communications link has been gained by the French company, Alcatel. The contract is worth around £10 million. This part of the cross-USSR link will be 250 kms long and comprise 34Mbit/s optical fibre running east-west through the difficult environment of Siberia between the cities of Irkutsk and Ulna. (Source: Electronics Weekly, 5 December 1990)

Intel chips under greater threat

US chip giant Intel's monopoly of 32-bit IBM-compatible personal computer (PC) microprocessors is under further pressure.

The announcement by leading US software vendor Microsoft on the future of its PC operating system strategy raises the possibility that non-Intel architecture computers will run software written for IBM-compatible PCs.

Intel is already facing the threat of competition in the 32-bit PC microprocessor field from rival chip maker AMD and possibly also from Silicon Valley start-up S3; although neither company has yet launched such a product.

In particular, Microsoft is targeting its advanced operating system at fast desktop computers based on the new generation of reduced instruction set computing (RISC) technology chips such as the Mips Computer Systems' R3000 and Sun Microsystems' Sparc.

Microsoft is planning an operating system based around a powerful new technology kernel (dubbed NT). On top of this kernel, the operating system will sport: DOS, a 32-bit version of Windows, the guts of a forthcoming 32-bit version of OS/2 and a POSIX interface. Computers featuring this operating system will be able to slot-and-run DOS, Windows, OS/2 and Unix applications software.

Furthermore, business PC maker Compaq is believed to be talking to Mips and possibly also Sun about the possibility of adopting a RISC microprocessor architecture. Other PC makers are also believed to be talking to Mips.

Microsoft's future operating system will also make it easy for RISC workstations to run DOS and OS/2 applications software and will open up the high-end PC market to workstation makers.

All this could spell bad news for Intel. The company depends on the high margins it makes on its best-selling 32-bit 80386 and 80486 microprocessor families for a large slice of its profits.

As RISC workstations move into territory currently occupied by high-end Intel-based PCs, this will affect Intel microprocessor sales. While competition in the PC microprocessor market may not only eat into its market share, but could force Intel to cut the price of its chips. (Source: Electronics Weekly, 6 February 1991)

Toshiba sets up UK chip laboratory

Toshiba, the Japanese electronics company, is opening a semiconductor research centre in Cambridge, England, in January 1991, its first European basic research laboratory.

The centre is one of a series of British-based research laboratories being set up by Japanese electronics companies, filling a vacuum in British semiconductor research left after recent cutbacks by British and European companies. Hitachi already has a seven-strong research group working within the University of Cambridge's Cavendish Laboratory, and Sharp, which recently opened a 12-man laboratory in Abingdon near Oxford, is planning to expand into a large centre in the Oxford Science Park in 1992.

The Toshiba Cambridge Research Centre will concentrate on quantum effect physics - which may underpin the next generation of miniaturized electronic devices. Michael Pepper, professor of physics at the Cavendish Laboratory, will be the centre's director, and says the ten researchers he is recruiting will collaborate closely with the university.

Japanese companies are keen to invest in research in Britain to marry British expertise in basic research with the Japanese flair for technological development. A longer-term aim is to strengthen the vertical integration of their operations in Europe from basic research to production. Toshiba also plans to establish product development laboratories at some European production facilities.

Another motivation is Toshiba's desire to collaborate in European Communities' (EC) research projects.

As a subsidiary of Toshiba registered in a European country, a new centre would be eligible to participate in EC research projects. But the problem will be finding European companies willing to collaborate with a Japanese-owned company. Some European computer companies are now questioning their continued collaboration with the British company ICL in a number of ESPRIT information technology projects, after the sale of a majority holding in ICL to the Japanese company Fujitsu. Toshiba officials are aware of the potential problems, and stress that their centre will be devoted entirely to basic research, which should be less commercially sensitive. (Source: Nature, Vol. 348, 20/27 December 1990)

Japan's computer-telecoms hybrids

With its hostile $6.1 billion bid for NCR, American Telephone & Telegraph (AT&T) is attempting to marry the telecommunications and computer businesses. This is a task at which AT&T, IBM and nearly every other big American and European computer or telecoms firm have failed in the past decade.

By contrast, Japan's biggest computer firms are also its biggest telecoms suppliers.

Most large Japanese companies do not erect barriers between their various businesses. Regular job rotation moves managers and technical staff between different product divisions. In the information processing industry, different factories may churn out telecoms gear and computers, but the same R&D laboratories and product designers frequently serve both businesses. Marketing and sales staff also move back and forth between telecoms and computers. Firms like Fujitsu, NEC, Hitachi, Toshiba, Mitsubishi Electric and Oki do not consider telecoms and computers to be separate businesses.

Many of these companies began as telecoms suppliers eager to catch up with western firms in computers. So they borrowed, licensed or copied from abroad uninhibited by the "not-invented-here" syndrome that has plagued so many western computer firms. The Ministry of International Trade and Industry (MITI) encouraged the brighter electronics firms into doing the research needed to become competitive. NTT, Japan's former telephone monopoly, has invested much of its vast profits in advanced research. It has made the fruits of this freely available to its suppliers - especially NEC, Hitachi, Fujitsu and Oki. NTT has set strict technical standards and long-term goals, and adhered to them religiously. It has also bought some $3 billion of telecoms and computer hardware each year. Unlike AT&T, the Japanese telephone giant has never manufactured anything of its own.

Despite the integration of their businesses at home, Japanese companies have been far less successful at combining the disparate cultures of computing and telecoms outside of Japan. Abroad they have done far better at selling telecoms gear than computers, despite more than a decade of effort. (Source: The Economist, 15 December 1990)

IV. APPLICATIONS

Special package for 16-Mbit chips

Texas Instruments and Hitachi have jointly designed a special package for their forthcoming 16-Mbit dynamic RAMs.

Externally the package is an ordinary 28/24 plastic small-outline J-lead (PSOJ), but inside the connections from the chip to the pins have been redesigned.

The bonding pads are in the centre of the chip, rather than at the edge. The leads from the pads to the pins are approximately the same length and have similar capacitances, compared to a variation of up to 23 per cent which conventional small-outline packages suffer from.

The package is called lead-on-chip with centre bond (LOCCB). The changes increase the amount of silicon which the package can hold, reduce on-chip noise and reduce thermal and mechanical stress on the silicon.

The two companies have been collaborating on the 16-Mbit DRAM since 1988, and though they are both going to use the same package, Hitachi's chip uses a stacked storage cell structure while TI's has a trench-based storage cell. (Source: Electronics Weekly, 27 February 1991)

Nutek develops Mac II chip set

Nutek Computers says it has developed a chip set that can be used to produce legal clones of Apple Computer's Macintosh II microcomputers.

The two-year-old Silicon Valley company says that large PC manufacturers in the US and Europe are interested in using the chip set and will make announcements of Macintosh compatible products by mid-1991.

Nutek says that with its chip set and software, a PC manufacturer will be able to build a Macintosh clone product that should be safe from legal challenges. The chip set takes care of the Macintosh's proprietary hardware and the Macintosh operating system version developed by Nutek was created in a clean-room environment. The user interface is a Macintosh version of the Open Software Foundations Motif graphical user interface which offers a 3-dimensional look.

The chip set and Macintosh compatible operating system will be available in mid-1991. (Source: Electronics Weekly, 6 February 1991)

Rewritable optical disk

3M says its rewritable optical disk cartridges store data for less than half the cost of a floppy disk. This is based on a byte-for-byte comparison with high density 3.5-inch disks.

The 5.25-inch ISO standard disks come with 512- or 1,024-byte sectors, providing total capacities of 594- or 650-Mbytes respectively.

The cartridges have a slip ring that 3M says virtually eliminates rub-off from the polycarbonate substrate. This is caused by frequent loading/unloading cycles, and can be a problem especially in juke-box applications. (Source: Electronics Weekly, 6 February 1991)

A million floppies of data on one reel

In both the audio and data recording businesses, there is a constant debate about whether disks or tapes are the best storage media. Creo Products, of Vancouver, Canada has developed an optical tape drive, the Creo 1003, which uses the same recording technology as CDs. It writes once onto a light-sensitive layer, then can read the data back many times.

But instead of the recording layer being supported by a rigid plastic disk, it is deposited on Melinex, ICI's proprietary polyester film. Melinex is also used as the substrate for ordinary audio tape, so its properties are well known. The recording layer is an ICI dye polymer.

The attraction of the 1003 is that it stores as much data as a million floppy disks on a single 12-inch reel, and scans the whole lot in less than a minute. Recording and reading are done by an array of 32 laser diodes operating at 830 nm, the same wavelength used in CD players - so no new optics needed to be designed.

The pyrokinetic recording technique leaves a groove in the dye polymer. Data is read back by the same laser at a tenth of the power. A specially designed system uses the data grooves to ensure accurate tracking.

ICI Imagedata, which is marketing the drive in Europe, says it is ideal for storing large databases, and for data acquisition from satellites: if left recording at its maximum rate, a 12-inch reel would take nearly four days to fill up. (Source: Electronics Weekly, 13 February 1991)

TV data sent via transmitter

A slow scan transmitter and receiver system from Davtrend allows television pictures to be sent down telephone lines or over voice radio links.

No special cameras or monitors are required: the system uses composite video signals at both ends of the link.

The transmitter generates standard slow scan audio at 128 lines x 256 pixels x 64 grey shades in eight seconds. A 256 line x 256 pixel, 16 second mode is also available.

There is a choice of two outputs: an electrically isolated 600Ω line, and a direct or capacitively coupled signal for devices such as an 8Ω speaker.

The receiver accepts slow scan audio tones into a protected and electrically isolated 600Ω line matched input. A standard 75Ω composite monochrome video output drives a monitor with 256 lines x 256 pixels x 128 grey shades.

PC-compatible serial interface control input can be used for remote control of the transmit and receive functions. The receiver PCB can drive a four input, four output video cross-point switch in the same chassis.

The system comes as a board for office equipment manufacturers, or complete in a 3U 19 in. card frame with a power supply. (Source: Electronics Weekly, 13 February 1991)

A safeguard for MPUs against data erasures

Dallas Semiconductor designed its Micro Softener Chip to safeguard microprocessors against data loss during power failures. A range of devices for use with the V40, 6303, 68HC11 and 80C196 will be available over the coming year.

Circuitry in the Micro Softener maintains calibration information as well as program and data storage using an uninterruptible lithium back-up supply. Whether the power fluctuates or is absent for years, its return computing should resume where it left off as though nothing had happened.

Software updates or changes can be installed and reprogrammed in the field through the processor's serial port.

The on-chip bootstrap loader is started by application code downloaded from a PC through the processor's serial port.

The Micro Softener Chip also enables companies to make one standard product and customize it for each customer simply by loading new software.

The chip also provides an extra 32 port pins.

The Softener also has provisions for trouble reporting. A voltage detector determines when power goes out of tolerance. A watchdog timer monitors software execution, and a built-in memory tester validates memory contents.

The Micro Softener replaces eight chips used for embedded control by integrating a power monitor, watchdog timer, non-volatile controller, address decoder, bootstrap ROM, parallel I/O ports, dual-port register file, and interrupt controller. (Source: Electronics Weekly, 20 February 1991)

New video processor chipset

Intel has developed a new chipset that will support multimedia applications on networked PCs and will be available in late 1991. The B series

i750 Video Processor chipset will enable the development of video processing cards that can transmit compressed full-motion video across networks. The chips allow analog video signals to be compressed by PCs into digital signals, which are then sent over T-1 connections or LANs. ProtoComm (Trevose, PA) will use the new Intel chipset in its new PC add-on board, to be shipped starting in the first quarter of 1991. (Extracted from Networking World, 12 November 1990)

Cordless mice

Z-Nix (Pomona, CA) and Logitech are developing different cordless versions of the popular pointing device, the mouse. Z-Nix's product, the Cordless Super Mouse, now available, is a battery-powered two-button device that sends an infrared signal to a receiver attached to the operating system and to the power line. The receiver also serves as a charging base. Logitech's mouse sends radio frequencies to its receiver, and will permit many users in close proximity if each mouse uses a different frequency. A number of companies are now building trackballs into keyboards, incorporating refinements such as smaller balls and full mouse emulation without the need for a serial port. (Extracted from Information World, 19 November 1990)

Keep your eye on the ball

Engineers at Microsoft Corp. have finally come up with what they think will be the answer to the tricky problem of supplying mouse pointing devices for portable PCs. The company has been quietly showing its product - called BallPoint - to potential customers. A small four-button device operated with the thumb and forefinger, BallPoint is attached to the side of any portable with an adjustable universal clamp device. Sources say the price will be around $175. Meanwhile, Microsoft has quietly done away with its Windows Font Cartridge product for Hewlett-Packard Co.'s LaserJet II and IIP printers. Sources at the company admit that stiff competition perceived from font cartridge and font software suppliers, such as Adobe Systems Inc. and Bitstream Inc., forced the product's early demise. Microsoft will, however, continue to develop its TrueType software for WYSIWYG printing under Windows. (Source: Datamation, 15 January 1991)

Refillable printer cartridge

The latest recyclable product to joint office stationery and plastic cups is the laser printer cartridge.

Over 1.3 million laser cartridges are thrown away by UK businesses every year, but now a process has been developed that allows the cartridges to be re-filled. A service to carry out the process, already in use by the Green Cartridge Company in Hong Kong, is now being offered in the UK from Enjay Business Services (UK).

The process, which involves cleaning the drum ultrasonically and testing the refilled product to ensure there is no leakage, produces a product that costs £40 to buy - compared with £80-£120 for a new cartridge. (Extracted from Financial Times, 16 November 1990)

Flying with a bat in virtual space

British researchers have developed a device to help computer users move more easily through computer simulations or virtual reality. It is a three-dimensional variation on the familiar computer mouse used to move a cursor around the screen. They called it, of course, the bat.

Developed by Allan Davison and Mel Slater, computer scientists from Queen Mary and Westfield College, University of London, the bat allows a user to fly easily around a simulated 3-D space. It replaces the so-called dataglove that is normally required for moving in virtual reality. Sensors in the glove detect movements of the hand and mimic them on screen, but this can necessitate awkward and tiring gesticulations.

A normal computer mouse contains a rolling ball which protrudes underneath and a sensor to detect the ball's movements. Move the mouse around on a tabletop and its motion is translated into movement of the cursor on the screen. The bat extends this with a dome-shaped top that can be freely rotated about any axis.

The free-moving dome provides any combination of forward and backward rotation (pitch), left and right rotation (roll) and clockwise and anti-clockwise rotation (yaw). To move a cursor up or down vertically you pull the dome fully back or forward and push the mouse. Variable resistors measure the degree to which the top is tilted or twisted in any plane. Five buttons on the bat, which correspond to the positions of the fingers and thumb, can be programmed with functions such as accepting options presented on the screen. (This first appeared in New Scientist, London, 26 January 1991, the weekly review of science and technology)

Image handling

The harnessing of computers to image handling is taking place in a dazzling array of applications. American Express offices in Phoenix and Fort Lauderdale scan up to 3 million charge card slips a day, sending them into a made-to-order imaging system assembled by a TRW subsidiary. The slips are shredded and buried; pictures of what was on them go through a fibre-optic line between Fort Lauderdale and Phoenix. The computer retains not mere letter and number data but compressed pictures of the slips, complete with signatures. The digitized images are reconstructed on Xerox printers and send out to cardholders with their monthly bills.

With image processing, the need for computing power makes a giant leap. Image processing is an enormous power consumer, because pictures contain such a wealth of information. In a computer's memory, a picture paints not a thousand words but more like a million, therefore image processing demands more memory, larger disks and higher horsepower to efficiently store, retrieve, route process and analyse the information. These processing demands will keep many a computer company busy for years to come. (Extracted from Forbes, 26 November 1990)

Speedy Ram/Bo

Hot on the heels of Chiptech's recently introduced CH-Ram/Bo, the company has introduced a new high-speed disk emulator card called CH-Ram/Bo. CH-Ram/Bo is a memory board in a standard expansion card format that will emulate a fast hard disk in any PC-compatible system. It is aimed at applications where magnetic media may prove unreliable because of harsh environments, such as dust or vibration etc., or where the non-volatile nature of EPROM storage offers particular

advantages. The board can be populated with up to 768 K of SRAM, in which case it functions as Drive C. The SRAM contents are backed up with dual battery supplies, ensuring total data integrity. The board can even be moved from one system to another and still retain data and indeed can be used as the boot drive. (Source: Practical Electronics, August 1990)

Pay for display in laptops

Laptop computers are a boon for the businessman, but you never get something for nothing. The machine may be extremely handy but something has to be sacrificed. Most of them cost more than equivalent desktop microcomputers but the extra price buys portability, not better performance. The most obvious drawback on the majority of laptops is the screen. Most have liquid crystal displays and although that technology has improved enormously, even the best LCD screen is not as good as a coarse-resolution conventional screen using a cathode ray tube. Pricewise, you do not get what you pay for. Machines with modern chips, like the 80386, are brilliantly fast and will use the latest version of some programs, but it is seldom a portable needs that sort of speed and if the software is compatible with older chips the extra money is probably wasted.

