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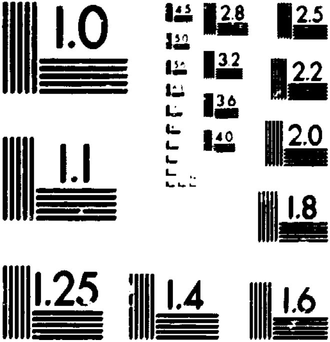

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

MICROELECTRONICS MONITOR

No. 9 14036

January-March 1984

Dear Reader,

Twelve professional organizations and a number of experts from developed and developing countries accepted UNIDO's invitation to a discussion meeting on information technology for development which took place in March at UNIDO's headquarters in Vienna. The participants agreed on joint action in areas of primary interest and benefit to the developing countries such as health care in rural communities; education at the primary, secondary and vocational levels; communication infrastructure for dispersed groups; and dissemination of information on relevant technologies. Also presented to the meeting was a new concept of "Technologies for Humanity" which had been discussed earlier in UNIDO by a small group of selected scientists and development specialists. This concept which is also supported by a recent General Assembly resolution on human rights appealing that scientific and technological progress be used for the benefit of mankind, envisages selected technologies, where research, development and dissemination would be carried out in the public domain, to be directed to meet essential needs of mankind in food, health, housing, energy and education. A promising candidate for this is microelectronics which finds applications in all of the above areas.

The "Technologies for Humanity" concept needs the support of leading scientists and technologists who would subscribe to this new effort of international co-operation. In this connection, UNIDO is working on an International Roster of Scientists and Technologists comprising top-level experts in selected technologies who would be willing to assist developing countries through brief field visits, by offering training opportunities or by communicating expert advice.

The secretariat is working on further developing modalities to set the concept into motion and to present it to the forthcoming Fourth General Conference of UNIDO, UNIDO IV, which will take place in Vienna from 2 to 18 August 1984. Documentation for this Conference, whose agenda also includes an item on technological advances, is already available in all official languages. Our next issue will report on final preparations for the Conference.

The expert group meeting on development of microelectronics in the ECWA region which ECWA organized jointly with UNIDO took place in Kuwait in March. You will find a short resumé in these pages.

G. S. Gouri
Director
Division for Industrial Studies

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RECENT NEWS AND EVENTS

UNIDO meeting on information technology for development

UNIDO organized a meeting on 21-23 March 1984 at its headquarters in Vienna with representatives from professional societies active in the information technology area with an interest in the use of this technology to promote development in the developing countries; policy institutes actively engaged in studying the social, economic and technological issues relating to information technology applied to development in developing countries; voluntary groups dedicated to implementing action-oriented programmes at the field-level in developing countries utilizing information technology to promote development; development and funding agencies interested in information technology as an important tool for development; and individual experts from developing countries interested in the use of information technology for development. The major organizations which participated are described below:

British Computer Society/Specialist Group for Developing Countries, 71 Gabriel's Road, London NW2 4DU, UK.

The BCS's Specialist Group for Developing Countries, which was formed in 1976, seeks to stimulate interest in developing countries' problems in applying computers effectively for the benefit of their societies and economies. It is building an information base on computer applications in water resource management, agriculture and forestry management, transportation planning, financial planning and information management. Forthcoming activities include a three-day workshop in London on Information and Science and Technology for Developing Countries (June 1984) and a two-day conference and workshop on the Use of Microcomputers in Transport Planning and Traffic Management in Developing Countries (July 1984) as well as a "Computing for Agriculture" Symposium to be held from 28 June to 3 July 1984. The Group publishes a quarterly Newsletter which can be obtained free of charge from Ms. J. Allen, Liaison Executive, British Computer Society, 13 Mansfield Street, London W1M OBP.

Centre Mondial Informatique et Ressource Humaine, 22 avenue Matignon, 75008 Paris, France.

The Centre was founded in 1980 as a centre of research and experimentation in the use of computers in human development, particularly as a means of helping the disadvantaged towards a modern economic and social life. Research programmes focus on technological developments necessary to support new applications e.g. micro-computer uses in teaching, training, medical care and agriculture. Experimental programmes convert these new technologies into practice. Public "outreach" programmes seek to involve the largest possible public in the culture of the computer.

Commonwealth Secretariat/Commonwealth Science Council (CSC), Marlborough House, Pall Mall, London SW1 5HX, UK.

The CSC is an intergovernmental organization open to member countries of the Commonwealth and consists of scientists and civil servants from those countries. The Commonwealth Secretariat CSC has formed a working group on the management of technological change that will study the existing and potential impact of information technology on the economies of Commonwealth countries and identify policies to facilitate adjustment and applications of software. The Commonwealth Secretariat's Industrial Development Unit has been recently involved in a study of computer-aided engineering for India's automobile industry, a study on manufacturing consumer electronics in Malaysia, and a consultancy on establishing an electronics industry in the Caribbean area. A workshop in Kuala Lumpur on industrial microprocessor applications is planned for 1984.

Council on International and Public Affairs, 777 United Nations Plaza, New York, New York 10017.

This is a private, non-profit organization which also provides secretariat services to the Intermediate Technology Development Group of North America, and works in close association with United Nations organizations. It is also working in close collaboration with the International Centre for Law in Development, a group of third world lawyers and social scientists concerned with the impact of technology on socio-economic change in developing countries. The Council has been involved in several studies and surveys related to the application of microelectronics in developing countries such as a study on government policy and industrial development in electronics in India, which was published by RPI, Lund (see below), or a study prepared for UNITAR on "Frontier Technologies, Developing Countries and the United Nations system after Vienna". It has also undertaken several studies for the United Nations Centre on Transnational Corporations on microelectronics and related advanced technologies. A dossier on some 15 North American semiconductor companies was prepared in 1980.

IFIP/ICID, 3 rue du Marché, CH-1204 Geneva, Switzerland.

The Committee on Informatics for Development (ICID) is a special committee set up by the International Federation for Information Processing (IFIP). It is concerned with the methodology of applying appropriate informatics to development, fostering interdisciplinary activities, identifying and studying technical problems of developing countries, providing a technical forum for specialists from countries that do not have professional societies and helping set up such societies. It works with other organizations to provide financial assistance for scientists and specialists from developing countries to enable them to attend scientific meetings, it prepares publications on the use of informatics in developing countries and it organizes exchanges of scientists and specialists between developed and developing countries.

Research Policy Institute (RPI), University of Lund, Box 2017, S-220 02 Lund, Sweden.

RPI is an interdisciplinary research unit directly under the governing board of the University of Lund. Its main research interest is in science, technology and society. Current research projects relating to the application of microelectronic technologies in developing countries include studies on the technological trends in microelectronics and biotechnology and their challenges to the third world; a comparative study of the Indian and Chinese experience with the scientific and technological information systems for development; a study on information services in India and Tanzania; on technical change in the capital goods industries of India and the Republic of Korea; a comparative study of the telecommunications sector in India and Brazil.