Another important factor is the memory, i.e. disk space. The decision here is even more difficult. Laptops come with 3-1/2-in. and 5-1/4 in. floppy disks, some come with a built-in hard disk, and some with a variety of other permanent memory devices. A simple rule with buying any computer is that it is almost impossible to buy too much memory. By the same token, the more of it is actually built into the machine and does not have to be slotted in at every occasion by the user, the better. So the price of convenience is not only the extra weight the disk drive itself causes, but the larger or extra batteries needed to keep the disk running. Extra weight or even larger bulk is not a handicap if the computer is merely taken home to finish a job over a weekend. Also, laptops have been known to save money with cheap keyboards.

As one of the reasons for laptops is remote usage, a communications facility can be critical. In any case, it is worth checking whether the hardware is compatible with and acceptable to the telephone systems in the countries where it will be used. (Source: The Daily Telegraph, 22 October 1990)

Hug-me-tight computers

It is hard keeping track of all the laptop and notebook computers being introduced into what is regarded as the fastest-growing segment of the computer market. Several recently introduced products feature plenty of computing power and light weight.

A notebook computer from Texas Instruments Inc. weighs in complete with nickel-cadmium battery at just 5.7 lb (2.6 kilograms), yet has the power and performance of 386SX desktops, thanks to its 20-megahertz 386SX processor. The Travel-Mate 3000 is equipped with a supertwist liquid-crystal, edge-lit black-on-white VGA display with a 10-inch (25-centimetre) diagonal, as well as a 1.44-megabyte, 3.5-in. diskette drive and a 20- or 40-Mbyte hard-disk drive. The standard 2-Mbytes of memory expands to 6-Mbytes.

All of this fits in a slender 8.5-by-11-inch (22-by-28-cms) box that is only 1.8 inch (4.6 cm) high when closed. Suggested list price of the TravelMate 3000 is $US 5,499 with the 20-Mbyte drive, $US 500 more with the 40-Mbyte drive.

Another notebook computer with the power of a desktop is Compaq Computer Corp.'s 7.5-lbs (3.4-kgs) unit, which also relies on a 20-MHz 386SX microprocessor. The LTE 3286s/20 from the Houston, Texas-based company has two models and includes cache memory, an edge-lit VGA display, and 2.5-inch hard-disk and 3.5-inch, 1.44-Mbyte diskette drives. The hard drive on the $US 6,499 Model 30 stores 30-Mbytes, and the one on the $US 6,999 Model 60 holds 60-Mbytes. Also available is a $US 1,499 expansion unit that provides full 386SX desktop capabilities, what with its 14-inch VGA colour monitor and full-size, enhanced keyboard.

ZEOS International Ltd., St. Paul, Minn., has an under-7-lbs (about 3-kgs) machine built around an Intel 80286 processor. It includes a 1-Mbyte memory, back-lit VGA display, 20-Mbyte hard-disk drive, and 1.44-Mbyte floppy. Price is $US 1,995. Optional items include a 2400-bit-per-second Class 5 modem and up to 5-Mbytes of memory.

Those really pressed for computer power on those long transcontinental flights might look out for Toshiba Corp.'s SPARC LT, AS1000/L10. Its processing speed is 13.2 million instructions per second. According to the company, it is the world's first RISC-based laptop engineering workstation (RISC stands for reduced-instruction-set computer) and utilizes the Sparc architecture developed by Sun Microsystems Inc.

Announced last spring in Tokyo, the 17.7-lbs (8-kgs) workstation is still sold only in Japan. It has a back-lit, active-matrix, monochrome liquid-crystal display, not to mention 8-Mbytes of memory, a 64-K-byte cache, a 3.5-inch diskette drive, and a 180-Mbyte hard-disk drive. Its price is ¥1,980,000 (about $US 15,000). (Source: IEEE Spectrum, December 1990)

Video recorders programmed by numbers

A novel remote control for video recorders is coming to the aid of the large majority of owners who never learn how to program their recorders. There are a number of systems already available to help them over this technological hurdle, such as bar codes in listings magazines, which can be read with a light pen. But the new device, called VCR Plus, seems to be the simplest yet.

VCR Plus looks like a conventional remote control, which communicates with a video recorder by infrared beam. A memory in the device holds all the control signals for all available video recorders so that the device can be programmed to control any brand. Keying in a code number will make it operate a particular recorder.

To set the recorder to tape a TV programme the user simply keys in a string of numbers which are shown next to the programme in newspapers and listing magazines. The device can retain the codes for up to 14 TV programmes.

Once programmed, the VCR Plus controller is simply left facing the video recorder. When the controller's internal clock tells it that the first programme is due to start, it then sends out

infrared control signals which switch the recorder to the correct channel, start it recording and switch it off again at the end of the programme so VCR Plus completely bypasses the recorder's timer, which the owner need never again struggle to set. (Source: New Scientist, 26 January 1991)

Conference call looks at CAD

Computer-aided design (CAD) conferencing is a new technique from Intergraph Corp. that allows the simultaneous viewing of colour or monochrome computer graphics images on the company's workstations at as many as eight sites. An accompanying voice connection lets conferees discuss the on-screen images.

Users may select the most current graphics information and then interactively discuss problems, questions and changes together. Without leaving their offices, engineering and management teams around the globe can work together on projects in real time.

The $US 10,995 Da aBeam CAD Conferencing module includes software, developed by DataBeam Corp., Lexington, Ky., that manages the interactive communication between workstations, a telecommunications interface card, and a tablet and stylus for making written notes.

During a conference, participants can redline drawings and engineering-change orders. They can also sign off on a project by putting their signature on the displayed image. Further information may be had from Integraph Corp., 1 Madison Industrial Park, Huntsville, Ala. 35807; 800-826-3515, or circle 66. (Source: IEEE Spectrum, December 1990)

VMEbus system sees

Claims of "first ever" come heavily in the electronics field, but a machine vision system for VMEbus computers introduced by Cognex Corp., Needham, Mass., could be more than just another wild claim.

According to the company, the Cognex 4000 Series machine vision system is the first to combine real-time image processing and high-level image analysis capabilities. The two-board system plugs directly into a VME backplane for solving industrial gauging, guidance, inspection and identification problems.

Until now, VME computer users with complex machine vision applications requiring both image analysis and image processing could face a costly integration effort. This involved a variety of image processing, central processing unit, memory, input/output, and special-purpose boards, and the writing of low-level image analysis software for such chores as locating objects or detecting defects.

This system combines a vision processor board based on an MC68030 microprocessor with a frame grabber/communications board equipped with an image digitizer and red-green-blue display controller. It also includes a library of vision software tools and a pair of custom vision chips that perform image analysis and image-processing functions.

Because the vision processor board is compatible with other VME devices, developers can use third-party or custom VME image digitizers to support line-scan camera input, slow-scan video, or other non-standard video formats. The Cognex 4000 Series will be available in the second quarter of 1991 with a price range of $US 10,000-$US 30,000, depending on configuration and quantity. Further information may be obtained from Cognex Corp., 15 Crawford St., Needham, Mass. 02194; Tel. 617-449-6030. (Source: IEEE Spectrum, December 1990)

Hand-held colour scanner

Taiwanese PC board, peripheral and system manufacturing Diamond Flower (DFI) claims to have produced the world's first colour hand-held scanner in the shape of the CHS-4000.

According to DFI, the CHS-4000 has a resolution of 400 dots per in. and is capable of scanning up to 64 grey scales and 256 colours.

It can scan colour originals up to 105 mm in width, and using a high frequency drive fluorescent lamp, the CHS-4000 can be set to scan in black and white line mode or in one of four dithered colour half-tone patterns.

Images are scanned at between 100 and 400 dpi, selectable by the user in increments of 10 dpi to gain the correct scanning detail level. Brightness, picture hue and contrast are software configurable at scan time for picture clarity and representation.

The scanner, which costs £399, comes with Z-Soft's PC Paintbrush IV and DFI's scan utility program. (Source: Computer Weekly, 29 November 1990)

Play bridge with a laptop

There is now a laptop that plays bridge. Saitek Industries Ltd. said the 128-k-byte program in its 5-lb (2.3 kilogram) Pro Bridge 500 is good enough to challenge serious club players, while also storing coaching features for beginners.

The laptop can play as a partner or an opponent with other players, or against itself in an autoplay mode. It plays both rubber and duplicate bridge and can choose from five bidding systems - Acol, American 5-card major, French 5-card major, American Standard, and Precision Club - with 11 bidding conventions. The coaching feature offers hints, suggests cards to play, and allows the takeback of a bid or card.

Opened for play, the unit relies on a panel with four small liquid-crystal display screens: one 16-character screen holds two player positions and menu options. Screens at each side of this central screen hold the two other player positions. A fourth screen keeps score.

When not in use, the display panel folds flat and snaps shut over the unit's custom keyboard to measure 9 by 9 by 1.5 in. (about 23 by 23 by 4 cm) The game works off 6 AA batteries or a voltage adapter and carries a suggested retail price of $US 399. Further details may be had from Saitek Industries Ltd., 2301 W. 205th Street, Suite 108, Torrance, Calif. 90501; Tel. 213-212-5412 [to find the dealer nearest you.] (Source: IEEE Spectrum, December 1990)

Antique reproduction by laser techniques

Manufacturers at the high end of the furniture market in recent years have turned more and more to

lasers and computer numerical control (CNC) to produce or reproduce intricate designs.

The most complicated designs are found in fretwork, a linear pattern of decorative motifs, and in marquetry, decoration formed by inserting pieces of material like wood or shell into a wood veneer attached to a piece of furniture.

At the Baker Furniture Co.'s factory in Mocksville, N.C., a 700-watt helium laser is operated in three shifts to cut furniture fretwork and marquetry. Most of the items made there are antique reproductions.

The laser can only cut wood up to 3/4 in. (2 cm) thick.

To draw blueprints to actual scale, a team of designers visits the Society to take notes, photographs and measurements of the antiques, sometimes returning with one on loan.

With the blueprint, a programmer uses a mouse with cross hairs to line up a multitude of points that define the design, plotting them into a PC program. Most plotting takes a few hours, but intricate fretwork may require up to eight. Using another program, the programmer then smooths the points into a curve, reproducing the blueprint on-screen.

The PC is linked to a cutting apparatus consisting of a laser and a surface that moves the piece of wood into position. On average, the laser system carves fretwork in half the time it would take with a fretsaw. For intricate fretwork, the saving is about seven-eighths of the time.

Marquetry exacts even more exquisite cutting. Strips or pieces of one kind of wood or other material are cut by laser and then placed by hand into a design, which is glued to the surface of another kind of wood to form, say, a rose pattern on a coffee table top. The top veneer is reinforced by a second layer of veneer with opposite grain, a third layer of lumber panel, and two more layers of veneer. The five layers are then pressed together at 250 lbs per square inch (1700 kilopascals) at 250°F for 4-5 minutes.

To scout out ideas for their antique reproductions, Baker Furniture designers have travelled throughout the world during the past century. Some antiques they purchased to imitate are housed in the Baker Furniture Museum in Holland, Mich.

In the past four years, the company has spent $US 10 million to replace the machinery in its six factories with CNC equipment This has enabled Hinshaw's factory to take on work formerly done by subcontractors. (Source: IEEE Spectrum, January 1991)

Laser printing goes full speed ahead

by Janet Mann and Jan Wright

Technological advancements and declining prices ensure the continued success of low-end laser printers.

In just a few short years, laser printers have moved to the forefront of the printer industry. Laser printers now account for an estimated 30 per cent of unit sales of microcomputer printers and 60 per cent of the market's dollar value. With models available for less than $1,000, they are likely to continue replacing conventional impact and non-impact printers for many applications.

Companies that routinely purchased 24-pin dot-matrix printers (priced between $300 and $900) can now, for a few dollars more, select a laser model that offers a dramatic increase in quality. Industry analysts predict that laser printer prices will decline even more dramatically during the next three to five years, with the next break point at the low end likely to hit $599 or $699 and prices ultimately dropping to about $500.

Desktop publishing has put laser printers on many desktops, giving organizations the ability to produce professional-looking documents and presentation-style graphics without relying on outside designers or print shops. Laser printers are extremely versatile in their ability to vary print sizes and styles, and generally include six to 40 or more internal fonts. Because the light beam used to form laser images can be turned on and off more quickly and aimed more precisely than the pins of a dot-matrix printer, for example, laser printers can reproduce graphics more accurately than most other printers. Modern laser technology accommodates variable dot sizes and placement, resulting in improved print resolution and smoother lines and text.

Although laser printers produce better looking documents than do most other kinds of printers, they are not necessarily faster. But speed-hungry users can buy laser printers with speeds as high as 50 pages per minute (ppm), although at substantially higher prices ($100,000 and up) than garden-variety laser printers. Usually, laser printers feature speeds of 8ppm and prices from $2,000 to $5,000. Within the past year, however, a number of major manufacturers have introduced low-speed models (4 and 6 ppm) at relatively low prices ($1,000 to $2,000) - spurring significant growth at the bottom of the market. At the same time, models in the 9 + ppm category, originally designed (and priced) to address high-volume applications, are gaining corporate acceptance.

To meet user demand for higher print speeds and improved resolution while holding prices within competitive bounds, printer manufacturers are beginning to offer a range of optional capabilities for the low- and medium-speed printers. Such options, which include memory expansions, additional internal fonts and various emulations, allow users to tailor a printer for their specific requirements - increasing the print speed or improving print resolution as application needs change.

Perhaps the most important choice in buying a laser printer is which page description languages (PDLs) the machine supports. Incorporated into the printer's controller, the PDL determines both performance and compatibility with applications software. The most widely used PDLs originate with the laser printer pioneers - HP and Apple.

Despite the dramatic increase in laser printer sales during the past several years, a number of factors have combined to restrict the widespread acceptance of laser technology.

Although laser printer prices have declined substantially, the fact remains that laser printers are more expensive to operate than conventional

impact or dot matrix models. Toner cartridges, mechanical components and other consumables cost considerably more than a replaceable printer ribbon. In fact, the average cost of consumables for a laser printer page is between two and three cents, compared with less than one cent for a dot matrix page. Also, unlike dot matrix printers that can operate almost anywhere, laser printers require a clean, temperature-controlled environment in order to function reliably and efficiently. And laser printers do not lend themselves to all applications. Multipart forms, for example, require impact printers.

Finally, other printer technologies offer nearly the same speed and print quality as laser printers, but at a lower cost. Ink jet printers, for example, provide users with near-laser quality output for about the same price as dot matrix printers. [Faulkner Technical Reports is a Pennsauken, N.J.-based independent publisher and research company specializing in information about computer and communications technologies. For information on Faulkner's subscription services, call (800) 843-0460.] (Source: Datamation, 1 February 1991)

All wired up for the electronic home

Electronics engineers from 11 European companies gathered in Amsterdam to finalize plans for a system through which pieces of domestic electronic equipment will communicate with each other.

In the future, switching on a video recorder, for example, will turn on a TV set or satellite receiver and tune it to the video, while the lights dim. The TV will give you a quick peep at what is being recorded on the video, then return you to your programme. All TV and video equipment will automatically synchronize onto the same local broadcasting frequencies.

The companies involved in making this happen include Philips, Thomson, Thorn EMI, GEC, Siemens, AEG, Zanussi and British Telecom. They met at a conference sponsored by the European Commission and Dutch Ministry of Economic Affairs. It marks the end of the first two-year phase of the Home Systems project, which is part of ESPRIT, the European research programme in information technology.

The project to create the necessary enabling technology, called the Home Bus System, has cost £12 million, half of which came from the Commission. Everything now depends on electronics manufacturers adopting it.