UK Council for Computing Development (UKCCD), Charles Clore House, 17 Russell Square, London WC1B 5DR, England.

UKCCD was established in 1981 to direct and co-ordinate support for developing countries in the development of their own computing capacity. It advises developing countries in the creation of computing strategy, and organizes training and education programmes appropriate to their needs. It is a professional, independent, non-profit-making organization funded by its members. It will organize a training course on the establishment and management of information technology training centres aimed at directors or senior executives in existing or proposed public or private computer training institutes in developing countries and is scheduled to be held in London from 4 June to 20 July 1984. It publishes a Bulletin which is distributed free of charge and is issued three times a year.

Volunteers in Technical Assistance (VITA), 1815 N. Lynn Street, Arlington, Va. 22209 Va., USA.

This is a voluntary organization which was created in 1959 by a group of scientists, engineers and business people with a sense of social responsibility. It has since grown into a major private, non-profit organization that provides technical assistance to people and groups in more than 100 developing countries. VITA seeks practical ways to bring the benefits of modern technologies to communities at village level. It operates a documentation centre, soon to be accessible via computer to provide technical information in response to queries. VITA emphasizes the use of microcomputers in communication applications such as information retrieval from remote data bases, for example via networks such as Tymnet and Telenet, and using electronic mail services and computer conferencing. The latest venture in this connection is the design, launch and operation of a low-earth orbit satellite for third world communications. (See also Microelectronics Monitor No. 8, page 95.) VITA publishes a quarterly newsletter "VITA News", which is distributed free of charge.

The conclusions and recommendations as approved by the meeting emphasized the need for exploring the possibilities of consultations, co-operation and joint action in the areas listed below:

- Information technology for integrated health care in rural communities;
- Information technology for primary, secondary and vocational education;

- Low-cost communication infrastructure for dispersed groups through the use of low-altitude earth satellites;

- Dissemination of information on technologies of relevance to developing countries;

- Preparation of a dynamic directory of groups and organizations working in the area of information technology for development;

- Compilation of an inventory/library of software packages applicable specifically to meet developing country needs.

The meeting also appreciated the efforts being undertaken by UNIDO to promote the concept of "Technologies for Humanity" and agreed that information technology was one of the central technologies falling into this category and its use should be promoted for the benefit of mankind.

It also endorsed the usefulness of creating an international roster of scientists and technologists working at the leading edge of information technology thus mobilizing the interests and assistance of such persons in the planning, formulation and implementation of projects for developing countries such as the ones listed above.

The proposal relating to the establishment of a silicon foundry to service the developing countries' needs and the designs originating from these countries was extensively discussed and it was agreed that the setting up of such a facility on a regional basis would be very useful, particularly in building up design competence.

A proposal for publication of an International Journal of Information Technology for Development was endorsed.

The meeting recommended that UNIDO take further initiatives to pursue and promote the various actions recommended and to draw other interested organizations as well as United Nations agencies to participate in an open-ended Consultative Group on Information Technology (GOGIT) which would meet periodically to discuss ongoing programmes and exchange exoerience.

ECWA/UNIDO expert group meeting on development of microelectronics in the ECWA region, 4-7 March 1984, Kuwait

The agenda included a review of the state-of-the-art of microelectronics; software engineering and application in the region; Arabic language in data processing; special applications; communications/robotics; development of microprocessor-based applications in the region; micro-electronics-related industries in the region; strategies for development of sound microelectronics-related industries and infrastructure in the region; and the role of regional and international organizations in promoting microelectronics in the region.

The participants included experts from France, India, Japan, Mexico, Netherlands, Poland, Sweden, USA and Venezuela. Regional organizations taking part in the meeting included the Arab Industrial Development Organization (AIDO); Organization of Arab Petroleum Exporting Countries (OAPEC); Arab Fund for Economic and Social Development (AFESD); Arab Industrial Investment Company (AIIC) and Arab Standards and Metrology Organization (ASMO). Countries in the region represented at the meeting were as follows: Egypt, Iraq, Jordan, Morocco, Qatar, Saudi Arabia, Tunisia and United Arab Emirates. (Also represented were UNESCO and ITU.)

The meeting, which was the first of its kind for Arab countries, revealed that several countries in the region were already engaged in activities related to microelectronics and that awareness of the benefits to the region of the technology existed. However, there was a general lack of information on the activities being carried out in the various countries of the region. It was therefore recommended that a newsletter on microelectronics be published periodically. As regards the development of software, there was a need for training, particularly on-the-job training and the meeting recommended that seminars and workshops focusing on high-level software development in the region be convened; and training programmes be organized in institutions within the region and outside.

Another topic of high importance for the region was arabization and standardization; in this connection it was recommended that a task force consisting of computer specialists, linguists and standardization specialists be established to survey and assess the existing efforts of arabization: identify the specific dimensions of arabization, draw up a phased programme of activities and identify the necessary funding for the proposed activities.

Copies of documentation prepared for the meeting may be obtained from ECWA headquarters at Emeriyah, Airport Road, Baghdad, Iraq.

Other recommendations were for a survey of the present and prospective demand in specific application areas, particularly related to the public services such as power generation, telecommunciations, transport, education and public health. It was also recommended that a market survey for the manufacture of integrated circuits in the region be carried out. The setting up of a silicon foundry * on a regional basis was considered which would service a number of design centres and it was recommended that a feasibility study be made. ECWA jointly with UNIDO were asked to promote a regional network of Arab countries in microelectronics with ECWA acting as the focal point.

United Nations Committee for the Co-ordination of Information Systems (ACCIS)

The ACCIS secretariat, which took over some of the work programme of the now defunct IOB (Inter-Organization Board for Information Systems) was set up in March 1983. The Secretariat is located at the Palais des Nations, 1211 Geneva 10, Switzerland. It publishes a bi-monthly Newsletter which is distributed free of charge upon request to the editor. Ongoing activities include the preparation of a new edition of DUNIS (Directory of United Nations systems) as well as a meeting of three technical panels to discuss (a) computer-based communications, (b) compilation of a register of development activities, and (c) access to United Nations databases.

American Society for Information Science (ASIS) meets to look at the implications of microprocessors on information handling

The thirteenth mid-year meeting of ASIS will be convened at the University of Indiana, USA on 20-23 May 1984 and will look at the impact of the microprocessor revolution on information handling. Topics to be discussed include: artificial intelligence, micros in education, computer graphics, and database construction. (ASIS, 1010 Sixteenth St. N.W. Washington D.C. 20036.)