HBS relies on control boxes being installed for equipment to be plugged into. They can be sited wherever a piece of equipment is needed and they communicate with each other through whatever system of connections is available in the house: telephone wires, coaxial TV aerial cable, infrared links, radio links using cordless telephone frequencies or the mains power wiring. The signals are digitally coded control words, each headed with a label so that it triggers only the correct device.

The speed at which these signals travel is tailored to the capacity of the connection, ranging from 500 bits per second for cordless phones to 9,600 bits per second for coaxial cable and telephone wires. Even at the lowest speeds, strings of instructions will be transmitted faster than anyone can press the buttons on the remote control.

The success of the system depends on support from Japanese manufacturers. Wisely, the European researchers based their work on D2B, a domestic digital interconnection system developed by Philips, Matsushita, Thomson and Sony, which is already an agreed standard. D2B standardizes the codes used to connect equipment's internal microprocessors to the outside world. D2B equipment can connect with up to 50 other pieces of equipment.

No HBS control boxes are yet in the shops, but the first TV set with a D2B socket, from Philips, is now on sale in Britain, with the first video recorder promised for early this year. (This first appeared in New Scientist, London, 12 January 1991, the weekly review of science and technology)

Intelligent machines

Just when the computer industry was growing a little dull, some Californian entrepreneurs are trying to stir it up again. This time the idea is computers cheap enough to fit into every appliance. Echelon - a new company started by Mr. Mike Markkula, a founder of Apple Computer, and Mr. Ken Oshman, a founder of Rolm, one of America's most successful telecommunications companies - is launching a chip that will not only make appliances cleverer, it will also let them cooperate with other appliances to make their owner's life easier.

Echelon hopes that by creating a single standard for intelligent, distributed control - and by selling it in the form of a powerful, easy-to-use chip costing less than $10 - it will make its founders yet another fortune.

The heart of the technology is what Echelon calls the "Neuron chip", which will be made under licence by Motorola and Toshiba. It contains three processors capable of executing control programs. It has the circuits necessary to receive input from sensors and to send control signals to another device. The Neuron chip also contains the wherewithal to talk to other Neuron chips.

In such dialogues, the chips use a new communications protocol, called LONTALK, which specifies how messages are to be addressed, how transmission errors are to be detected and so on. The company has developed a number of chips that translate signals from Neuron chips into the appropriate form for each and has also created a collection of tools to help designers make and test products incorporating its new chips. Based on an IBM-compatible personal computer, a full development kit costs about $15,000. (Extracted from The Economist, 8 December 1990)

Radio card opens doors for the blind

Britain's one million blind and partially sighted people could soon find it easier to cross roads and negotiate with machines such as cash dispensers. Researchers have developed a card-sized transmitter that emits signals which can trigger an audible response in suitably adapted machines up to 5 metres away from its carrier.

The system, called React, will go on trial with the Department of Transport next spring in pedestrian crossings in one British town. One of its uses is to lengthen the phase of the "green man" on adapted crossings for disabled carriers.

Researchers at the Royal National Institute for the Blind (RNIB) and the electronics company

GEC-Marconi developed the device after wide consultation with blind people. The part carried by the user consists of a rectangle of epoxy, about the size of a credit card but thicker and slightly heavier. It contains a circuit powered by a lithium cell that emits a radio signal on a frequency of 890 megahertz that the wearer can switch on or off. The battery could last up to 10 years. The card is also robust, i.e. washing-machine and guide-dog proof.

But the scheme's success depends on the cooperation of transport authorities, banks and also construction companies - scaffolding and roadworks are frequent causes of accidents to blind people. These organizations have to install the other half of the system - an interrogator unit - which is triggered by the signal from the card. The unit can in turn activate a loudspeaker, for example with a recorded message guiding the user through a ticket barrier.

Blind people are frequently the victims of low slung signposts, billboards and other obstacles not easily detected with a stick or guide dog. But they could soon have the opportunity to kit themselves out with a pair of glasses which incorporate sonar.

The glasses are the brainchild of Gustavo Chaos, a Spanish inventor. A transducer in the centre of the glasses above the nose constantly emits ultrasonic signals and then detects the echo from any objects ahead.

The echo information is then converted into a rapid clicking noise if there is an obstacle ahead which is conveyed to the wearer through an earpiece contained in one of the legs of the glasses. (This first appeared in New Scientist, London, 15 December 1991, the weekly review of science and technology)

V. COMPUTER EDUCATION

Basic electronics trainer

Flight Electronics designed its Basic Electronics Trainer to provide students with a clear understanding of fundamental electronics. It illustrates the operation of electronic components such as resistors, diodes, transistors and transducers.

The training system is suitable for a variety of age ranges and abilities, including the GCSE "O" and "A" level electronics syllabuses. Initial experiments can be performed by children of 12 years and upwards. Others should be suitable for a general introduction on higher education courses.

The portable system comprises a main unit housed in a rugged, moulded carrying case. Built in to the main body are the voltmeter, ammeter and PP3 battery housing. The system may also be run off the mains power supply using a mains adaptor.

Eleven modules which plug into the main unit are supplied as standard. Modules can then be linked into the required circuit configuration using the accompanying set of 4 mm plug leads. A further four optional modules which expand the capabilities of the trainer are available separately.

The manual supplied with each unit contains 16 experiments, enabling the student to explore a total of 23 different circuit configurations. (Source: Electronics Weekly, 6 February 1991)

In the beginning was the CD

Preliminary trials have begun of a PC-based system which exploits multimedia techniques - combining pictures, text, sound and motion video on a computer screen - to provide an interactive learning medium for adults with little or no reading ability. The project is headed by Cambridge Training and Development (CTAD) and the Cambridge-based computer firm, Next Technology. The UK Government has contributed £200,000 towards the development costs - just under half the total funding. About six million adults in Britain are thought to have literacy or numeracy problems. The aim of the project is to supply the country's 50 Open Learning Centres with an affordable training package which can run on existing 286-based PCs. The technology is based on CD ROM XA, an enhanced form of CD ROM. The teaching method is based on the "language experience" approach, which takes spoken words and presents them to the learner to read. The CD project has attracted the attention of educationalists both at home and overseas. The project has a strong theoretical underpinning and wants to get as close to best practice for adult literacy as possible. (Source: The Guardian, 6 September 1990)

Smart systems get in training to teach

In some sectors of the economy the shortage of skilled workers has reached crisis point. Among the alternatives proposed for training more staff are automated teaching systems. Although most machine teaching systems are still at the prototype stage, there are some which are routinely used to train programmers, factory workers in crisis handling, and medical practitioners.

Computer-assisted instruction has a long history stretching back almost 35 years. The majority of the earlier instruction systems had a characteristic multiple choice question approach to teaching. Questions were presented to the learner in a strict sequential fashion; if students made errors they were given appropriate canned answers. However, the systems were limited because they did not have an adequate understanding of the student's level of competence. This resulted in an inability to provide advice and to ask questions that were suited to the individual learner's needs.

In the mid-1970s came the realization that assisted instruction could not progress further unless knowledge of the teaching and learning processes was incorporated into tutoring systems. Techniques from artificial intelligence began to cross over into the teaching systems to shape the field which is now known as intelligent tutoring.

Such systems have the crucial feature of knowing not only what they teach, but also how it should be taught. This type of knowledge is typically represented by a variety of ai knowledge representation schemes which include production rules, frames and semantic networks. The processing of this knowledge allows these systems to present questions and advice tailored to an individual learner.

Measuring the learner's level of ability is also a task that requires the representation and processing of knowledge. Most tutoring systems have a model of an individual student's performance, and this is updated throughout training sessions. They try to understand what the student is currently doing, identifying errors and figuring out the student's reasoning.

Tutoring systems have also had significant commercial success in training factory workers for process control tasks. Rediffusion Simulation has recently developed a tutoring system for training workers to handle equipment in a sugar refinery. This system, which is now being used on a daily basis, focuses on the sugar decolourization process. The refinery used a tutoring system because there were no provisions to train the workers on real equipment.

Because of the very large volume of sugar processed (3,000 tonnes a day), it is vital that the workers have adequate training in handling the equipment.

The refinery workers are also given training in managing various crisis situations.

In both academia and industry there has been keen interest in building intelligent teaching systems on top of existing expert systems. It was believed the knowledge contained in an expert system could be used to produce tutoring systems to teach expert tasks. However it soon became apparent that the knowledge in most expert systems was not in a form that was suited to the construction of tutoring systems. Converted expert-tutoring systems, when asked by students to explain their errors, failed to produce answers which could be understood.

The reason for this is that a great deal of knowledge in expert systems is encoded implicitly in the ordering of rules and prerequisites. This type of knowledge is not available to tutoring systems built on top of them. For a tutoring system to function satisfactorily the knowledge should be available in an explicit form that can be easily communicated to the learner. Knowledge that can be used to perform a task is not necessarily the same knowledge that is needed to teach someone that task.

Another issue which has attracted attention is the adaptation of teaching systems for different environments. Researchers at the Institute for Research and Learning in Palo Alto are developing teaching systems to be used in the workplace. It is argued that many of the resources for learning reside in the workplace itself, not in classrooms. There is a need for tools that facilitate continuous learning, as opposed to the current practice of sending people on training courses for two weeks a year. However, at most workplaces, the environment does not provide adequate support for learning. The team at Palo Alto is therefore not only investigating adequate software and hardware systems for learning workplaces, but also exploring changes in the design of office buildings and management structures.

A major limitation of all current tutoring systems is the resticted communication between teacher and learner. Most only have keyboard input and screen output; a minority can accept a limited subset of natural language. This contrasts strongly with human teaching processes where a rich repertoire of communication modes is used. Voice, facial expressions and body postures convey a spectrum of messages to the students.

Language is the most significant medium in the teaching process. Advances in natural language processing and voice recognition are therefore vital for the success of machine teachers. Unfortunately, progress in these areas has been slow with the majority of problems remaining unsolved.

A partial solution to the communication problem in tutoring systems may lie in the incorporation of multimedia technologies. With the creative use of sound and images, teaching may make a stronger impression.

In many subjects complex ideas are often conveyed through images. This is particularly true in biotechnology, where crucial roles are played by visual models such as the DNA double helix. Similarly, images form a significant part of expertise in areas such as architecture, engineering and biology. Tutoring systems based on multimedia technologies may use their image manipulation capabilities to effectively communicate such knowledge.

An important feature that multimedia-based tutoring systems may exploit is visual interference. A multimedia-based tutoring system for training psychiatrists is being developed at the University of East Anglia. The system will include real-time video images of patients. Pet scans, doctors' notes, information about diseases, symptoms and possible treatments. The first prototypes to be completed in four months' time will be placed in 200 clinics around Europe.

There are, however, serious questions regarding the social impact of intelligent tutoring systems.

Because there are still a whole range of problems that need to be solved, there is a great deal of speculation as to when we will have systems that can completely replace skilled teachers. In the short to medium term, the role of tutoring systems is more likely to be that of assistant. (Source: Computing, 14 February 1991)

VI SOFTWARE

Europe measures up for metrics test

The Economic Community has launched a £3 million international ESPRIT project to promote and improve the use of metrics in software development The two-year project, called Pyramid, will work through a consortium of European companies, including Siemens and Data Logic. Pyramid has been set up in response to concern that Europe lags well behind the US and Japan's routine use of metrics in software development and its integration into common working practices. (Extracted from Electronics Weekly, 23 February 1991

Standalone publishing system

Xerox has unveiled a sophisticated, standalone publishing system. The DocuTech Productinn Publisher features accounting and publishing software, a 600-dot per inch digital scanner, a 600-dot per inch, 135-page per minute printer, and in-line stitching, collating, stacking and binding gear. The device can handle Adobe PostScript Level 2, WordPerfect, Interleaf, HP PCL, PageMaker Ventura Publisher formats. Publications are handled via icons and a 17-inch grayscale touch screen. Graphics and documents as big as 11-x-17 inches can be scanned into the system. Input can be cropped, merged, cut and pasted via system software. The system can output 1-inch-thick hardcover books at the rate of one book per minute, and it automatically prints double-sided pages in the right sequence for binding. (Source: Technology Update, 3 December 1990)

Usability testing

Human factors engineering and usability testing is gaining attention from software publishers. Pursuing increased market share, developers seek programs that work intuitively, products of knowledge of the human brain and testing results. Used early enough in the development timetable, usability testing can identify design problems and strengths. Few current products reflect human factors engineering because software investment in it is only about two years old, though Xerox and Apple pioneered its use a decade ago for software, and big hardware firms have used it for years. The number of usability testing laboratories has increased possibly ten times in the past five years, according to the American Institute for Research Human Factors Center (Bedford, MA). Demand for testing has risen dramatically for new graphics products and technologies. (Extracted from Information World, 19 November 1990)

'Virtual reality"

"Virtual reality", a technology with few current commercial applications, portends a new style of marketing for tomorrow's architects, aircraft and car makers, surgical tool designers and others with high-ticket, hard-to-demonstrate products.

The computer-based technology, also known as cyberspace, creates imaginary three-dimensional environments. The virtual-reality operator wears high-tech goggles to view a landscape of imaginary objects. Using specially wired gloves, he or she may grasp the objects and simulate motion relative to the space.

Virtual reality lends itself to "a great many sales applications that relate to test driving", says Scott Davison, manager of communications with Autodesk Inc., a Sausalito, Calif., firm that is developing cyberspace software. "The very first application was flight training for helicopters, which tend to be very difficult to fly and very expensive." Additional applications will include entertainment and animation; scientific modelling; ergonomic car, truck and aircraft design; retail product demonstration; and interior design. (Extracted from Business Marketing, November 1990)

NucNet: Nuclear information network in Europe

The European Nuclear Society (ENS) plans to start operating a news and information service for public information officers in the nuclear field, in early 1991.

Called NucNet - the European Nuclear News Network - the system is being cooperatively launched by organizations in Belgium, Finland, France, Germany, Italy, the Netherlands, Spain, Sweden, Switzerland, the United Kingdom and the USSR. Other (East European) countries are expected to join shortly.

NucNet will cover nuclear developments in Europe by working with individual contacts, correspondents, and other news sources. It is hoped that it will interlink with the USA's INFOWIRE news service and a possible far Eastern nuclear information network. Main subscribers are expected to be: communicators at utilities, nuclear facilities, research centres, safety inspectorates, regulatory bodies, and other organizations requiring timely and factual information about nuclear events, controversies, milestones, political issues, media reports, forthcoming developments and other topics.

More information about NucNet is available from: ENS, Monbijoustrasse 5, P.O. Box 5032, 3001 Berne, Switzerland. (Source: IAEA Bulletin, February 1990)

Fisheries information systems for Pacific

The Pacific Islands Marine Resources Information System (PIMRIS) is a new regional bibliographic database for fisheries and marine resources, supported by the International Centre for Ocean Development (ICOD).

The PIMRIS Coordination Unit, located in the University of the South Pacific (USP) Library (P.O. Box 1168, Suva, Fiji), will, it is hoped, be the hub of an information network reaching out to all the countries and territories of the tropical Pacific. It will provide information services using the database and other resources.

Founding partners of PIMRIS are the Committee for the Coordinating of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP/SOPAC), the Forum Fisheries Agency, the South Pacific Commission and the University of the South Pacific.

The PIMRIS database will be maintained on the USP Library Computer using CDS/ISIS (Mini-Micro Version). (Source: Agricultural Information Development Bulletin, September 1990)

New CAM package from the CAD centre

The longstanding computer-aided manufacturing software package, GNC, has been completely rewritten and launched under the name of GNC Plus. The earlier product, which has more than 2,000 seats world wide, suffered from being difficult to learn and use. GNC Plus, despite the similarity of its name, must be regarded as an entirely new product. It has also been designed so that it can be learned quickly by production staff without the need for lengthy training courses and good keyboard skills. The new product has been developed for the middle band of customers in the £10-50 million turnover bracket, requiring an advanced part programming system to turn out CAD-generated component designs directly into machining programs for NC/CNC machine tools. It is provided with full 3D capability with an easy-to-use pop-up menu system which almost completely eliminates the need to use the keyboard except for special user text entry. GNC Plus is designed for engineers to develop part programs and test them on the computer screen rather than in the workshop and to be able to amend them with ease. (Source: Professional Engineering, November 1990)

Calling up instruments in realtime

Man/Machine user interfaces have taken a step forward with the introduction of the RAVE (Realtime Audio/Video Environment), a new multi-media development tool. This system is designed to simplify the information received from machinery by combining high quality audio and video, computer generated graphics and customized menus, all in the same user interface. The system allows the designer to configure his own design of instruments and control panels on the screen to represent the control environment as he wishes to see them. Thus he can eliminate the vast quantity of irrelevant data, which many users of computer systems find so daunting, and concentrate only on the control data he needs, in the form he needs. The system is designed on the premise that non-technical users are better able to understand real-world visual representations, such as a picture of a voltmeter,

than a large volume of printed figures or drawn images. (Source: Professional Engineering, November 1990)

Power cost accounting

Software capable of automatically monitoring the energy performance of buildings and plant, which can aid in optimizing energy cost savings, is produced by Stark Associates. Data from environmental sensors and metered services is collected and stored and the in-built formula language manipulates this into useable information. This information is analysed by the software, which can alert the building manager when energy performance parameters are not met. The kind of performance given allows plant managers to fine tune their plant's efficiency automatically. What took hours can now, it is claimed, take minutes. It has the ability to create output in tabular or graphical form and in greater detail. The software can monitor a variety of energy sources including gas, electricity, water and other metered services. Temperature pressures and other sensors can also be monitored. (Source: Professional Engineering, October 1990)

Converting a PC to a data logger

A plug-in board can be installed to turn any IBM-PC compatible into an intelligent digital multimeter, data logger and chart recorder, thus reproducing the functions of a traditional bench-top instrument. The Digital Multimeter - Virtual Instrument Product (DMM-VIP) shows on its display screen a picture of a multimeter front panel. The buttons on the screen are operated by a mouse in order to select volts, amps, ohms, etc. The result is shown in 4.5 digit resolution in the display window. Besides this it performs a number of other functions. (Source: Design Engineering, September 1990)

The soft sell

Scientific programmers who have written applications on the PC can use KnowledgePro (Windows) by Knowledge Garden Inc., a graphical version of its KnowledgePro knowledge-base generator that runs under Windows 3.0. A compiler for creating Windows 2.x and 3.0 application programs accompanies KnowledgePro, allowing programmers to create and distribute royalty-free stand-alone demos, tutorials, and references that run under Windows. KnowledgePro (Windows) is a complete package for creating knowledge bases, which are programs that store and display text, graphics, and sound.

Knowledge bases are cost-effective tools. There is no overhead since they can be produced when needed, one at a time. They can be shipped by first-class mail on floppy disks instead of fourth-class book rate - or transmitted electronically when needed. And they can be upgraded instantly.

Most programmers will use KnowledgePro to create filmstrip-like demos, but they can also use it to make interactive tutorials. Engineers and technical writers can use KnowledgePro to create on-line manuals and references; a complete set of reference manuals is available with any PC and modem. Other engineers can use it to create expert systems, since an expert programmer is not required. Furthermore, KnowledgePro also touts it as a tool to create general Windows applications.

Simple 5-minute filmstrip-like demos with graphics and sound can be created with KnowledgePro (Windows) in just a couple of days. More powerful interactive demos take a week or two, while in-depth interactive tutorials and references need a month. The company lets the scientific programmer add value to his or her software by shipping CAI (computer-aided instruction) material with its software package. Further information can be had from Knowledge Garden Inc., 473A Malden Bridge Road, Nassau, N.Y. 12123; Tel: 518-766-3000. (Source: IEEE Spectrum, December 1990)

Local Operating Networks

Founded in 1988 Echelon Corp. has combined a low-cost processor IC with an ultrarobust communications protocol to create a technology it calls a Local Operating Network. Because of their low implementation costs, LONs are expected to be useful for communicating and controlling all sorts of equipment and appliances in office buildings, factories, warehouses, homes, and even the family car. The cost of a typical node will be less than $10.

In an office building, a LON can link the security system with the lighting and ventilation systems by using the power lines as a communications medium. In factories - the first market on Echelon's list - LONs can connect process controls using spread-spectrum radio, power lines, or infrared communication - all transparent to the network user. In cars, LONs can radically reduce the size of wiring harnesses by endowing the lights, suspension, and heater with the intelligence of a $5 chip called a Neuron Distributed Processing Unit running 3 million instructions/s.

One way to view the Neuron chips that create control points in the LON is as a universal programmable logic controller.

Indeed, the potential market is both vast and largely untapped, says Echelon president Kenneth Oshman. In 1991, there will be approximately 4.5 billion nodes worldwide where cheap intelligence could be useful. Less than 5 million nodes have been connected using traditional communications and control technologies. W. Strauss, President of Forward Concepts, Inc., says that in US industry alone, 47.5 million nodes are being monitored and controlled at an average cost per point of $14.70. LONs can make deep inroads into that market as less expensive, value-added replacements, he says.

Such broad market reach requires a simple, robust architecture. Design specifications for the technology include media independence, scalable transmission rates, a universal addressing scheme for a very large number of nodes, and a self-contained protocol.

To satisfy these criteria, Echelon built a soup-to-nuts system on a chip, including a processor and a network protocol based on collision sensing and multiple access to the network by nodes. The LON protocol covers the complete International Standards Organization's seven-layer stack. Bit rates scale from 10 Kbits/s for applications using power lines as a medium up to 1.2 Mbits/s for twisted-pair wiring. The LON operating system supports up to 32,000 nodes per domain; domains can be linked by routers and bridges.

Each node is controlled by a Neuron chip that integrates three 8-bit, on-chip processors, each capable of handling 1 mips. The three processors share 2 Kbytes of RAM and 512 bytes of EEPROM and are dedicated to one of three functions: protocol conversion, communication, or computation. (Source: Electronics, December 1990)

Multivendor networks

After a couple of years of uncertainty, it is beginning to look like the Simple Network Management Protocol (SNMP) has become the de facto standard for managing local and wide area network equipment from different vendors.

SNMP will not completely eliminate that swivel chair in the network operations centre needed to view multiple monitors, but it will go a long way towards making network management both simpler and more uniform. Rather than use different, usually proprietary, network management schemes for each device on a network, the SNMP approach uses a common software "agent" in each device. This agent can be queried by and reports back to a single network management station, generally a dedicated workstation. SNMP was designed as part of the Transmission Control Protocol/Internet Protocol (TCP/IP) suite, the underlying common communications link.

The attraction of SNMP is that a single workstation, which can be from any manufacturer, can monitor SNMP agents in any vendor's equipment. One vendor carried that point to an extreme at Interop'90 data communications conference last October, demonstrating that SNMP could monitor a toaster and a stereo that were equipped with an intelligent power supply. (This led to speculation that TCP might really stand for Toaster Control Protocol). On a more serious note, vendors have been developing SNMP-compliant tools that monitor network performance and status; control the various parameters of the devices; and report, analyse and remedy faults.

Suranet, one of the regional networks making up the US National Science Foundation network (NSFNet), links 13 southeastern states and Washington, DC., giving it control of more than 10 per cent of the Internet. Each of the routers is a gateway to a network that may itself have hundreds of nodes. The network's routers are a mix of devices from Cisco Systems Inc. and Proteon Inc.

Other current and prospective users of SNMP equipment see a long-term future for SNMP as well, reports the Delran, N.J., research house, Datapro Research. In its "1990 SNMP Product Guide", Datapro says that 71 per cent of such users believe SNMP will be the dominant internetwork network management protocol for at least three to five years, and 23 per cent believe it will be around for six to 10 years.

But SNMP is not the only player in this arena. For the past couple of years, there has been something of a battle brewing for dominance of the heterogeneous network management marketplace between SNMP and the Common Management Information Protocol (CMIP), the network management standard defined by Open Systems Interconnection (OSI). OSI proponents claim that CMIP offers more functionality and would eventually be a true standard. But SNMP proponents have pointed out that, unlike CMIP, SNMP products are already defined and available.

Despite this nearly universal acclaim for SNMP, the protocol is not without its problems. Critics of SNMP have questioned whether the agents themselves create so much traffic that network performance degrades.

Desktop publishing

Word processing packages have facilities that used to be the preserve of desktop publishing

New versions of the leading wp packages embody capabilities previously the preserve of expensive dtp packages. Facilities include scalable fonts, column formats for pages, graphics preview of finished pages and the ability to create and import graphics into text pages.

The package suppliers all added extensive capabilities last year to remain competitive but, paradoxically, many enthusiastic users have failed to notice or take up these new facilities.

A recent Context report gives Wordstar 24 per cent, Wordperfect 24 per cent, IBM 19 per cent, and Word 14 per cent. These figures are more in line with the sort of usage encountered in the field.

IBM's strong showing with Displaywrite stems largely from big corporate customers' inclination to buy licences of the product simply because it has the IBM label rather than because it offers advanced functionality. In fact, IBM has not treated Displaywrite with the seriousness it deserves and the product's development has languished so that it lags considerably behind the big three independent wp packages in performance. However, there are signs that IBM is acting to remedy this.

Each of the major independents launched a graphics-oriented version last year: Wordstar 6, Word for Windows and Wordperfect 5.1. Each retains its original approach to putting down words on paper, but each too has adopted the stock in trade of the dtp package.

This means the majority of first time users' needs can be satisfied by simply upgrading to the latest version of a favourite word processor and the idea of dtp can be dispensed with. The big three packages all have facilities that can be used to produce a corporate newsletter aimed at staff or customers.

Wordstar is the acknowledged grandfather of all major wp packages, making the transition from CP/M to MSDOS in the mid-1980s, and inspiring a loyalty amounting to fanaticism among its devotees.

Wordstar is perhaps the richest functionally. It has been criticized on the grounds that some of its functions are split into separate modules rather than being fully integrated, but this is not a serious criticism to anyone with only one pair of hands.

The principal dtp proofing tool in Wordstar is the page preview command which shows onscreen the page or pages to be printed containing the typefaces selected in the correct size. The picture displayed is an accurate representation of text and graphics on a white background. Its scale can be varied from a zoomed-in four times life-size down to a pair of facing pages or even a set of miniature thumbnail sketches which give an impression of layout for long documents.

This method of preview is very powerful. It is possible to call up a grid to help with accurate placing of text and graphics and play "what if" games by changing typeface and type size and checking results. The drawback is that these

changes cannot be made while in graphics mode, only in conventional text mode. So the user is continually toggling between screens, first editing then viewing the result.

When it comes to editing pages, Wordstar has many facilities that are extremely useful but which require a little time and practice to master. These include a column format command; the ability to change typeface and type size many times on the same page (though this may be limited by the capabilities of the printer) and the ability to create or import graphics anywhere in the text.

This facility is accomplished by a separate Wordstar program called Inset. Inset is a memory resident facility that is optionally loaded before starting Wordstar and can be hot-keyed at any stage while editing. Graphics are tagged and positioned in the text in much the same way that typefaces are selected and flagged. They cannot be viewed in text mode but can be seen in graphics preview mode in either black and white or colour.

Probably the greatest compliment paid to Wordstar was that it was commissioned by Hewlett Packard to develop a word processor that could fully exploit all the functions in its Laserjet III laser printer and it was this development that formed the basis of version 6.0.

This has given the latest version the facility to support scalable fonts (typeface and point sizes are chosen through a dialogue box) and also kerning and leading of lines. Kerning is having variable spacing between letters to compensate for their natural shape. Leading is white space between lines.

It is also possible to generate ruled lines and boxes directly from the keyboard as well as the usual typographical effects such as underlining, subscript and superscript (bold and italic effects are selected by choosing a different typeface).

Although a relative latecomer to the market-place, WordPerfect vies with Wordstar as the most widely used professional package. Both packages have somewhere around 25 per cent of the market. WordPerfect is attractive to users, especially new users, because it offers a very clean screen (looking like a blank sheet of paper in a typewriter) and the basics are very easy to pick up. Using the alt key reveals a line of pull-down menus across the top of the screen.

This initial friendliness makes it a favourite with secretaries and administrative staff. There is a down side to this simplicity in that the concealed command repertoire is extensive and getting at the more advanced features is not quite so easy.

Nevertheless WordPerfect is a very powerful and friendly package that embodies some very powerful dtp capabilities under its graphics pull-down menu.

Pages are previewed in graphics mode, as with Wordstar, although the options are rather more limited. Pages can be viewed full size, twice full size or as a facing spread. The graphics command of WordPerfect is very comprehensive. It enables the user to import graphics from the most popular formats (such as Autocad, Macintosh, Gem or Dr Halo) and also to create and edit graphics onscreen for incorporation into a document. The command also enables the user to draw boxes around graphics and, especially useful, to wrap text around a graphics box.

Images can be scaled up or down, moved around the page and rotated. One further goody, useful for reports, is that spreadsheet data can be imported into a graphics box.

However, WordPerfect is limited in its ability to create graphics, a function which is the province of a separate sister package, DrawPerfect.

Word is extremely simple to pick up and, because it was developed by Microsoft, it is the only package that is truly compatible with Windows and able to take advantage of version 3.0.

A user can start Word from inside Windows and still have access to all the other Windows applications on the screen whereas Wordstar and WordPerfect are regarded by Windows as "on-Windows Applications" and hence take over the entire screen when invoked, shutting out useful applications like Cardfile and Paintbrush.

Word for Windows introduces a new level of complexity. Windows 3 is an immensely powerful graphical interface and is years ahead of previous versions of Windows. However, it does take some getting used to for users familiar with text-based systems, a process which is an essential prelude to learning Word for Windows.

Largely because Word for Windows was designed as a graphical system from the outset (unlike Wordstar and WordPerfect which simply have graphical preview facilities) it is a mouse-oriented system rather than primarily keyboard oriented.

Word's functionality is comparable with that of Wordstar and WordPerfect. It enables users to mix text and graphics freely on the page and to flow text around them. It has four different ways of displaying documents in addition to text editing mode: outline view; draft view; page view; and print preview which not only shows the page but allows elements on it to be repositioned.

Word also has the remarkable facility to "lock" a document so that reviewers can annotate it with their comments while it remains protected from change.

Finally, Microsoft has pulled off a clever coup in the excellent accompanying documentation by including a manual of instruction aimed at users of other word processing packages. Individual chapters are aimed at users of Displaywrite, Multimate, Wang, WordPerfect and Wordstar. (Source: Computing, 10 January 1991)

Hamburg firm announces new OCR system

According to its own statements, the Horst Stielow Electronic System Company of Hamburg has made "decisive progress" in automatic text recognition. With its Paratexer program package, this commercial company is marketing a system which should be able to read different typewritten or printed texts into a computer for further processing "with previously unheard-of reliability". It is said that this will open extensive opportunities for streamlining for archives, libraries, and any institutions which have to manage extensive bodies of material.

The company claims the sophistication and power of the parallel-computer architecture of this new program package will enable the system to overcome all previously known restrictions for OCR systems.

This means that the system is not tied to specific typescripts. For example, the company says that Paratexer reads all known typewritten fonts that have been on the market since 1931. Whether it is a financial newspaper from the United States or a news magazine from Germany, a technical journal from Holland, or a fashion journal from Paris, the new program package can handle all printed media, reports the company.

Paratexer can automatically process headlines and running text even when they are set using different fonts. The program has been "trained" to have wide-ranging reading ability. This training used the most sophisticated methods of pattern recognition. Variations in the font image no longer require adjustments by the user. The error rate, at 0.25 per cent, is very low.

According to Stielow, a personal computer of the AT class is sufficient for using the Paratexer suite of programs. Such computers are already standard equipment in many offices. A scanner first enters the text into the computer as a complete image file. The Paratexer parallel processors are inserted into the main computer. They convert this file into text characters that can be sent back to the main computer (or another personal computer). These text files are then available for computer evaluation. They can be additionally processed in any way.

Complex quantities of data can be automatically filtered to find specific information. One method for doing this is by entering search terms. Stielow sees potential applications primarily in the entire area of archives. Whether it is a publisher's archive containing hundreds of thousands of newspaper excerpts, the information bureau that stores all commercial register excerpts, or the data base that keeps technical articles available for the experts, they can all eliminate time-consuming retyping of existing text. (Source: Frankfurter Zeitung, 6 August 1990)

Industry sector information and control system

Ministries of industry or other governmental bodies with overall responsibilities for industrial development require relevant information from their subordinate companies and factories in order to carry out their major task: to plan further improvements and control the efficiency of their investments. The information flow is in reality bi-directional: from the ministry in the form of plans and directives, to the ministry in the form of feed-back of actual industry performance. This information circuit is crucial for any form of budget control. Ministries in many developing countries encounter serious difficulties, for various reasons, in performing this budget control, which is often inadequate, sometimes even non-existing. As a result there is no clear picture of the efficiency of financial investments and any attempt to create such a picture, of an individual factory or a whole branch, involves a substantial amount of paper work. Based on a number of real situations in developing countries, a three-module system which addresses the problem has been developed, called the Industry Sector Information and Control System (ISICS).