IDPAD project on microelectronics

The Institute of Social Studies, The Hague, is carrying out a programme of co-operation between India and the Netherlands, the Indo-Dutch Programme on Alternatives in Development (IDPAD), which is jointly supported by the Dutch Ministry of Foreign Affairs and the Indian Ministries of Finance and Education. As part of this, a project is being implemented on the impact of microelectronics on the worldwide restructuring of the electronics industry and its implications for the third world industrial policies in this field. The project activities will include research based on company and expert interviews in the United States, Japan and Western Europe as well as a few select locations in South-East Asia. The purpose is to contribute to a better understanding of the overall perspectives for electronic manufacturing in developing countries with a fairly developed industrial base. (Institute of Social Studies, P.O. Box 90733, 2509 LS The Hague, Netherlands.)

Center of the International Co-operation for Computerization (CICC)

CICC was founded in June 1983 under the co-operation of Japanese governmental agencies and enterprises related to computerization. The purpose of CICC is to implement co-operation activities from promoting computerization in Asia, the Middle East, Africa and Latin America as a part of the economic co-operation of the Government of Japan. Activities include group training courses in computer system technology (software); computer seminars as well as technical guidance and consultation. A liaison office for co-operation with Asian countries has been opened in Singapore.

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*/ There is no general agreement as to the definition of the term silicon foundry, but basically it refers to a facility which accepts designs to be fabricated according to a standard set of specifications. Other names known in this connection are "customer-tooling", "customer-owned tooling" or "design-rule businesses".

Symposium on the application of computers in manufacturing operations

This symposium is jointly organized by the Asian Productivity Organization (APO) and the Hong Kong Productivity Centre and is scheduled to take place on 28 May to 1 June 1984 in Hong Kong. It will review the latest position in computer technology and its application in manufacturing processes including NC machines, flexible manufacturing systems, robots etc. and to study the pros and cons of their introduction and usage. (APO, 4-14 Akasaka 8-chome, Minato-ku, Tokyo 107, Japan.)

15th Korea Electronics Show

The electronics show will be held on 10-14 October 1984 in Seoul and is organized by the Electronic Industries Association of Korea (EIAK). It will be sponsored by the Ministry of Commerce and Industry, Republic of Korea. In addition to the exhibit which will cover the whole range of electronics, inclusive of consumer products, components and parts, and industrial electronics from home and abroad, there will be a series of high technology seminars during the show. (EIAK, Room 1101 World Trade Centre, Korea Building, 10-1, 2-ka Hoehyun-dong, Chung-ku, Seoul, Korea.)

SEMICON/Europe 1984

This year's SEMICON meeting took place on 13-15 March 1984 in Zurich, Switzerland. Over 300 booths exhibited products from leading suppliers of semiconductor materials and equipment. The show is sponsored by the Semiconductor Equipment and Materials Insitute (SEMI) USA. Technical sessions covered subjects of patterning, materials and thermal processing and interconnections and features some 30 speakers from top industry management as well as research. (See also report in "Market Trends and Company News", page 21.)

NEW DEVELOPMENTS

Gallium arsenide devices make headlines

GaAs has been much in the news lately as an alternative to silicon as a semiconductor substrate as it can achieve speeds of at least twice that of silicon circuits at the present stage of the silicon technology. In the United States and Europe, the bulk of the research and development in GaAs is carried out by the major defence companies while Japan, with Government support, is focusing its research on the development of very fast supercomputers. In a recent report "Gigabit memories and Logic" by Mackintosh International, the market share of high-speed circuits is shown to be rather low at about 1.5 per cent but with an expected value of $1.3 billion by 1992.

While Toshiba claims to have succeeded in developing a large gallium arsenide gate array featuring 1,050 gates which could form the heart of a very fast computer, this will not be available for commercial use until the latter part of 1985. An American company, Harris, has meanwhile introduced a smaller 170 gate array which will be commercially available in the course of 1984.

In Canada, research and development for a processing technique for GaAs transistors is being carried out by high-technology firm Optotek Ltd. on a $1 million contract from the Department of Communications; the company will also identify applications of the technology for Canadian users. Canada is one of the few world sources for the relatively rare element gallium, so it may have an advantage in producing the transistors.

Plessey, UK will invest £50 million in a new subsidiary for development of GaAs technology with £22 million devoted to research.

Ford Motor Co. USA plans to produce GaAs chips in 1985 both for internal needs and for outside sale.

RIFA AB., a member of Ericsson (Sweden) telecommunciations and electronics group has developed GaAs transistors three to five times more rapid than conventional silicon transistors. So far, work on the GaAs transistor has been focused on products such as photo and laser diodes for fibre optics and low-noise metal semiconductor field effect transistors. (Compiled for the Microelectronics Monitor from Computing; Computer Weekly; Canada Weekly; Electronics; and the Swedish International Press Bureau.)

Superconducting chips

Where is chip technology based on super-conducting Josephson junctions going? Not very far in the west. IBM was the first to bet that Josephson junctions and the so-called squid devices linking them together might form the guts of tomorrow's superfast computers. Last year, it called the bet off. Many other western high-tech companies followed its lead. Rightly? The Japanese think not.

Two basic factors govern the speed at which a computer can work. One is how fast its switches can flip on and off. The other is how far apart they are, and so how long it takes an electrical signal to get from one to another. Being relatively power-hungry, ordinary circuit elements give off considerable heat. Crowd too many too close together and you risk melting your computer. Switches based on Josephson junctions are not only fast, they use so little power that a computer using several million would produce only a few watts of heat. The reason is that they exploit a curious phenomenon. When cooled to temperatures close to absolute zero - minus 273° C - certain materials (though, oddly enough, not copper) become superconductors: an electric current flows through them without meeting any resistance. But therein lies one rub. Keeping circuits at temperatures close to absolute zero is no fun. Moreover, the junctions are fragile and difficult to tool into working devices. IBM decided that the business of trying to overcome these drawbacks was taking too long, and that improvements in conventional silicon and gallium arsenide chips were eroding the potential payoffs.

The Japanese evidently think that their wizardry at adapting technology and tooling it into production lines can handle problems that daunt the Americans. They have been making a series of incremental but significant advances which, some experts think, are about to put them in the world lead as regards useful devices. Predictably, at the forefront of Japan's effort are researchers at its domestic telephone company, NTT. They have been working on a special type of Josephson switch aimed at solving a problem bedevilling fibre-optic communciations. The problem lies in the devices coupling the fibres to electronic gear, translating light signals into electrical ones (and vice-versa). The conventional devices do not work well at the wavelengths that best suit the fibres and using them involves cumbersome extra signal boosting down the fibres. NTT's new switch operates on wavelengths of light ranging from one to 10 microns, which are much better matched to the needs of the fibres. A team at Miti's own Electrotechnical Laboratory reckons it has already gone beyond the last IBM achievement on Josephson-junction memory chips. It has built a 3,000 cell memory based on a niobium-nitride alloy; IBM used lead. The researchers claim that their chip is more reliable (less prone to unpredictable upset currents) and so should make the technology more appealing. Hitachi, which has stuck to lead-based Josephson devices, is working on gate-array chips. These are general-purpose chips lacking only a final metal film of interconnections to customise them for a particular application. Hitachi's array has only 24 gates - small beer by the standards of conventional silicon chips (which can manage 10,000). But the company's scientists think the technology could be pushed to 100 gates even now, and perhaps to 3,000 in two years' time. For critical parts of supercomputers, like central processing units and outlying memories which have to handle partially-formed results of calculations in quick succession, such chips could be cost-effective.