Relevant planning and adequate feed-back of industry performance is a prerequisite for budget control. But feed-back requires that industry performance be measured, that managers involved are sufficiently familiar with financial control principles and that there is a technical infrastructure to capture the flow of information. The Industry Sector Information and Control System is a set of tools to address these issues.

The three tools of the ISICS, specially designed and developed for industry sectors in the least and less developed countries, are: first, a software package, designed for a general low-cost PC system with a common database and adapted to reflect any industry sector. Industry branches and products are classified in accordance with the UN classification system to enable international comparison and statistical analysis. Second, a management training course containing principles of budgeting, financial control, measurement of industrial activities, production control and information processing (duration: two, plus two, weeks). Third, a project assistance scheme that includes an initial industry survey, adaptation and installation of software, training in ISICS maintenance (updating of industry records, etc.), running of test data, start of productive processing. Two follow-up phases of one week each during a one-year period.

The ISICS database has information records for each industry/organization unit. Each record has data about organizational belonging, sector/branch/product codes, type of organization, serial number, geographic code, employment size, production achievement, project status (for industry projects under implementation). For each unit there are seven types of transaction records, viz. organization/company master record, factory master record, financial balance/result records, financial operating budget record, personnel operating plan record, operating factors record. The ISICS database would be located at the ministry (or its equivalent) and is updated regularly from the operating units (factories, etc.) belonging to the ministry. Updating can be done manually, i.e. completed forms submitted from field locations or via diskettes, in case there are local PCs. In the long run the implementation of an information network can be planned. The first information network should be implemented within the ministry (local area network).

The primary users of ISICS are ministries or similar institutions dealing with industry operational planning, industry strategic planning, personnel planning, budgeting and financial control, statistical analysis. The system is designed to be used also as a control tool at the factory level.

ISICS stresses simplicity in use. Users will find simple ratios ("operating figures") as indicators of industry performance and trends. This is different to other computer-based solutions, which are mostly too complicated for inexperienced users. ISICS furthermore includes adaptation and implementation, training of managers in planning and control principles and assistance during and after implementation as check-ups. The basic idea of ISICS is to avoid sophistication and complexity and to offer a tool that can be implemented and understood by middle managers in their day-to-day professional work. The computer is merely a means of creating this tool.

Total project implementation time: 8 weeks (excluding PC-hardware acquisition and implementation) and the price is very reasonable. For further information and price quotation, please contact Dr. Per Lind, Business Development Partners, Box 145, S-18212 Danderyd, Sweden.

VII. COUNTRY REPORTS

China

New association for China's information industry

Founded in March 1990, the China Information Industry Association (CIIA) hopes to establish regular communications - and mutually beneficial relationships - with organizations in the information business from other countries. Affiliated to the People's Republic of China's State Planning Commission, the association's executive office is located at the State Information Centre.

Areas of co-operation envisaged by the CIIA include:

- Inviting representatives of interested organizations in other countries to lecture in China, and helping them build business links with potential Chinese partners;
- Providing professional consulting services and helping to find Chinese partners for joint ventures with foreign organizations;
- Accepting funding and donations from foundations in other countries in order to carry out co-operative research or training in areas of interest to both parties.

The CIIA is a nationwide organization consisting of agencies, participating on a voluntary basis, which are engaged in research, production, dissemination and other information services in social sectors such as economics, science and technology. It aims to serve as a bridge between government and the information industry, to promote the development of the information profession and information enterprises, to enhance the quality and level of information science and technology and to contribute to economic and social progress.

The new association invites information organizations at home and abroad to develop mutual contacts and bilateral or multilateral co-operation. For further details, contact: Mr. Zhou Qifeng, Managing Deputy General Secretary, China Information Industry Association, Room 403, 4th Floor, No. 58, Sanlihe Road, Beijing 100045, People's Republic of China. (Source: Newsidic, October 1990)

China signs deal to create computer company

The Ministry of Machinery and Electronics Industry (MMEI) in China will work with Hewlett-Packard in a joint venture to establish Huapu Information Technology Co., Ltd., to manufacture workstations and develop software.

Based in Shanghai, Huapu will assemble and market the US company's HP Apollo 9000 Series 400 workstations for the Chinese market. The joint venture initially will employ 70 Chinese people; 40 will work in software development and the others will adapt products to accommodate local languages, or perform test, assembly, installation and training functions. The company is the only high-technology joint venture for workstations in China and is part of the Government's long-range plan to develop the Chinese economy and expand the computer industry.

It is also part of the Shanghai East-China Computer Corp., a research institute with 1,400 employees, established under the MMEI in 1958, which focuses on R&D for large- and medium-scale general-purpose computers, aerospace computers and special microcomputer systems, plus computer software, networks and computer-aided design projects. (Source: AEU, No. 6, 1990)

European Community

Spending on supercomputing research

An EC report says that European industry will have to spend £750 million a year on supercomputing research or risk becoming uncompetitive in developing industrial products within the next decade.

The EC Working Group on High Performance Computing says that companies in all industrial fields will need new high-power computers over the next 10 years to model the performance of their products.

The supercomputers used to run simulators are only made in the US and Japan at the moment and Europe will have to catch up.

The Group's chairman Professor Carlo Rubbia of the CERN research laboratories, said that the computers will have to be 1,000 times more powerful than those available now.

The report is being considered by the European Commission. Dr. Michel Carpentier of the EC's computing and telecoms directorate said that it would look at the possibility of setting up an Esprit-style research initiative, involving industrial companies and universities as well as the Commission.

Although this year's high technology research budget had already been set, Dr. Carpentier said he would consider the supercomputer initiative for next year's programme. (Source: Electronics Weekly, 20 February 1991)

Computing on a beam of light

The European Community's Stimulation programme (now to be called the "Science Programme") had several successes - but certainly the greatest was the demonstration of the basis of an "optical computer". The task was to use light alone, for example, to store numbers, retrieve them, work on them and restore the result.

The basic human and physical materials were to hand in Europe; however, although the pieces were there for a great project in optical computing, the usual laws of European fragmentation had been operating; different university and career systems, different languages, expensive transport; it needed the strong support of the Stimulation programme to get groups together frequently enough, and with enough resources for a new project, for the human reaction that is a major scientific activity to occur.

Within a short time of the project being launched, 18 laboratories from throughout Europe were associated with the project. Soon after beginning the work, the European groups began to take the world lead in such research, and the race towards the first optical computing engine was on.

By early 1986, Professor Desmond Smith and his colleagues at Heriot-Watt University of Scotland, who had led the experimental side of the project, were indeed demonstrating what was originally demanded - the guts of an optical computer. Journalists and broadcasters invited to the press presentation watched a set of glistening green and red laser beams on a laboratory bench switching and processing primitive "information" (on-off signals) without the intervention of any electronic device. It was all done with mirrors.

The groups also discovered a number of unexpected physical phenomena, such as the first observation of switching between two states (bistability) according to radiation pressure (rather than intensity); bistability in non-linear waveguides; and bistability due to induced absorption in several different materials.

The project also showed that there is still much more to do on computer architectures for optical computers - in particular to exploit the potential enormous "parallelism" in optics. In contrast to an electrical current, which has only one variable - the current - a laser beam can also carry information across its breadth: what we know more familiarly as an image, or a picture. Each laser beam in an optical computer could carry an image transverse to its direction of motion, allowing in principle individual processing of each point of the image along one and the same computing path. Such a possibility is unique in computing, and has yet to be exploited - although the potential is seen to be there in even the project's first demonstration computing engine. Whether these possibilities of what is being called "massive parallelism" will be first used in the military sphere, for high-speed image processing and recognition (important to intelligent missiles and the US Strategic Defense Initiative, for example), or industry (in pattern recognition and intelligent robotics, for example) is yet to be seen.

Meanwhile, however, there are still many obstacles to overcome on the way to a full-scale, glittering crystal optical computer: notably the great intensities (and hence heating) that must be used in existing light-sensitive materials.

The "European Joint Optical ristability Project" (EJOB) illustrated beautifully just what could be achieved if European scientists were offered the right international opportunities at the precisely right moment in a scientific discipline - without too many bureaucratic or political delays. And whether or not all-optical, parallel computing truly proves possible in the short or long term, EJOB rightly became a model for the Stimulation programme. (Source: Scientific European, December 1990)

EC leaders look to cut chip tariff

European Commission (EC) policy-makers are considering proposals for dramatically lowering the tariff on imported microchips.

Tariffs on microchips and electronic goods imported into European Community countries are being reviewed as part of EC attempts to form a coherent industrial policy. Industry ministers will be meeting to discuss these proposals over the next few months.

One idea gaining support in the EC is to dramatically cut the tariff on imported chips, currently set at 14 per cent, while maintaining tariffs on more sophisticated products such as printed circuit boards (PCBs), which currently rate 4-7 per cent. But such moves will depend on the current round of GATT world trade talks where US and Japanese delegations are pushing for zero-tariffs on all semiconductor products. EC trade officials are likely to accept lower chip tariffs as a bargaining ploy for maintaining tariffs on high-value electronic goods.

EC sources stress there are no plans to amend the controversial reference price agreement between the EC and 11 leading Japanese memory chip makers. (Source: Electronics Weekly, 20 February 1991)

Chip reference price

European Commission (EC) attempts to regulate the price of DRAM memory chips are still coming under heavy fire more than a year after its price-fixing deal with 11 Japanese chip makers was signed.

Critics say it is currently jacking up the price of DRAMs bought by Europe's equipment makers, making their wares less competitive. They accuse the EC of guaranteeing the profits that Japanese chip makers need to develop the next generation of technology.

In January the STACK consortium of electronic equipment makers protested to the EC about what it sees as the latest folly to result from this policy.

The reference price is determined by a formula agreed as part of the price-fixing deal and a fall in demand increases the cost per chip and hence the reference price because overheads must be spread over smaller production runs, say EC officials.

They point out that the DRAM reference price system is designed to protect European memory chip makers from unfair competition and guarantee European equipment makers access to this vital technology. And it is working, they say.

As evidence they point to figures from market research company Dataquest, which show that Siemens, Europe's only major indigenous DRAM maker, is supplying an increasing proportion of Europe's DRAMs.

In 1990 Siemens took around 25 per cent of the $1.14 billion European DRAM memory chip market, up from around 20 per cent in 1989, according to Dataquest. And last year it sold a quarter of all the 1-Mbit DRAMs shipped in Europe.

Observers point out that Siemens may be benefiting from gaining access to Toshiba's leading-edge 1-Mbit DRAM technology and that it is late in introducing its home-grown 4-Mbit chips.

However, much of Siemens' production, and possibly the majority according to some sources, is for internal consumption among its communications equipment and computer-making operations.

There is also evidence that the EC price-fixing deal may have broken Japan's grip on the DRAM market in Europe. Dataquest figures show that Japanese companies now control only a half of Europe's DRAM market compared with 70 per cent for the world as a whole.

This is partly because of the growth of Siemens' DRAM operation and also because of the inroads being made by Korean DRAM makers, mainly Samsung and Goldstar, who are not constrained by the

reference price and can therefore undercut their Japanese rivals.

Siemens strongly denies any connection with the price-fixing system, and Japanese chip makers deny they are trying to manipulate the market. But there is mounting evidence that several leading companies are switching their factories over to 4-Mbit DRAM production, and that the reference prices set for 1-Mbit and 4-Mbit parts are encouraging their customers to switch.

It is precisely this issue of future chip technology and the threat of Japanese technological supremacy that provides reference price supporters with their strongest argument.

European equipment makers need access to this vital technology, they argue. (Source: Electronics Weekly, 27 February 1991)

Europe seeks home-grown supercomputers

A panel of European scientists have said that the European Community will have to spend up to 1 billion Ecus (£700 million) per year on the development of high-performance supercomputers if its industry is to compete with the US and Japan.

The panel says that "social and scientific progress, industrial competitiveness, and environmental [management] will be governed by the availability of adequate computing power". This power may not be available if Europe depends on foreign companies to supply its supercomputers.

Supercomputer manufacturers are rapidly moving from serial processors, where tasks are carried out one after another very quickly, to parallel processing where arrays of processors share the tasks between them. The numbers of processors in an array could range from tens to several thousands.

The panel was chaired by Carlo Rubbia, head of CERN, the European centre for particle physics, and was set up by DGXIII, the part of the European Commission that manages research in information technology. Rubbia says Europe accounts for 30 per cent of the world market for supercomputers, but builds none itself. The fastest machines are built by the US, but Japanese Government and industry are investing heavily to shorten the US lead.

At the moment, European supercomputer users must adapt the systems to their applications, rather than building the technology from scratch to fit their needs, as is common in the US. Despite "significant research" in supercomputing, concluded the panel, "Europe has no control over the design and production" of the machines.

Software designers and supercomputer users tend to form "closed circles". If Europe cannot enter into equal partnership by contributing to machine, as well as software, design, it will remain a "second rate computer power" said Rubbia.

Rubbia says Europe needs a funding programme similar to that in the US, where the Government's National Science Foundation contributes equally with the computer firm IBM and the telecommunications giant ITT to a billion-dollar annual fund for supercomputer development.

Europe also needs the high-performance telecommunications links between users and central supercomputers. Such links cost 10 times as much in Europe as they do in the US, largely due to the monopoly of the national telephone companies in Europe. (This first appeared in New Scientist, London, 23 February 1991, the weekly review of science and technology)

EC opens up the skies for data communications

The European Commission has paved the way for two-way satellite data communications two weeks after the UK duopoly review moved to deregulate its own satellite market to include two-way broadcast.

These announcements from both camps were long awaited, enabling suppliers, including public telecommunications administrations, to begin investing once and for all in a technology that previously had been used successfully only in the US.

Based on very small aperture terminal (VSAT) technology, two-way satellite communications offer large multinational users enormous efficiency gains and cost savings over the current mix of dial-up and leased lines, private and public circuits.

In addition, European users must deal with each national telecommunications authority separately when building their networks, often paying each separately in different currencies.

The Green Paper and the duopoly review discussion document are welcomed by the six UK specialized satellite service operators. They are British Aerospace, BSB Datavision, EDS, Maxwell Satellite Communications, Satellite Information Services and the Uplink consortia.

Each is currently allowed one-way, point-to-multipoint broadcasting, severely limiting scope for building data networks.

Ironically, the first UK operator to enter the two-way VSAT market is likely to be British Telecom, which under the duopoly regulations has been allowed to offer the services since 1984. (Source: Computer Weekly, 29 November 1990)

France

Hitachi builds plant near Orleans

Hitachi Computer Products (Europe) computer division of the Hitachi group is building a computer component plant for DM 100 million close to Orleans, France. By 1994, 500 jobs will be created. The plant will produce magnetic disks and checking devices. In its first stage, the works should reach a turnover of DM 500 million. On a long-term basis, Orleans will be the focus point of Hitachi European electronic production. (Extracted from Frankfurter Allgemeine Zeitung, 12 November 1990)

Germany

Eight-inch wafer fabrication

The first commercial 8-inch silicon wafer plant in Europe could be in Germany. Hitachi is currently considering whether its experience with 8-inch wafers at its factory in Kofu, Japan makes it worthwhile installing 8-inch production machinery at the new plant it is building in Landshut, Bavaria.

The first 8-inch plant in Europe belongs to IBM, which has been using the larger wafer for over a year. However, it is not producing for the commercial market.

Hitachi has been making 4-Mbit DRAMs on 8-inch wafers in limited quantities at Kofu. The move from 6-inch to 8-inch allows a doubling of chips per wafer from around 225 to 450.

The reason for the apparent lack of progress is that each DRAM generation has been growing its die size to around 30 per cent compared to previous generations. (Source: Electronics Weekly, 30 January 1991)

India

Centre for photonics in Mandideep soon

The National Photonics Council has decided in principle to set up a "Centre for photonics" at Mandideep, where an optel plant and other optoelectronics units are located.

This was conveyed to the Chief Secretary to the Madhya Pradesh Government, Mr. R. P. Kapoor, in a letter from Mr. N. Vittal, Secretary of the Department of Electronics at the Centre and Chairman of the National Photonics Council.

The proposed centre for photonics was to help accelerate the product development and engineering from photonics research and development. The ultimate objective was to develop Mandideep as a "photonics beacon" in the country.

The centre is expected to meet intermediary and immediate requirements of the photonics industry, provide international technology and applications back-up support so that synergetic development of this interdisciplinary project can take place.

The areas in photonics that could be considered could include optical fibres and cables, fibre-optic systems, lasers and various applications, optical memory/date storage, switching and computing image informatics and other related areas.

The Centre for Advanced Technology, Indore, the proposed centre for photonics at Mandideep, and optel plant and other electronic optoelectronic units there, should provide the required synergy and impetus to grow Mandideep into a "photonics beacon" in India, attracting prospective investors with incentive packages. (Source: Financial Express, 29 January 1991)

London underground plots passage to India

London Underground may hand over running of its computer operations to a facilities management company based in India.

CMC's Offshore Facilities Management Service, based in Bombay, allows customers to establish and run a data centre in India, where the cost of IT labour is up to 30 per cent cheaper than in the UK.

Arun Mehra, CMC vice president international, said the running costs of a large computer facility can be cut by up to 50 per cent, by managing them from India.

The service will run alongside CMC's offshore software systems already used in London Underground and P&O Harbours.

CMC's data centre is equipped with satellite links and an in-house development centre that the company uses to manage customers' IT resources.

London Underground, which went to CMC for a train timetable system, is considering the service.

CMC intends to sell the service to large UK organizations which are heavily reliant on IT resources, particularly those already sourcing facilities management services from third parties. (Source: Computer Weekly, 29 November 1990)

Japan

Electronic production expected to rise

Japan's electronic production will gain 6 per cent in value this year, reaching Y24 trillion, according to the Electronic Industries Association of Japan.

During the first half of 1990, the production value in the electronic industry reached Y11.39 trillion, 3.5 per cent more than the value growth for the same period in 1989. Exports gained 12.8 per cent, achieving a value of Y5.27 trillion while imports rose 29.7 per cent to Y999 billion. Production of consumer electronics registered a 2.5 per cent gain to Y2,045 billion, industrial electronic equipment advanced 3.9 per cent to Y5,496.4 billion and there has been a 3.3 per cent growth in the production of electronic components and devices, reaching Y3,851 billion.

The prediction of a 6 per cent growth rate is slightly higher than EIAJ's initial forecast of a 5.7 per cent rise in production value for 1990. Slightly higher growth has been demonstrated in the consumer electronics and electronic component sectors, while slightly slower growth is seen in the industrial electronic sector. (Source: AEU, No. 6, 1990)

Foreign semiconductors command all-time high

Foreign semiconductors rose 0.3 per cent in the second quarter of 1990 to capture 13.3 per cent of the Japanese market, an all-time high, according to World Semiconductor Trade Statistics. However, the Ministry of International Trade and Industry (MITI) says the figure is 17.5 per cent.

The United States is pressing Japan to raise the share of foreign semiconductors to 20 per cent by July 1991. At present, the value of sales continues to expand and the market share of foreign-made semiconductors is growing. (Source: AEU, No. 6, 1990)

Falling off the learning curve

Japanese manufacturers of memory chips are poised on the brink of a price war. The price of a 1-megabit dynamic random-access memory (DRAM) chip - the current workhorse of the Japanese semiconductor industry - has tumbled 40 per cent since September, to around $4.50. Falling prices for 1-megabit chips erode prices for the coming generation of 4-megabit DRAMs. At $17 a chip, the price of 4-megabit DRAMs is already probably too low for semiconductor manufacturers to recoup the cost of the new production lines needed to make them.

The main market for Japan's semiconductor makers - the American computer industry - has been sinking deeper into slump since August 1990. Now chip sales in Japan are beginning to collapse as well. As a result, big DRAM producers like Toshiba, Hitachi, Mitsubishi Electric and NEC have 4-megabit chips piling up in their warehouses, just as they

start opening additional factories. Over the past year Japanese semiconductor firms have spent a colossal Y850 billion ($6.7 billion) building more production lines for 4-megabit chips.

Between them, Japanese semiconductor firms will produce 120 million of the new 4-megabit chips for the year ending in March. According to World Semiconductor Trade Statistics, customers are expected to buy 100 million of these chips at most. All told, demand for memory chips fell more than 16 per cent in 1990.

DRAM makers are now talking about launching the next-generation DRAM, the 16-megabit chip, as soon as March 1991. Previously it was not expected to reach the market until 1992. Over the past couple of months all the leading Japanese DRAM suppliers - including Hitachi, Toshiba, NEC, Mitsubishi Electric and Fujitsu - have started shipping "engineering samples" of 16-megabit chips. So have Texas Instruments in America and Siemens in Europe. Korea's Samsung will start doing so in a few weeks.

For the first time in its brief history, the semiconductor industry is going to be making, and trying to sell, three generations of memory chips in large volumes at the same time.

A 4-megabit chip ought to sell for five times as much as a 1-megabit device, the price premium justified by the smaller space and lower power needed to provide four times the amount of memory. Dataquest, a market-research company based in California, is now forecasting that a 4-megabit chip will cost barely three times more than a 1-megabit chip by next year. More painful still, 16-megabit chips will hit the market at only nine times the price of existing 4-megabit DRAMs. New generations of memory chips normally arrive at 30-40 times the price of the industry's mainstream product.

Hitachi, Fujitsu, Toshiba, Mitsubishi Electric and Matsushita hurried out experimental 64-megabit models for "Silicon Olympics" (the annual conference in San Francisco where chip designers show off their latest inventions). For semiconductor makers not already committed to building 16-megabit production lines, the case for going straight for the 64-megabit device looks increasingly attractive. Fujitsu recently showed that 64-megabit DRAMs could be made using fairly conventional lithographic equipment, based on ultra-violet light rather than exotic lasers or X-rays. In January Fujitsu announced that it will spend Y100 billion ($770 million) next year getting its plant in Miyazaki Prefecture ready for making 64-megabit chips.

Meanwhile, Japanese and American officials have begun negotiating a renewal of their semiconductor-trade pact. (Extracted from The Economist, 23 February 1991)

Intelligent manufacturing systems

The Ministry for International Trade and Industry (MITI) said it would delay and dilute proposals for a $US 1 billion Japanese-led multinational collaborative research program into intelligent manufacturing systems, or computer-integrated factory automation. The agreement addressed US and European Community fears of a one-way flow of technology from the West into Japan. The three trade partners agreed instead to start a one-year feasibility study to cover funding, choice of research areas and intellectual property rights. (Source: IEEE Spectrum, January 1991)

Korea

Koreans' DRAM thrust ignored ASICs and logic

Although Korean semiconductor makers spent millions gearing up for DRAMs, particularly the 4-Mb variety, the industry's one-sided thrust left it "feeble" in areas like microprocessors and ASICs, a recent report claims. Vast sums also went into product lines for 256K DRAMs, 1-M DRAMs and 1-M SRAMs. Only 60 per cent of the demand for these devices is met locally, the report contends.

While Korean memories have reached a global competitive level, technology for designing ASICs and logic devices lags "far behind". This, says Inforama Technology News Service, Los Angeles, is due largely to a lack of cell libraries and CAD systems. Despite its "structural imbalance", the Korean IC industry charted impressive sales growth in 1989. The giant Samsung, through its electronics group, garnered sales of $1.28 billion last year. Inforama says Samsung ranked seventh in MOS, placing it near Hitachi, NEC and Toshiba. (Reprinted with permission from Semiconductor International Magazine, December 1990. Copyright 1990 by Cahners Publishing Co., Des Plaines, IL. USA)

Poland

Application of specific integrated circuits

ELPOL is a joint stock company operating in the field of advanced electronic technologies. The company's ATMOS Division is responsible for the design and production of Application Specific Integrated Cirucits (ASICs) tailored to the individual needs of customers.

At ELPOL ATMOS it is possible to have an ASIC designed within six weeks and produced within one week owing to ASICfab - a complete fabrication unit for gate-array circuits developed by the Swiss company LASARRAY.

ELPOL ATMOS produces HCMOS gate-array circuits with maximum frequencies over 25 MHz.

Two kinds of base wafers are available: with logical capacity of 1,200 equivalent gates and with logical capacity of 2,400 equivalent gates.

Orders in any form suggested by a customer can be accepted, i.e. a logical scheme in any convention (e.g. a diskette with a schematic capture from ORCAD or TTL, CMOS 4000 and other schematic standards) together with dynamic and electric specifications of input and output signals, or only a functional description of a circuit with electrical and time requirements in case when a customer wishes that a synthesis of the circuit be done by ATMOS.

The average time of a design is approximately six weeks with a schematic delivered by the customer and up to three months with an order of the "black box" type.

The prototype delivery (i.e. a 10 integrated circuits series) takes place within one week after the customer has confirmed that the design documentation meets his requirements. After a prototype check-up the customer can order a production lot.

The production lot size is from 20 to 50,000 integrated circuits. The time of delivery is one month after the order has been placed.

The standard product is a ceramic package with a number of pines ranging from 24 to 100 (working temperature range from -40°C to +85°C).

ELPOL ATMOS can also supply, as an option, tested chips without packages to a customer having his own micro-assembly facilities.

There is a possibility of obtaining modified versions of the design readily and at a low cost.

ELPOL ATMOS can design LSI/VLSI semi-custom integrated circuits intended for a complete, full-mask technological process at renown world manufacturers. The effect of a sufficiently large series production is a meaningful reduction of costs and an enhanced reliability of the devices.

The delivery time of design and prototype series for LSI/VLSI circuits is shorter than 12 months whereupon the delivery of a complete series may follow within three months. Both the time and cost depend upon the complexity of the circuit and the size of ordered lots of integrated circuits. (Source: Polish Technical Review, No. 6, 1990)

United Kingdom

UK firms freefall into recession

British business is rushing into a recession on a par with that of 1981.

In the face of tough trading conditions at home and decreasing competitiveness abroad industry is living off of its stocks, reducing investment and shedding jobs in a bid to cut costs.

One of the hardest hit sectors is electronics. A staggering 87 per cent of firms in the industrial electronics sector said they were working below capacity with 82 per cent reporting below average order books. Half were less optimistic about their export prospects than four months ago.

Investment spending was also particularly badly hit in this sector. Three quarters of firms said they would be reducing cash spent on training, research and development and product innovation in the coming year.

The consumer electronics sector was slighly more buoyant with as nearly as many firms increasing their investment as reducing it.

The Confederation of British Industry (CBI) quarterly trends survey published at the end of January 1991 paints a picture of falling output and industrial contraction. Manufacturing output in the first quarter of this year is expected to fall by 3 per cent with 60 per cent of manufacturing firms working below capacity. Prices for finished goods are rising at the slowest rate for four years. Financing costs are also a problem despite the 1 per cent reduction in interest rates.

This cocktail of negative factors has pushed firms into cost-cutting. Investment has been one of the first casualties with firms citing lack of funds and inadequate returns as a reason for not investing.

While the economists debate whether we are in a recession or a depression it looks likely that it will be the shopfloor worker who pays the cost. In the manufacturing sector alone 225,000 people are expected to lose their jobs over the coming year. CBI figures also show that manufacturing employment has already fallen by 214,000 since the spring of 1989. Firms are expected to try and keep wage increases as low as possible to help reduce costs.

On the industrial front it is hard to see how manufacturing industry can pull out of this nosedive. If investment has already been cut electronics firms will be in a worse position to compete if or when the orders start to flow. (Source: Electronics Weekly, 6 February 1991)

Grant cuts threaten UK optoelectronic research

World renowned optoelectronic research at three British universities is under threat following cuts in government research grants.

The Science and Engineering Research Council (SERC), which oversees the allocation of university research funding is understood to be considering cutting back on the number of its long-term grants designed to create centres of excellence in optoelectronic research.

Four of the SERC's four-year rolling grants are due to be reviewed this academic year covering optoelectronic projects at three universities, Cambridge, University College, London and Heriot-Watt in Edinburgh with two grants.

A spokesman for SERC said a 50 per cent cut in all grants was likely and the opto-electronic grants "would be reviewed in the light of present circumstances".

Earlier this month SERC announced the closure of nuclear physics and astronomy programmes.

UCL's work on high optical switching elements based on multiple quantum well devices mirrors similar work going on at AT&T's Bell Laboratories into symmetric self electro-optic effect devices (S-SEEDs), claimed to be the optical equivalent of the transistor.

Heriot-Watt, which is another research establishment with an international reputation, received a promise of more SERC money for its optical computer research last month. But it is unlikely to escape future cuts. (Source: Electronics Weekly, 20 February 1991)

Scotland chosen for semiconductor site

A semiconductor plant owned by Digital Equipment Corp. (DEC) of Massachusetts in the United States has opened in South Queensferry, Scotland.

The new plant will produce CMOS micro-processors. Located on 25,000 square feet of land, the 200,000-square-foot factory houses an up-to-date clean room. Construction of this plant gives DEC the ability to perform all the main computer manufacturing processes, from silicon wafer production to design and production of finished products, in Britain.

Europe is an important market for DEC; during 1989, 40 per cent of the company's $12.9 billion in sales revenues came from this market. Like many other companies, the company chose to build a factory in Europe to prepare for the unification of European markets in 1992. (Source: AEU, No. 6, 1990)

Deregulation of telecommunication industry

The Government has said it would pursue wide-ranging deregulation of the nation's telecommunications industry. The move is likely to influence policy in other countries and will include allowing largely unrestricted access to the local, long-distance and international service markets, and erasing legal restraints separating the telephone and cable TV industries. (Source: IEEE Spectrum, January 1991)

Automated plant left to the experts

One of the first commercial joint ventures to result from the UK Government's Alvey programme of collaborative research into advanced information technology has been launched. British Gas, SD-Scicon and Salford University Business Enterprises have set up a company, Cogsys, to market industrial automation software based on artificial intelligence technology. The company's first product, also called Cogsys, is an expert system designed to monitor the operations of complex industrial plants and provide warnings of possible hazards and advice on areas where efficiency could be improved. Cogsys is the result of several years' research and development. The system runs on DEC Microvax computers. It can analyse several thousand external variables (for example, readings from sensors on factory equipment) simultaneously and almost instantaneously. Using artificial intelligence Cogsys can make deductions about the state of the plant which would be beyond the grasp of human operators. In the extreme case of a computerized plant suddenly going out of control, Cogsys could tell the operators what to do to prevent a serious disaster. (Source: Financial Times, 14 September 1990)

Screens speak in tongues

The UK is a multilingual society. In the schools of London alone, 172 different languages are spoken, but the computers that process words and numbers in business and education normally speak only one: English. The computing power and programming techniques that have brought desk-top publishing within the reach of every office can just as easily be harnessed to depict languages with non-roman alphabets. Now a small English company, Gate Steven, has produced a multilingual computer. It developed an automatic way of transferring Signum fonts into Calumus format, and now offers complete desk-top publishing systems in Gujarati, Bengali, Tamil, Russian, Devanagiri and Punjabi. Others are on the way, and any language, except ideographic ones such as Chinese and Japanese, can be developed. Calumus can also hold translations of menus and instructions, operating entirely in the non-roman language. (Source: The Independent, 26 November 1990)

United States of America

US firms ready to join ESPRIT micro project

Several leading US electronics companies are hoping to benefit from a massive research project planned by the European Community to develop the next generation of microprocessors.

They may be willing to trade know-how for financial help in developing this expensive technology by joining the proposed Open Microsystems Initiative (OMI).

OMI has not yet been approved by the European Commission (EC) but it may form part of the EC-funded ESPRIT high-technology research programme.

Foreign firms are already talking with European companies such as Siemens, Philips and SGS-Thomson Microelectronics' Inmos.

Participation in OMI by US companies is not ruled out, according to a senior executive in the EC's information technology directorate, but any decision would be based on whether or not the US company has a significant research and development presence in Europe and whether the Community would gain some benefit. (Source: Electronics Weekly, 6 February 1991)

US report opts for 1-Gbit chip

The US National Advisory Committee on Semiconductors (NACS) is expected to issue a report recommending the development of a 1-Gbit DRAM.

The report will outline a plan to help steer US semiconductor and computer companies in coordinating efforts to develop a 1-Gbit DRAM by the end of this decade.

US Government pressure, however, forced NACS to drop a plan for setting up the Electronics Capital Corp. which would have been a government-funded investment bank providing US electronics companies with low-interest loans for capital-intensive projects.

NACS' proposal could spell trouble for the government-funded Sematech consortium. Sematech has been concentrating on supporting US semiconductor production equipment manufacturers who have been hard hit with competition from Japan. The NACS report is expected to be published at the end of February.