Japanese universities are also hard at work on Josephson junctions. Tokyo University is investigating how very small junctions behave, and whether tricks from conventional silicon technology can be applied to them. Hokkaido University is tackling the biggest irritant of all: the massive refrigeration needed to achieve superconductivity. Its scientists have developed a squid device that works at temperatures 17° C above absolute zero which, they reckon, is a big improvement on the usual 4-5° C above. That is of interest outside the field of computers. The Hokkaido squid promises to be especially suitable for applications involving the measurement of tiny changes in magnetic fields: e.g., for instruments used to detect changes in the beat of a patient's heart or those used by geologists to map potential sources of minerals. Perhaps the most grandiose of Japan's current projects in superconductivity is its plan to store electricity in the form of a constantly circulating current of some 400,000 amps in the coils of a magnet. The Japanese calculate they can shave 90 per cent off the refrigeration costs that would otherwise be entailed by entombing the thing 300 feet underground in a man-made network of caves. (The Economist, 7 April 1984)

IBM reveals high-speed 64K

IBM researchers at the T. J. Watson Research Centre have developed an experimental 64,000 bit computer memory chip that works with unprecedented speed - between 16 and 20 billionths of a second (nanoseconds). The new chip was fabricated and tested at IBM's general technology division facility in Burlington, USA. Most 64,000 bit chips - 64K-bit as they are commonly called - range in access speed from 70 to 300 nanoseconds (NS). Access speed is the time it takes to 'read' a bit of information from a chip. The IBM chip achieves its performance through new design concepts and innovative circuitry, including:

- A self-timed 'sensing' circuit that permits much faster chip operation than is possible with conventional circuits;

- An improved 'address buffer', which allows the chip to 'read' information quickly, the address buffer detects the location of data to be retrieved from the chip;

- Simpler timing and a reduced number of 'clocks' required to keep the chip operating properly.

The new, experimental IBM chip is 4.5 x 7.2 millimetres (roughly 1/4 inch on the longest side). The average minimum feature size is 1.7 micrometres (millionths of a metre), and the channel length is 1.2 micrometres. Memory cells are 292 square micrometres.

The technology used is N-channel metal oxide semiconductor (NMOS), field effect transistor (FET) single-level metal single-level polycide. Access times tested range from 16-20 NS at 5 volts, cycle time is 30 NS. Physically, the chip consists of four 16K blocks, or quadrants, of memory cells with associated row and column decoders in adjacent blocks. During access, each 16K block has one row decoder and four column decoders activated providing an 'X-Y' grid to access bit locations. (Electronics Report, Ireland, April 1984)

Researchers transfer 5 billion bits/second on data communication network

The transfer of five billion bits per second on a data communication local area network has been achieved with the aid of fibre-optic methods by researchers at the Chalmers Institute of Technology in Gothenburg. Within a few years, it is stated, there will be a large need for transfer speeds in this range in order to facilitate the exchange of information between "electronic" offices, automated industries, global data banks and satellites, for instance.

Five billion bits per second is thought to be one hundred times quicker than the fastest transfer time hitherto attained. This would make it possible to transfer the entire text of the Encyclopaedia Britannica between two word processors in different locations in less than one-third of a second, or connect 50,000 computers via a common cable without any loss of transfer speed. (Science and Technology, SIP, March 1984)

Japan has 8-inch wafer

A Japanese company is claiming to be the first to produce a silicon wafer eight inches in diameter, which could significantly cut chip manufacturing costs. Shin-Etsu Handotai has developed the technology to grow the eight-inch diameter silicon crystals, and is already planning to introduce it into two new production plants which it is building in Japan and the United States.

The large diameter means that more chips can be produced for every wafer, thus increasing productivity. The most common size wafers in use at the moment are mostly four or five inches across, although six-inch wafers are becoming increasingly popular. A general rule is that for every one-inch increase in diameter, the production yield is doubled.

However, Tony Pyne, a senior consultant at industry observer Mackintosh International, said: "The problem with eight-inch wafers is that the production equipment necessary to use them, does not yet exist. It is, in general, a chicken and egg situation. It will be some time before the industry can use these large wafer sizes". A spokeswoman at silicon wafer manufacturer Monsanto said: "Production equipment manufacturers usually like to stay ahead of silicon wafer manufacturers, but there is still little work being done to develop equipment that will cope with eight-inch wafers". The method of production is based upon the Czochoralski process which gradually draws an ingot from molten silicon, to produce a single crystal weighing 100 kilograms, during each operation. (Computing, 9 February 1984)

Mitsubishi reveals plastic chip design

Mitsubishi Electric of Japan has announced the development of a completely plastic 256 Kbit dynamic random access memory (dram) chip. Mitsubishi claims the chip will reduce production costs to a quarter the level for conventional ceramic devices. The chip will also be slightly smaller and use a 1.7 micron circuit channel width.

A Mitsubishi spokesman said manufacture of the new chip was made possible by using a new 'bit-line shielding scheme' which improves circuit design and patterns. The spokesman stressed that mass production of the new chip is still 'way ahead' in the future, but confirmed that sample shipments will start this year.

An industry source said that Mitsubishi's success stems from its development of a 30mm size chip, 5-10 mm smaller than those of other makers, and equivalent to a lead of several months over its competitors. (Computing, 1 March 1984)

Japan breaks the megabit barrier

Four Japanese companies last week announced that they have developed a tiny silicon chip capable of storing one million pieces of information - four times the capacity of chips now available. The new megabit chip is thinner than a human hair, with the surface area of a drawing pin. The announcement was made at the International Solid State Circuits Conference in San Francisco. The companies involved are Toshiba of Kawasaki, Hitachi Central Research Laboratory of Tokyo, NEC of Kanagawa, and NTT Atsugi Electrical Communication Laboratory of Tokyo. The specifications are impressive. The chip can store 128,000 letters and numbers or about 75 pages of an average-sized book printed in English. It is about 40 micrometres thick and contains more than 800 metres of conductive material. But according to the chairman of the conference, Peter Verhofstadt from the Fairchild Company in California, less than 1 per cent of the mass - an area about the size of a pinhead - actually carries out chip functions. It has to be larger than this to avoid breaking. Verhofstadt said that other companies, including several from America, will announce similar one megabit chips later this year. He predicted that four megabit devices - silicon wafers that could carry half a million letters and numbers - were a few years down the road. The largest capacity chip now available is 256K.