A 1-Gbit DRAM would enable US semiconductor manufacturers to reclaim a lost lead in DRAM technology now dominated by the Japanese. (Source: Electronics Weekly, 13 February 1991)

Data-communications networks

America's electronic networks are abuzz with debate over ... the future of America's electronic networks. Since the 1970s, the Government has been building subsidized data-communications networks so that researchers could more easily send electronic mail and share computer resources and the results of experiments. The effort has been a spectacular success, with traffic growing by 30-40 per cent a month. One reason it is growing so fast is that it is often provided free.

In late January, Senator Albert Gore began his second attempt to pass a bill to promote high-performance computing and communications. The bill proposes to spend $1 billion on computer research, a large part of which would support a $400 million plan to build a "National Research and Education Network" - a high-speed computer network, many times faster than the fastest parts of today's networks. Meanwhile, the National Science Foundation (NSF), a big channel for federal networking subsidies, is rethinking its own support for networks.

The biggest network, called the INTERNET, is itself made up of over 2,000 smaller networks. Some

of them are networks built to connect a state or region; others grew nationwide to serve the needs of specific groups, like computer scientists and research universities. Each group brings its own special concerns to the debate, from access to supercomputers to computers for kindergarten children. The arguments grow hottest where these networks converge - in this case, the so-called NSFNET backbone.

The NSFNET is the fastest part of the INTERNET. It uses that speed to provide both access to supercomputer and high-volume, long-distance traffic. NSF subcontracts the running of NSFNET to Merit, a company based in Michigan. Merit, in turn has looked to IBM and MCI for equipment and expertise. Though NSFNET costs about $10 million a year to run, a $3 million-a-year subsidy from the NSF plus further money from IBM and MCI enable its services to be offered free to most of the academics and researchers who use them. In the autumn of 1992, however, NSF's contract with Merit expires.

Merit, MCI and IBM have pooled their expertise into a consortium called Advanced Network Services, which will bid to take over from NSFNET after 1992. That raises the worry that a privatized version of NSFNET might inherit an over-privileged competitive position. Not that anybody agrees how to define privilege in this new industry. (Extracted from The Economist, 16 February 1991)

VIII. AUTOMATION

Robot for use in hostile environments

Turtle, a three-wheeled, three-eyed robot capable of improving robotic control in dangerous conditions, has been developed at Oxford University, led by Professor M. Bradey. Turtle will be an important basis for "intelligent" factories in the future. The device is able to recognize and move objects quickly and with accuracy via a vision system, and can construct an internal map of its environment. Turtle has two infrared sensors and 12 sonar sensors, the latter providing quick measurements of depth, and the former giving angular measurements. The robot may be used for oil exploration in deep seas, baggage handling at airports, transferring containers around ports, and in hospitals. (Extracted from The Daily Telegraph, 19 November 1990)

Robot senses the movement of the seas

An autonomous underwater robot bristling with sensors is helping Australian researchers to find out what goes on in turbulent water. Using a new sonar system, it can analyse the water over scales ranging from millimetres to tens of metres to answer questions such as how the momentum of a tropical cyclone is transferred from the wind to the water, how sewage effluent dumped into the ocean mixes with the surrounding water, or how organic wastes disperse and feed unwanted algae.

The device, called the microstructure flux profiler (MFP), was developed by scientists at the Centre for Water Research at the University of Western Australia in Perth. It contains a suite of instruments, some new and some off the shelf, which collect detailed information on turbulent processes in lakes, estuaries, and coastal seas.

According to the team leader, Jorg Imberger, the MFP is the first instrument that can provide direct measurements of turbulent processes over a wide size range. This is critical because the transfer of energy in water is caused by a combination of advection - the water's large-scale horizontal motion - and mixing which may be on a minute scale. Data must be collectd on both scales for a full picture of turbulent activity.

The MFP successfully completed its first scientific investigation late last year. It resembles a small tree-like cactus called a cholla, weighs roughly 100 kilograms, and is 2 metres from top to toe. In the water it operates independently. Researchers preprogramme its up and down movements and what measurements it should take at each depth and then lift it into the water with a crane.

The vertical position of the MFP in the water column is controlled by a ballast system similar to that of a conventional submarine. A computer directs a piston to take in water to descend, or eject water to ascend. Until the retrieval mechanism is fully developed, however, the Australians are taking no chances and are using fishing line to guarantee that their £800,000 instrument returns safely. There is also a fail-safe mechanism which will cause the MFP to rise if the electronics fail. (This first appeared in New Scientist, London, 26 January 1991, the weekly review of science and technology)

Robot simulation for PCs

A British company has developed what it says may be the first robot-simulation program for a personal computer. Workspace from Robot Simulations runs on any IBM PC or compatible having EGA or VGA graphics and a hard-disk drive. Targeted at engineers who use robots, design robot workcells, or compare the efficiency of different robots in performing tasks, the program simulates and displays robot workcells in real time. It includes a full kinematic modeler, three-dimensional graphics, and facilities for off-line programming.

The program automatically calculates cycle times and checks for collisions between moving objects. Several robots can be simulated in one workcell, which can be replayed for a realistic visualization of complex workcells.

Workspace will also model tooling, automatic feeds and conveyers, automatic programmable vehicles, linear tracks, and turntables.

Computer-aided design capability includes true 3-D wireframe with hidden-line removal, blocks and cylinders, extruded objects, curved-line and surface approximation, and object-attachment hierarchy. Pull-down menus and an extensive help facility make the program easy to use. Further information is available from J. Owens, Robot Simulations, High Bridge House, High Bridge, Newcastle-on-Tyne, England NE1 1EW. (Source: IEEE Spectrum, January 1991)

Mechanical arm guides the surgeon's hand

Surgeons in the US have pioneered the use of a mechanical arm laden with sensors to track the positions of their surgical instruments while they operate on patients' brains. The sensor arm allows them to watch their manoeuvres live in three dimensions on a video monitor.

James Zinreich and colleagues at Johns Hopkins Medical Institution in Baltimore have used the sensor arm successfully in five operations to remove

deepseated brain tumours, and they are now adapting the system for sinus surgery. According to Zinreich, the mechanical sensor arm enables the surgeon to see the exact relationship of the sinuses to critical nearby areas such as the eye socket and the brain.

The arm, known as a "surgical localiser" has six joints with a sensor on each joint. The surgeon mounts it on the side of the operating table and fixes to the end a surgical instrument or a biopsy needle for taking samples of tissue. The arm's sensors are connected to an image-processing computer.

The computer screen displays an image of the patient's skull taken before the operation using computerized tomography, a technique which combines X-ray pictures to obtain a three-dimensional image of the interior of the body. The position of the surgical instrument in the real skull is determined by the sensors in the mechanical arm. This position is then superimposed onto the screen image to guide the instrument during the operation.

To align the instrument with the computer image of the skull, specific anatomical reference points on the patient's face, such as the corner of the mouth, are aligned to corresponding points on the three-dimensional image.

Zinreich believes that the sensor signficantly improves the precision with which surgeons can excise brain tumours, and enables them to operate through smaller flaps in the skull. After tumour removal, it is possible to check the boundaries of the site and see the extent of removal. (This first appeared in "New Scientist", London, 16 February 1991, the weekly review of science and technology)

Robots get sensitive

A sensor that is as sensitive as human skin, to be used by robots, is being developed in Japan as part of its space programme.

Engineers in the cybernetics division of Japan's Mechanical Engineering Laboratory are working on a mechanical copy of the human hand, so that robots in space can do tasks such as maintenance as well as humans.

As well as being sensitive, the tactile sensor will need a high resolution of detection points. (Source: Electronics Weekly, 27 February 1991)

IX. STANDARDIZATION AND LEGISLATION

Standardization

Audio and video firms want own EMC rules

The professional audio and video industry is calling for special electro-magnetic compatibility (EMC) standards for its products.

More than 50 representatives of trade associations and companies are setting up a feasibility study for special standards. They believe the generic standards, which apply to all products without specific standards, are unsuitable for studio, broadcast and concert equipment.

Strict EMC regulations are due to become law across the European Community by 1 January 1992. They will limit interference between the signals in electronic circuits.

The representatives want at least a four-year period: standards take at least two years to prepare, and they need two years to redesign and test their products.

But the transition period will not be set until the autumn - months after the EMC regulations are fixed on 1 July.

The German electronics industry is lobbying for a minimum two-year delay in imposing the new EMC regulations in Europe. (Source: Electronics Weekly, 13 February 1991)

Software standard due in Europe

The fruits of an initiative to converge the national software development methodologies of Britain and France should emerge in the next version of the Merise methodology early this year, says Hubert Tardieu, director of corporate technology for Sema Group PLC. Sema Group has been blending the UK's methodology, Structured Systems Analysis and Design Method (SSADM), with Merise, the de facto standard for software development in France. The Anglo-French software company has "basically kept the three-layer model of Merise, but on top of that we have refined the data flow model to ... use data-flow diagrams at an early stage of development", Tardieu says. The company's efforts are part of a European Commission-backed project to develop a pan-European standard for software development, called Euromethod. (Reprinted with permission of DATAMATION[r] magazine[c], copyright by Technical Publishing Company. A Dunn and Bradstreet company - all rights reserved - 15 January 1991)

The SNMP standard

SNMP, developed in the same university and technical arena as the Transmission Control Protocol/Internet Protocol, is the closest thing to a standard heterogeneous networking protocol that exists today. Like TCP/IP, SNMP standards are governed by working groups drawn from the user and vendor community. That provides some measure of control over the SNMP standards, although they are not formal standards in the sense of being approved by the Institute of Electrical and Electronics Engineers Inc. (IEEE) or the International Standards Organization (ISO).

Four documents, known as Requests for Comment, make up the SNMP standards. RFC 1155 describes the forms by which network management information can be represented; RFC 1156 and 1158 define a minimum set of about 100 variables, test points and controls that must be supported (known as the Management Information Base, or MIB); and RFC 1157 defines the legal interactions that can occur between network devices under SNMP.

A vendor must meet all of these qualifications to be able to call their products SNMP-compliant. In addition, vendors can define extensions to the MIB, which allows the vendor to support features particular to their devices yet remain compatible with other vendors' SNMP devices. (Reprinted with permission of DATAMATION[r] magazine[c], copyright by Technical Publishing Company. A Dunn and Bradstreet company - all rights reserved - February 1991)

Information technology makes strides

A new International Standard has recently been produced to facilitate the interconnection of information processing systems.

It relates to other International Standards in the set defined by the Basic Reference Model for Open Systems Interconnection (ISO 7498). The reference model subdivides the area of standardization for interconnection into a series of layers of specification, each of manageable size.

The introduction to ISO/IEC 9804 says that the goal of OSI is to allow, with a minimum of technical agreement outside the interconnection standards, the interconnection of information processing systems: from different manufacturers; under different managements; of different levels of complexity; and of different technologies.

This International Standard recognizes that application-processes may wish to communicate with each other for a wide variety of reasons. However, any communication requires certain services independent of the reasons for communication. The application-service-element defined in the International Standard provides such services.

The standard defines the facilities of the application-service-element for commitment, concurrency and recovery (CCR) and provides services for a single association.

The standard is referenced by a specification to apply CCR to its operation. CCR services may be used with presentation services (ISO 8822) or with other Application Layer services. The introduction says that the use of CCR services allows a referencing specification to define its activity as an atomic action. An atomic action may use many associations, possibly with different protocols on each association.

The scope of ISO/IEC 9804, Information technology - Open Systems Interconnection - Service definition for the Commitment, Concurrency and Recovery service element, covers definition of services that are used on a single association to coordinate two application-entity invocations involved in an atomic action. The standard establishes the general principles for the coordinated use of the CCR services when more than two application-entity invocations are involved in a single atomic action, or when recovery is required after failure. This International Standard is only applicable to a distributed application whose specification references this International Standard.

In another development concerning information technology, a new technical report, ISO/IEC TR 9294, Information technology - Guidelines for the management of software documentation, has been published. The report states that the preparation and maintenance of documentation constitutes a necessary and continuous effort from the inception of the software through to its disposal. Documentation begins with the initiation of a software project and continues with the design, development, testing, installation, use modification and enhancement of the software. The documentation process can only be regarded as having ended when the software comes to the end of its life. Documentation is essential for the success of any software development project, and the production of documentation requires the commitment of time, effort and money. Documentation can ensure the quality and success of the software product.

The scope of the technical report is to offer guidance on the management of software documentation to those managers responsible for the production of software or software-based products. The guidance is intended to assist managers in ensuring that effective documentation is produced in their organization.

The report addresses the policies, standards, procedures, resources and plans which managers must concern themselves with in order to manage software documentation effectively.

The principles of software documentation management, the standard states, are the same whatever the size of the project. The standard provides guidance from the point of view of documentation management.

It refers to ISO 2382-1, Data processing - Vocabulary - Part 1: Fundamental terms, ISO 6592, Information processing - Guidelines for the documentation of computer-based application systems, and ISO 9127, Information processing systems - User documentation and covers information for consumer software packages.

The report mentions the role of managers to commit their organization to documentation effort and give support to that effort in the policies, standards, procedures, resource allocations and plans established. Effective performance of the managerial role can be seen to rest on three elements: management commitment to documentation; management support of staff commitment to documentation; evidence of managerial commitment and support.

The functions of software documentation can be regarded as having six major functions: communication to management; task-to-task communication; quality assurance; instruction and reference; software support; historical reference.

Another section of the report deals with establishing documentation policies that are prepared and supported by senior management and provide guidance to decision-makers at all lower levels. Policy, the report says, provides broad direction, but not detailed prescriptions on what to do or how to do it. Because of the vital role documentation plays at all stages of the software cycle, a formal statement of policy should be prepared.

The report recommends establishing documentation standards and guidelines adopted for the software lifecycle model; documentation types and interrelationships; document content; document quality; document formats; and document identification. These standards and guidelines determine how documentation tasks are carried out and provide criteria for judging the completeness, usefulness and appropriateness of the software documentation produced within the organization.

The report also advises on establishing documentation procedures to define sequences for documentation such as planning, preparation, configuration control, review, approval, production, storage, backup, distribution and updating and disposal.

The resources to be allocated to documentation are: people, facilities, funding. The people must be responsible for developing the software, the subject-matter - to provide information about the application - documentation.

The report states that it is important that staff are fully trained in documentation techniques, for example, the need for software designers and programmers, subject-matter specialists, and publication specialists. It is important to give consideration to the provision of adequate and appropriate facilities for documentation tasks, and software tools need to be available for the preparation and control of documentation. The

report adds that it is important that documentation costs are identified as unique budget items since they often form a very significant part of the cost of software development.

Finally, the report states that documentation planning may be part of an overall project plan or a stand-alone document. The documentation plan should be distributed to all development team members and to anyone else affected by it. It should clearly delineate responsibilities of all those involved in the documentation effort.

An annex to the report gives a checklist for software documentation management, including a policy checklist, standards checklist, procedure checklist and project planning checklist. (Source: ISO Bulletin, February 1991)

International standards in process

An International Standard is the result of an agreement between the member bodies of ISO. A first important step towards an International Standard takes the form of a committee draft (CD) - this is circulated for study within an ISO technical committee. When consensus has been reached within the technical committee, the document is sent to the Central Secretariat for processing as a Draft International Standard (DIS). The DIS is submitted to all ISO member bodies for voting; publication as an International Standard requires approval by at least 75 per cent of the member bodies casting a vote.

CD registered
(period from 23 November to 31 December 1990)

These documents are currently under consideration in the appropriate ISO technical committee. They have been registered at the Central Secretariat.

JTC 1	**Information technology**
CD 9804	Information technology - Open Systems Interconnection - Service definition for the commitment, concurrency and recovery service element Amendment 2: Session mapping changes
CD 9805	Information technology - Open Systems Interconnections - Protocol specification for the commitment, concurrency and service element Amendment 2: Session mapping changes
CD 11159	Information technology - Office equipment - Minimum information to be included in specification sheets - Copying machines
CD 11160	Information technology - Office equipment - Minimum information to be included in specification sheets - Printing machines
CD 11172	Information technology - Coding of moving pictures and associated audio for digital storage media up to about 1.5 M-bit/s
CD 11179	Information technology - Representation of data elements - Basic attributes of data element types

DIS circulated
(period from 23 November to 31 December 1990)

These documents have obtained substantial support within the appropriate ISO technical committee. They have been submitted to the ISO member bodies for voting by the date shown.