In another breakthrough in semiconductor manufacture, a company in Silicon Valley announced last week that it had developed a $820,000 robot to scan silicon wafers automatically for impurities. The machine, built by KLA Instruments of Santa Clara, has a built-in microscope and takes less than half a second to look at any spot on a silicon wafer. It can detect defects as small as one thousandth the size of a human hair. KLA claims that it will be much more accurate and faster than human inspectors - it could therefore put a lot of people out of work. The machine's memory is programmed with a "snap-shot" of what the perfect semiconductor wafer should look like. (This first appeared in New Scientist, 1 March 1984, the weekly review of science and technology.)

Japan to build 100 megabit chip

Japan is planning a five-year, £17 million project to develop a 100 megabit chip - over 100 times bigger than devices produced today. The project has been proposed by a group of academic experts and industrialists, led by University of Tokyo professor, Shoji Tanaka.

Japan's Ministry of International Trade and Industry (Miti) has welcomed the proposal saying that the basic outline of the project is now being discussed. But according to industry sources Miti's role is likely to be limited to co-ordination. Japan's fiscal crisis is severely curtailing its ability to fund projects like this - a reversal of past practice. There has so far been no indication as to which companies might participate.

Tanaka's group has forecast the total very large scale integration market, including the 100 megabit chip, could be worth approximately £3.5 billion by the year 2000, requiring production volume in the region of 10 billion chips annually. The study group has determined that the key technology which must be developed to manufacture the 100 megabit chip is an advanced ultra-fine etching technique, capable of achieving a line width of 25 microns. Both Mitsubishi Electric and Toshiba have recently announced etching techniques which might be capable of such accuracy. These very component-dense devices are expected to be complementary metal oxide semi-conductors, in order to keep power needs to a minimum. (Computing, 8 March 1984)

One billion transistors on a chip?

The annual rate of increase in numbers of transistors on a chip is slowing as theoretical limits are neared, but there may be a billion by the year 2000. It could happen by the turn of the century, according to James Meindl, director of Stanford University's Centre for Integrated Systems. Meindl's forecast came in the opening session of the three-day International Electron Devices Meeeting, held in Washington, DC, early in

December 1983. For comparison, the most densely packed integrated cricuits at present cram about 600,000 transistors onto a silicon chip about 6 millimetres on a side. Moreover, these integrated-circuit chips, random access memories that store 262,144 binary bits of information (so-called 256K RAM's), will not be commercially available for another year or two.

Projection of the future course of semiconductors has become a liturgical requirement of integrated circuit meetings since Gordon Moore of the Intel Corporation formulated "Moore's law" in the mid-1970s. Moore observed that the number of transistors on a chip had been roughly doubling each year since Texas Instruments and Fairchild Semiconductor independently developed the integrated circuit in 1959. From 1973 to the present, the rate of growth has been slightly lower, the number of transistors per chip increasing by a factor of 4 every 3 years. A continuation of this trend would find integrated circuits of over 10 billion transistors by the year 2000.

Meindl's message, then, is that further moderation of the growth curve is in store. Depending on certain assumptions pertaining to the fabrication technology, the number of transistors per chip may climb to a number ranging from "only" several hundred million to about 1 billion in the next 16 years. The reason for the anticipated decline in rate is that engineers are approaching a number of theoretical and practical limits on the minimum size of transistors. Their situation is like that of a football team that finds it harder to advance the ball as it nears its opponent's goal line because there is less room for manoeuvring.

Meindl calls this future era ULSI, for ultralarge-scale integration, as opposed to the current VLSI or very-large-scale-integration epoch. The upcoming generation of 256K RAM's have minimum feature sizes ranging from 1.3 to 2.5 micrometers. The minimum feature size is usually defined as the average of the width of the electrical conductors that connect transistors and the spacing between the conductors. ULSI circuits will reach minimum feature sizes of 0.25 micrometer by the end of the century, said Meindl, and possibly even smaller later on. (Science (AAAS), 20 January 1984)

Work on chip to recognize speech

An Australian computer scientist is developing a prototype speech processing chip that could lead to much improved performance from speech recognition products. At present speech recognition is reliable only with small vocabularies - less than about 100 words - and even then the machine has to be trained to just one speaker. Dr. John Reid is at the first stage of a £400,000 two-year project to build a prototype voice scrambler, or vocoder, to convert speech into digital form and back again. The key to what Reid hopes will be a much more powerful product than existing ones is a dedicated chip incorporating the highly specialized mathematical formulas, or algorithms, used in decoding speech and matching the spoken word with the stored version.

No existing speech recognition product uses a dedicated chip, although Texas Instruments offers an add-on board to its Professional Computer for speech recognition, which uses its TMS 320 signal processing chip. This chip is partially dedicated to speech recognition, but is used for other signal processing applications as well. Even so the development has enabled TI to cut the price of speech recognition below the previous common level of £10,000. The board costs just $2,600. The speaker has 50 choices of word at any time, and the machine can recognize short sequences of words so long as each one is clearly articulated, with a pause between each word. (Computer Weekly, 8 December 1984)

Materials in Electronics

Advanced chemical technology plays a critical role in the build up of the new materials which will be the backbone of the electronic technology of tomorrow's world.

The direction of development was illustrated by Dr. K. Odagawa of Toshiba at the Society of Chemical Industry's recent London conference on Chemicals and Materials in Electronics, when describing device and process technology trends for Si VLSI and GaAs ICs. Toshiba have developed new VLSI process technology which does not use photo-resist materials and uses u.v. laser excited chemical reaction; this has led to the discovery of the new technique of radiation damage-free resistless etching. A major advantage is that the resistless etching process requires only one step as against 7 required in the present semi-conductor etching processes. Toshiba believe that CMOS will be the most important technology in VLSI for two reasons: (1) low power consumption, makes high integration of millions of transistors on a chip easy without heat and reliability problems; (2) micro-fabrication technology brings about a short one μ channel length for transistors in CMOS VLSI which greatly improves CMOS speed, until now the only CMOS shortcoming.