		Vote terminate
JTC 1	**Information technology**	
ISO 3309: 1984/DAN2	Information processing systems - Data communication - High-level data link control procedures - Frame structure Amendment 2: Extended transparency options for start/stop transmission	1991-07-0
ISO 7809: 1984/DAM 6	Information processing systems - Data communication - High-level data link control procedures - Consoli dation of classes of procedures Amendment 6: Extended transparency options for start/stop transmission	1991-07-0
ISO/IEC 7816-3: 1989/ DAM 1	Identification cards - Integrated circuit(s) cards with contacts - Part 3: Electronic signals and transmission protocols Amendment 1	1991-06-1
ISO/8632-2: 1987/DAM 3	Information processing systems - Computer graphics - Metafile for the storage and transfer of picture description information - Part 2: Character encoding Amendment 3	1991-07-0
ISO 8632-3: 1987/DAM 3	Information processing systems - Computer graphics - Metafile for the storage and transfer of picture description information - Part 3: Binary encoding Amendment 3	1991-07-0
ISO 8632-4: 1987/DAM 3	Information processing systems - Computer graphics - Metafile for the storage and transfer of picture description information - Part 4: Clear text encoding Amendment 3	1991-07-0
ISO/IEC 8802-5/ DAM 4	Information processing systems - Local area networks - Part 5: Token ring access method and physical layer specifications Amendment 4: MAC sublayer bridging - Source routing	1991-07-0
ISO/IEC 8802-5/ DAM 5	Information processing systems - Local area networks - Part 5: Token ring access method and physical layer specifications Amendment 5: Conformance testing - PICS proforma	1991-07-(
ISO/IEC 8882	Information technology - Telecommunications and information exchange between systems - X.25-DTE conformance testing - Part 2: Data link layer test suite	1991-07-0
ISO 8885: 1987/DAM 4	Information processing systems - Data communication - High-level data link control procedures - General purpose XID frame information field content and format Amendment 4: Extended transparency options for start/stop transmission	1991-07-(

		Vote terminates
ISO/IEC 10536-1	Identification cards - Contactless integrated circuit(s) cards - Part 1: Physical characteristics	1991-07-03
ISO/IEC 10589	Information processing systems - Intermediate system to intermediate system routing protocol	1991-07-03
ISO/IEC 10607-2/ DAD 1	Information technology - International Standardized Profiles AFTnn - File Transfer, Access and Management - Part 2: Definition of Document Types, Constraint Sets and Syntaxes Addendum 1: Additional definitions	1991-03-27
ISO/IEC 10607-4	Information technology - International Standardized Profiles AFTnn - File Transfer, Access and Management - Part 4: AFT12 - Positional File Transfer Service (Flat)	1991-03-27
ISO/IEC 10607-5	Information technology - International Standardized Profiles AFTnn - File Transfer, Access and Management - Part 5: AFT22 - Positional File Access Service (Flat)	1991-03-27
ISO/IEC 10607-6	Information technology - International Standardized Profiles AFTnn - File Transfer, Access and Management - Part 6: AFT3 - File Management Service	1991-03-27

Standards published

New International Standards published between 23 November and 31 December 1990

		Price Group
JTC 1	**Information technology**	
ISO/IEC 8571-5: 1990	Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 5: Protocol Implementation Conformance Statement Proforma	S
ISO/IEC 8649: 1990	Amendment 1 to ISO 8649: 1988	C
ISO/IEC 8650: 1990	Amendment 1 to ISO 8650: 1988	E
ISO/IEC 8802-3: 1990	Information processing systems - Local area networks - Part 3: Carrier sense multiple access with collision detection (CMSA/CD) access method and physical layer specifications	XA
ISO/IEC 8802-4: 1990	Information processing systems - Local area networks - Part 4: - Token-passing bus access method and physical layer specifications	XB
ISO 8824: 1990	Information technology - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1)	U
ISO 8825: 1990	Information technology - Open Systems Interconnection - Specification of basic Encoding Rules for Abstract Syntax Notation One (ASN.1)	J
ISO 8859-3: 1988	Information processing - 8-bit single-byte coded graphic character sets - Part 3: Latin alphabet No. 3*	C
ISO 8859-4: 1988	Information processing - 8-bit single-byte coded graphic character sets - Part 4: Latin alphabet No. 4*	C
ISO/IEC 8859-5: 1988	Information processing - 8-bit single-byte coded graphic character sets - Part 4: Latin/Cyrillic alphabet*	C
ISO 8879: 1986	Information processing - Text and office systems - Standard Generalized Markup Language (SGML)*	XC
ISO 8880-1: 1990	Information technology - Telecommunications and information exchange between systems - Protocol combinations to provide and support the OSI Network Service - Part 1: General principles	B
ISO 8880-2: 1990	Information technology - Telecommunications and information exchange between systems - Protocol combinations to provide and support the OSI Network Service - Part 2: Provision and support of the connection-mode Network Service	C
ISO 8880-3: 1990	Information technology - Telecommunications and information exchange between systems - Protocol combinations to provide and support the OSI Network Service - Part 3: Provision and support of the connectionless-mode Network Service	C
ISO/IEC 9171-1: 1990	Information technology - 130 mm optical disk cartridge, write-once, for information interchange - Part 1: Unrecorded optical disk cartridge	R
ISO/IEC 9171-2: 1990	Information technology - 130 mm optical disk cartridge, write-once, for information interchange - Part 2: Recording format	U
ISO/IEC TR 9294: 1990	Information technology - Guidelines for the management of software documentation*	D

* Published in French only.

		Price Group
ISO 9318-2: 1990	Information technology - Intelligent Peripheral Interface - Part 2: Device specific command set for magnetic disk drives	V
ISO 9318-3: 1990	Information technology - Intelligent Peripheral Interface - Part 3: Device generic command set for magnetic and optical disk drives	XF
ISO/IEC 9318-4: 1990	Information technology - Intelligent Peripheral Interface - Part 4: Directory - Device generic command set for magnetic tape drives	W
ISO/IEC 9594-1: 1990	Information technology - Open Systems Interconnection - The Directory -Part 1: Overview of concepts, models and services	F
ISO/IEC 9594-2: 1990	Information technology - Open Systems Interconnection - The Directory - Part 2: Models	L
ISO/IEC 9594-3: 1990	Information technology - Open Systems Interconnection - The Directory - Part 3: Abstract service definition	M
ISO/IEC 9594-4: 1990	Information technology - Open Systems Interconnection - The Part 4: Procedures for distributed operations	T
ISO/IEC 9594-5: 1990	Information technology - Open Systems Interconnection - The Part 5: Protocol specifications	T
ISO/IEC 9594-6: 1990	Information technology - Open Systems Interconnection - The Directory -Part 6: Selected attribute types	J
ISO/IEC 9594-7: 1990	Information technology - Open Systems Interconnection - The Directory - Part 7: Selected object classes	F
ISO/IEC 9594-8: 1990	Information technology - Open Systems Interconnection - The Directory -Part 8: Authentication framework	M
ISO/IEC 9899: 1990	Programming languages - C	XE
ISO/IEC 9945-1: 1990	Information technology - Portable Operating System Interface (POSIX) - Part 1: System Application Program Interface (API) [C language]	XB
ISO/IEC 10021-1: 1990	Information technology - Text Communication - Message-Oriented Text Interchange Systems (MOTIS) - Part 1: System and Service Overview	V
ISO/IEC 10021-2: 1990	Information technology - Text Communication - Message-Oriented Text Interchange Systems (MOTIS) - Part 2: Overall Architecture	X
ISO/IEC 10021-3: 1990	Information technology - Text Communication - Message-Oriented Text Interchange Systems (MOTIS) - Part 3: Abstract Service Definitions Conventions	P
ISO/IEC 10021-4: 1990	Information technology - Text Communication - Message-Oriented Text Interchange Systems (MOTIS) - Part 4: Message Transfer System: Abstract Service Definition and Procedures	XC
ISO/IEC 10021-5: 1990	Information technology - Text Communication - Message-Oriented Text Interchange Systems (MOTIS) - Part 5: Message Store: Abstract Service Definition	XA
ISO/IEC 10021-6: 1990	Information technology - Text Communication - Message-Oriented Text Interchange Systems (MOTIS) - Part 6: Protocol Specifications	T
ISO/IEC 10021-7: 1990	Information technology - Text Communication - Message-Oriented Text Interchange Systems (MOTIS) - Part 7: Interpersonal Messaging System	XA
ISO/IEC 10030: 1990	Information technology - Telecommunications and information exchange between systems - End System Routeing Information Exchange Protocol for use in conjunction with ISO 8878	H
ISO/IEC 10607-1: 1990	Information technology - International Standardized Profiles AFTnn - FileTransfer, Access and Management - Part 1: Specification of ACSE, Presentation and Session Protocols for use by FTAM	H
ISO/IEC 10607-2: 1990	Information technology - International Standardized Profiles AFTnn - File Transfer, Access and Management - Part 2: Definition of document types, constraint sets and syntaxes	E
ISO/IEC 10607-3: 1990	Information technology - International Standardized Profiles AFTnn - File Transfer, Access and Management - Part 3: AFT 11 - Simple File Transfer Service (unstructured)	Q

(Source: ISO Bulletin, February 1991)

Legislation

Compromise sees end to EC copyright row

The EC will finally issue its directive to harmonize European software copyright legislation in the next few months.

A meeting of European ministers in December 1990 unanimously accepted a compromise draft directive. This will now go to the European parliament in Strasbourg for ratification.

As expected, the final version rejects attempts by IBM and the United Kingdom's Department of Trade

and Industry to outlaw reverse engineering for the purposes of developing competing products.

The compromise represents a victory for the European Committee for Interoperable Software, which opposed attempts to tighten legislation on reverse engineering. (Source: Computing, 10 January 1991)

AT&T enforces patents on windows technology

AT&T has dropped a bombshell on the PC software industry with claims of patents on technology for displaying windows on a computer screen.

AT&T said it has contacted several software companies to inform them of its patent claims and that they will have to pay licensing fees to continue selling their products. The patent claims could raise the price of all software using graphical user interfaces that display programs in windows.

AT&T will not say to which companies it sent warnings last month. Companies and products likely to be affected include Apple's Macintosh, Microsoft's Windows 3.0 and IBM's Presentation Manager.

AT&T said its Bell Laboratories received the patent in 1985 but did not say why it waited so long before enforcing it.

The company said it has no immediate plans to try to stop the use of such software, but insists those companies pay licensing fees.

AT&T said its patent covers technology which allows more than one software program to be displayed at the same time. The patent also covers the technology which allows more than one of those programs to be run when its display window is covered by another.

AT&T may find it difficult to enforce its patent and may also face challenges in court. Xerox, for example, filed a $150 million lawsuit against Apple Computer in 1990, claiming that the Macintosh violated its copyrights on its graphical user interface which also uses windows, but the case failed. (Source: Computing, 7 March 1991)

Ashton-Tate fights on in US copyright conflict

PC database giant Ashton-Tate, which lost a bitter copyright infringement battle against Fox Software, has asked a US court to reconsider its ruling.

Ashton-Tate lost its copyright protection after the court ruled the company had repeatedly failed to disclose that dBase versions II and III were derived from a public domain program developed at the Jet Propulsion Laboratory. The judge said Ashton-Tate had done this "knowingly and with an intent to deceive".

But Ashton-Tate claims the judge erred in his ruling, and that its failure to name the JPL work was not intentional.

If the judge does not reverse his decision Ashton-Tate will seek clarification of the order. The company would also launch an appeal.

Ashton-Tate is the dominant player in the $250 million database market, holding 28 per cent of the market in terms of unit sales, but its fortunes plummeted after the release of a badly flawed product, dBase IV 1.0, two years ago. (Source: Computing, 10 January 1991)

X. RECENT PUBLICATIONS

UNESCO publishes database directory

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has published the first edition of a Directory of UNESCO databases. The main objective behind this new publication is to describe the computerized information sources available to UNESCO Member States, as well as how to gain access to them.

The directory contains details of all bibliographical, referral and factual databases produced at UNESCO headquarters and Field Office Information Services, as well as those which are jointly managed by UNESCO and certain international non-governmental organizations. The first edition contains 55 databases.

Only databases that are operational and accessible to Member States appear in the directory. Databases in the planning or development stages, or currently dormant, have been listed in a file created with the CDS/ISIS (Mini-Micro Version) software. They will be added to updates of the directory as they become operational. Internal UNESCO databases, such as those concerned with budget, project management and mailing, have been omitted.

The databases are listed in alphabetical order by the region in which they are produced. There are three indexes: name/acronym; site of production and subject.

Published in a joint English/French version, the directory is also available on diskette (3 1/2" x 5 1/4") for PC-compatible microcomputers using MS/DOS.

Computerization in Developing Countries by Per Lind

In the early 1980s optimism was high about the benefits of computerization in developing countries. Reality, however, would prove otherwise. While computers are a fact of life in most of the developed world, in developing countries they remain underutilized.

In Computerization in Developing Countries, Per Lind discusses the problems of applying Western computer programmes to third world countries. He argues that these difficulties are not just technological but also cultural. Supported by numerous examples, the book illustrates that as computer programs are a product of a developed culture they are not suitable for the specific problems of third world reality. Likewise, there can be no one system to solve the problems of all developing countries. The book is written in a straightforward style and is divided into three logical parts. Part 1 provides the background to, and details of, the problems of advanced technology in developing countries. Part 2 proves this point, with a detailed case study of an Egyptian firm. However, it is Part 3 which allows Lind to expound his most original and interesting theories and which makes this book so unique. Computerization in Developing Countries was published by Routledge, London, UK, in September 1990; 160 pp; Hb: 0-415-03818-9: £30.00.

International records management glossary

The International Records Management Council, an organization based in Victoria Park, Australia, has produced an International records management glossary in a number of languages. Published in 1989, the glossary (around 90 pages per volume)

forms part of the Council's efforts to promote worldwide understanding of records and information management.

Language versions currently available are: French-English/English-French, German-English/English-German, Japanese-English/English-Japanese, and Spanish-English/English-Spanish. A Portuguese-English/English-Portuguese version is being printed. For further details, contact the International Records Management Council, PO Box 397, Victoria Park, WA 6100, Australia.

International frequency list now available on CD-ROM

The International Telecommunication Union (ITU) is now publishing its International Frequency List (IFL) on CD-ROM. The machine-readable edition is an improved version of the microfiche IFL.

Dating back to 1928, when ITU published, for the first time, a list of all frequencies used in Member States, the IFL contains information relating to radio frequency assignments recorded in the Master International Frequency Register (MIFR) and maintained by the International Frequency Registration Board (IFRB). The latest edition shows an increase in the number of frequencies listed in the first edition from 1,700 to approximately 1,100,000.

Users of the CD-ROM version will be provided twice a year with a local copy of the IFL. CD-Answer information retrieval software is supplied on an accompanying diskette. Data can be accessed by frequency, country code of station location, notifying administration, class of station, station name, geographical co-ordinates or geographical area and region code. Users can also process any extracted subset of the database in local application systems.

The IFL on CD-ROM is the first in a series of optical disc publications being prepared by ITU. It is planned that all these publications will use the International Organization for Standardization (ISO) standard optical disc format and the same (CD-Answer) software. Subscribers can order a disc covering the next two editions of the IFL, corresponding to microfiche editions 12.5 and 12.6. A subsequent subscription will cover all six issues of the 13th edition, due for publication from September 1991 to March 1994. Existing subscriptions can be converted to this new form of publication for the remaining two editions without supplementary charges. The microfiche version will continue to be available. The cost for one edition to telecommunications administrations is SFR 363, to others SFR 442. Two editions are available for SFR 604 (for telecommunications administrations), while to others the price is SFR 736.

For further details, contact the Sales Service, ITU General Secretariat, Place des Nations, CH-1211 Geneva 20, Switzerland.

Public domain software listed

A free catalogue to over 500 shareware disks is available from the New England Software Library. The 1991 Reference Guide to Public Domain and User Supported Software includes disks for electrical, mechanical, and civil engineering, mathematics, and statistics, as well as utilities for programmers and engineers.

The more popular disks contain programs for computer-aided design, expert systems, electrical filter design, Fourier transforms, equation processors, and graph plotting. There is a distribution charge of $3-5 per disk. Contact: New England Software Library, RR1, Box 260, Starksboro, Vt. 05487; 802-453-3556.