Among the exciting contributions in the Exhibition held on the evening before the conference were those by Philips, Plessey and by ICI's new Electronics Group in conjunction with Joyce Loebl, all demonstrating in one way or another the properties of new devices, chemicals and polymers. For example ICI showed high performance polymers including polyphenylenes which like the polyenes whose best known member is polyacetylene, are conducting polymers, as is phenylene sulphide a good, easily processed conductor. They also showed liquid crystal dyes and phthalocyanins which are conductors with an unusual set of properties to choose from, as well are anthraquinone dyes with photoresist qualities. (Processing, March 1984)

MARKET TRENDS AND COMPANY NEWS

The semi-custom revolution

As already pointed out in Microelectronics Monitor No. 8, recent reports confirm that semi-custom ICs (comprising both the gate array and the cell library approach) will enjoy phenomenal growth during the 1980s. This may result in increasing emphasis in the wafer fabrication (silicon foundry) operations. A recent UNIDO study on the approach for establishing a silicon foundry in a developing country also looked at this interesting development.

The following extract of an article, although it was published some time ago, gives a good overview of both the technical as well as market aspects involved.

Many observers believe that the integrated circuit (IC) industry is witnessing a revolution comparable to that which started with the microprocessor. The symptom of this upheaval is the advent of the semi-custom integrated circuit. Up until recently, the industry has been pre-occupied with the design and manufacture of high volume circuits such as memories and microprocessors. But now, thanks mainly to advances in design software, specialized electronics can increasingly bridge the gap between fully customised ICs and mass production standard parts. The importance of this development can be illustrated by its predicted growth rate. Market analysts believe that this will be in the region of 50 per cent annually, and that it will accelerate to the point where semi-custom circuits will account for over 50 per cent of the semi-conductor business by the end of the decade. Impressive statistics by any standards.

Despite this burgeoning interest, semi-custom is not a child of the 1980s. Like many developments today, it has its roots in the 1960s. And like many such developments, it was elbowed aside by the microprocessor. However, the fiercely competitive nature of electronics in the 1980s, coupled with more rigorous circuit design constraints, has forced the pendulum back. Now there is a movement away from standard parts to supplying design/manufacturing services for specialized chips. Most vulnerable to the competition from semi-custom ICs are TTL and CMOS small scale and medium scale integration logic circuits. These are the circuits which form 'glue' around major functional blocks such as microprocessor and memory devices. The trend towards ever increasing circuit complexity has created a climate in which semi-custom electronics can flourish; the cost advantages of higher levels of integration are well known. This means that semi-custom will be a key ingredient to boosting electronic engineering productivity over the next decade.

Why are semi-custom circuits so important? They offer certain advantages over other approaches. They reduce size and power needs which, in turn, reduces packaging and power supply requirements. Systems can therefore weigh less, cost less and have increased reliability. Fewer parts leads to a reduction in goods inwards checking and stock control problems. But most important, semi-custom allows small volume producers to more readily achieve the standards of their large volume counterparts. Another important feature of semi-custom circuits is their ability to protect the proprietary nature of a manufacturer's product, by providing increased design security...

So just what is a semi-custom circuit? There are two distinct types: gate arrays and standard cells. To date, the gate array has created by far the biggest impact. It has generally acknowledged advantages over other semi-custom approaches, for example shorter lead times to prototypes (less than three months) and lower mask costs.

Gate arrays now have many logistical advantages over cell libraries and are available in a wider range of technologies, such as emitter coupled logic (ECL) for very high speed applications, and CMOS for low power and high density. Furthermore, they are the simplest form of semi-custom and this makes their use popular among designers...

One reason for the use of gate arrays in such volumes is that they allow for flexible featuring, for example, dual European and American specification. Also, the product can more easily adapt to changes in the market place. Timing is of paramount importance in a highly competitive industry, and gate arrays allow a design to be implemented in a hurry and 'glitches' to be fixed quickly.

On the other hand, design based on standard cell libraries resembles more the full custom approach in that a full set of fabrication masks are required (gate arrays require only the last few). However, the use of considerable design automation, in the form of CAD, reduces development times and costs considerably; typically around three months to prototype is the time scale involved. This CAD backup is now of such an order that cell-based designs can compete with full custom in terms of silicon usage and design flexibility. Cell-based designs require a significantly smaller die than an equivalent gate array solution. In high volume, this can reduce packaging costs. Against this, gate arrays present definite advantages in testing and assembly, since the test set-ups can be standardized. The work involved in setting up test and assembly to cope with a unique die size may impose a significant cost on cell-based chips in low volumes. If there is a significant amount of linear circuitry or LSI functions in the design, the cell-based approach scores over gate arrays, particularly where a limited amount of memory or linear interfacing or both is needed in a single chip. Gate arrays with linear capability are few, and are specialized in nature. There is also little in the way of gate arrays with on-board memory, although a number of parts are promised...

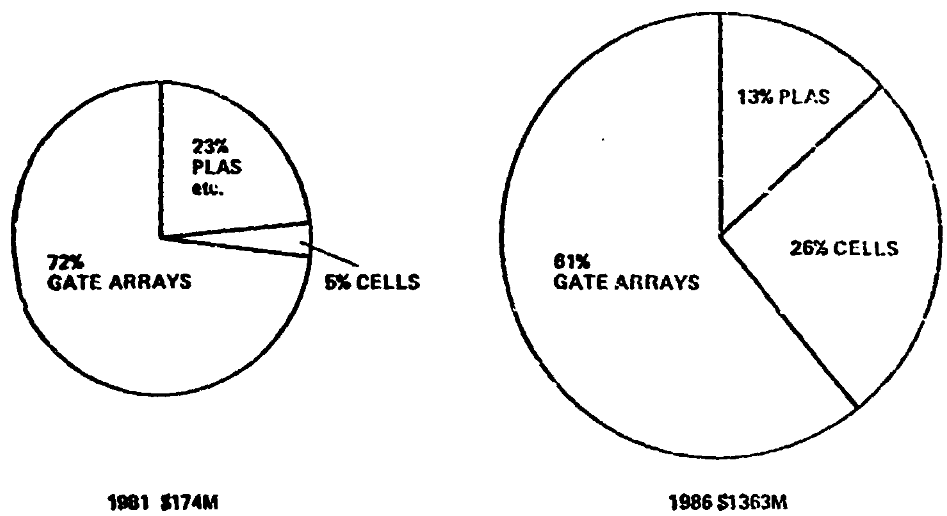
While the battle for pre-dominance rages between gate arrays and standard cells, the battle for the dominant technology has all but been won. The major semiconductor manufacturers have already decided that CMOS will be the major technology for very large scale integration (VLSI) applications during the next decade. CMOS provides higher levels of noise immunity than equivalent technologies. Also it uses less power, which means that it generates less heat. As the number of active devices per chip increases, it becomes more and more difficult to dissipate the greater amount of heat generated using readily available packages. For this reason, CMOS allows for greater forward expansion in the level of integration. So CMOS has asserted itself as the primary semi-custom technology. Other technologies such as NMOS, current injection and current mode logic (CML) will still have a role, albeit in more specialized applications, and will be improved to compete with CMOS...

How can one exploit semi-custom? To start the design exercise, the buyer must select a vendor. Selecting a semi-custom vendor may be as crucial as creating the logic diagram. Relatively inexperienced users are likely to encounter many obstacles in selecting an approach. For example, three years ago there were only a handful of suppliers producing a small number of array types. Recent growth means that there are now well over 30 suppliers of over 400 types - a bewildering choice for the novice.

The type and quality of the service produced by semi-custom suppliers is as varied as their products and, in a comparatively fledgeling industry, good advice is hard to come by. So consider several manufacturers before making a choice. Ask each about the technologies available, the minimum drop quantity (especially important for smaller companies) and the extent of the CAD tools available (important for efficient design and fast turnaround). From the user's point of view, a licensed second source is an ideal solution, but only if the source is viable and can deliver on time. The second source not only introduces price competition but also increases the reliability of supply of your circuit.

Probably the most important single factor influencing a decision not only on which semi-custom vendor to use but even on whether semi-custom will be viable in your application is cost. Cost can be broken down into up-front design costs and subsequent production costs. Design costs will to a large extent depend on how much of the design exercise the buyer decides to handle himself. This can go up to a certain limit, roughly 70 per cent, imposed by the manufacturer. Production costs, in lower volumes, can be significantly influenced by a minimum fee per year required by certain vendors. This fee is payable regardless of the number of parts ordered up to a pre-determined maximum.

(By Edward Vernon of the Wolfson Signal Processing Unit of Queen's University, Belfast. Reproduced in Technology Ireland, November 1983).



Market trends in semi-custom ICs. (Source: Mackintosh International, as quoted by Texas Instruments).

Semi-custom push by ASEA

Swedish-owned ASEA Hafo AB announced its latest push into semi-custom ICs. The firm had major product offerings making their debuts in Paris, as well as injecting more pace into its turnround time from the design starting line through the finishing tape to packaged ICs. The latter is achieved by ASEA Hafo's DDS (direct design on silicon) which the company claims will lop both time and money off custom IC design and manufacture.

"We have introduced a 10-day process turnround time", a spokesman told Electronics Weekly, "and we now offer a full foundry-run from tape to packaged ICs in 30 days." Depending on the application he estimated the break-even point related to printed circuit board alternatives as below 1,000 pieces.

The Swedish company's initial market thrust will be at customers who are not looking at high quantities of complex chips. For the first steps into DDS, it is better that tricky designs are avoided and the time schedule is not too tight, says ASEA Hafo. Training will be provided to customers' designers plus an initial quantity of processed wafers from which should come 2,000 devices. Customers also become members of the ASEA Hafo DDS club. Benefits include access to ASEA Hafo's CAD system at special rates, and access to what the company describes as inside information.

To design direct onto silicon, ASEA Hafo has developed a system called Mosart, an automated CAD software package. This comprises a library of digital and linear functional blocks. The company reckons it will ease the way into defining a custom circuit. The cells are placed onto a screen, the interconnections defined, and the data then transferred to the computer. The system will run on various low-cost terminals, says a company spokesman. (Electronics Weekly, 23 November 1983)

TI to concentrate semicustom efforts on C-MOS standard-cell line

Now that it has agreed to second-source gate arrays from Fujitsu Ltd., Dallas-based Texas Instruments Inc. plan to focus its semicustom-chip efforts on its 5-month-old complementary-MOS standard-cell line, says Walden C. Rhines, senior vice president in TI's Semiconductor Group. Much of TI's gate-array efforts will now be concentrated on the Fujitsu arrays, he adds. Under the contract, announced this month, TI receives a nonexclusive world-wide license to make and market Fujitsu's bipolar arrays (ranging from 240 to 1,100 gates) and C-MOS arrays (440 to 8,000 gates). In return, Fujitsu can get TI's computer-aided-design software package, Transportable Design Utility. Also, Rhines says, a translator will be used to automatically convert customers' array designs between TI's CAD package and Fujitsu's own design software, known as Fujitsu Logic Description Language. (Electronics, 26 January 1984)

Syntek opens semi centre in SE Asia

The first VLSI semiconductor design centre in South East Asia has been established by Syntek Design Technology in the Hsinchu Science Business Park in Taiwan. David Wang, Syntek's general manager said his firm had signed an agreement with Honeywell's subsidiary, Synertek Far East Design Center, to transfer VLSI design, technology including standard cell design technology, the data base for such design approach and related CAD technology. Richard Abraham, president of Synertek, said the US firm agreed to the technological co-operation with Syntek because it had shown strong potential for being able to develop VLSI circuit designs. (Electronics Times, 8 March 1984)

Toshiba enters semi-custom market

Toshiba is ready to establish itself in the semi-custom market place. It is set to open two design centres in the United States and these are seen as the beginnings of a programme aimed at establishing world-wide coverage for Toshiba semi-custom. Additional centres in Germany and in the UK are likely to follow. The centres in the States, on the West Coast in Silicon Valley and in the East in a suburb of Boston, are equipped with the LSI Logic LDS-11 design system. Several terminals in each facility will be linked via satellite to computers in Toshiba's design centre in Tokyo. Toshiba has a second source agreement with LSI Logic and under the agreement Toshiba has supplied LSI with silicon.

In the near future Toshiba will be able to offer two families of gate arrays both based on existing technology developed for their CMOS RAMs. Presently the T61 5G family offers arrays up to 6,000 gates with a typical delay of 2.5 ns. The arrays use the same technology as the 16K RAM family; a 3μm silicon gate process with two metal layers for the interconnects. By the end of this year Toshiba will be able to offer the TC17G family; arrays up to 10,000 gates with a 1.5ns delay using a 2μm process (developed for the 64K RAMS). Toshiba expects that sales or gate arrays will reach £30 million in 1984. However, of this world-wide total only a small percentage will be attributable to Europe. (Forecast 31 January 1984)

The fifth generation - can it add anything?

Gordon Bell, once head of engineering at Digital Equipment, and now chief technical officer at start-up company Encore Computer, gave the Second Annual British Computer Society Jubilee Lecture, sponsored by Computer Weekly on 14 March 1984. Bell was responsible for DEC's PDP -4, -5, and -6 minicomputers, and also worked on the PDP 11. He is a widely-published author on computer architecture and design and holds several patents in the computer and logical design area. Reprinted below is some of the material used by Bell in his lecture at the Royal Society in London.

Bell's lecture is entitled "Computer Evolution". The abstract for the speech is as follows: since the ENIAC, the early Manchester machines, and EDSAC, computer development has been evolutionary. Revolutionary circuit technology has provided new structures following the time-worn path. Can the new fifth generation, based on ultra-large scale integration, be any different, using either revolutionary concepts or more parallelism?

* * *

Like the minicomputer, hundreds of information processing products can be built using microprocessors and their associated semiconductor and electro-mechanical peripherals because they are so inherently universal (i.e. programmable). In fact, many more products can be built than with the mini. Let's totally ignore the products such as cars, instruments, testers, etc. that embed a computer in a larger product and whose primary function is not information processing. When PABXs and telephones compute and store information, they too must be considered as part of the computer industry. That is, there can be substitution among personal computers, games, terminals, typewriters, computing telephones and so on when they perform the same function as general purpose computers. The rapidly evolving high density semiconductor and magnetic recording products are clearly high technology, representing significant investment, high risk and high entry cost for a company. However, the systems assembled from these components are clearly not high tech, and the barriers for entering an end-user OEM or system level business with a generic product are negligible, especially when compared with previous computer generations such as the minicomputer which demanded a comparatively large number of disciplines.

A company can be formed by a part-time president, someone who can buy and assemble the various circuit boards into a Multibus backplane, a programmer to buy and load a version of Unix and one or two helpers. There are about 100 groups of one to a dozen or so engineers who are building workstations for various engineering and business professionals. Design consists of assembling the following:

- boards with microprocessors, disc, CRT and communication controllers that use one of several standard buses e.g. Multibus, Obus, or VME/Versabus;

- appropriate discs and CRTs;

- standard or custom enclosures;

- a licensed version of Unix available from a myriad of suppliers;

- generic software including word processing, spreadsheet, etc.

Each new start-up company believes its product and business plan will beat Apollo, one of the first entrants into the high performance workstation market. Just after going public, Apollo was valued at $1 billion in the fall of 1983, on annual sales of less than $100 million with less than 1,000 employees. In contrast, DEC has a valuation of about $4 billion with sales of $4 billion and a workforce of over 70,000.

A typical workstation start-up company compares itself with Apollo on two data points: its start-up date, which is usually one to two years after Apollo (when systems were easier to build), and the current month's annual shipments. In this fashion, within two years each of 100 companies will be valued at $1 billion, giving a valuation of work station companies of $10 billion to $100 billion - at least one order of magnitude greater than any optimistic projection of the market. This valuation does not include the established companies, such as IBM, whose values are approximately equal to sales and who may believe workstations are mainstream products. Thus today's assembly operations that permit this great overstatement about hi tech are at the root of what is surely to be one of the largest corporate re-evaluations in the history of American business. The only barrier to entering the industry as a board, software or system supplier is having a personal computer capable of generating a business plan.

Formal standards by US and international standards groups establish many of the standards (constraints) for designers. These are typically: low-level signalling, environment, communications links and languages. De facto standards by various manufacturers provide the most important standards. These include microprocessor architectures, buses, peripherals, operating systems and application software file formats. The levels, and corresponding standards for today's micro-based products are:

- hi tech semiconductor microprocessors (Z80 through to 8086 through to 68000 or National 32032) and memory chips (16K through to 64K through to 256K bits/chip);

- boards based on a standard bus (S100 through to Multibus I through to Multibus II or Versa-bus/VME; IBM-PC cards);

- electromechanical discs (8 in. floppy through to 5 in. floppy through to 5 in. Winchester disc);

- hardware systems are particular to the structure, but usually use Multibus form factors;

- operating systems (Basic through to CP/M through to MS/DOS through to Unix);

- languages (Basic through to Pascal through to C);

- generic applications (e.g., word processing, spread sheets);

- vertical applications within various professional and intellectual domains (e.g., accounting, structured design, project scheduling).

Large vendors such as DEC and IBM treat computing as a substitutable commodity in a complete market place. Computing can be traded off among the personal, shared departmental mini, mainframe levels over a price range of $1,000 to $1 million. (There is some evidence that growing use of personal computers increases the need for mainframes by giving more users access to tightly connected databases, instead of decreasing the need for mainframe power).

Computing carried out in any fashion should be treated as part of a single, available market. Many alternatives are possible for supplying a range of products, from the purely general purpose base system, to the product that has been highly customised by hardware and software. The critical mass (or economy of scale) is in the sidescale sales, distribution, installation and service of hardware products. In addition to having very good products, winning requires both the OEM and end-user channels to get critical mass of product distribution and wipe out costs. An OEM approach usually requires a product range, not just a point product. An OEM customer often requires service, and always requires high-level applications and field support assistance. An end-user approach requires both a wide product range and complete sales/service.

The applications software company (e.g. CAD) that has to invent its own hardware system is likely to become either obsolete with hardware, especially when reviewing what happened in the case of minis, or fall behind in its software development. Furthermore, the company is limited by growth in its own market because investment is required in both vanity hardware and its speciality added value software. The hardware vendors will surpass the combination supplier, and the software-only CAD companies are likely to provide better software. Since the perceived (and often the actual) price of software is low, a company that has a software product and wishes to enhance its sales volume does so by buying hardware and then re-selling the hardware as a complete system. In effect, a company competes with the mainline manufacturer. While the gross sales are up, the costs can easily outrun the sales since the company must support a hardware too. In addition, the software company doesn't usually market the range of products that a mainline hardware supplier has. Such a system is likely to be less profitable than a pure, software supplier. In addition, the supplier is cut off from a large number of channels of distribution made possible when a basic software package is made to operate on many different base systems.

Look at the case of minis. The companies who came out on top did so by having fundamentally good general purpose hardware and then distributing it:

- as a generic product for a variety of uses. In the case of minis, DEC opened up many markets with the PDP-11 as the range included boards for embedded computing, a range of systems for personal computers, business,

- through other channels such as distributors, distributors to subdistributors, retail outlets, installers, etc. Software product segments, i.e., new professional software application products, will form from today's experts in existing companies which either have vanity hardware or OEM hardware because the true value of the product is completely contained in the software. Ultimately, these companies will disappear to be replaced by: standard systems supplied by hardware vendors such as IBM; and software only companies staffed by the experts who create the professional applications.

For a while, it looked as if a specialized market existed for the growing number of users who wanted Unix. Today, Unix promises to be the whole market, not a specialized market in itself. Highly interactive computing with Unix is no longer a niche, but rather, the product constraint future users are all likely to demand, or at least specify. IBM has shown its flexibility in adopting industry standards rather than forcing its own in a de facto fashion. If customers want it, IBM will likely supply it. IBM appears to be near announcement of Unix across the range from PCs to mainframes. In a similar fashion, every minicomputer and microcomputer supplier will supply this standard in a similar way. While the combined market is large, the fundamental market has not been expanded, but merely made more accessible by every manufacturer. The result will be a much greater fall-out of the smallest manufacturers who have inadequate marketing and manufacturing organizations.

Unix evolved along these lines. Unix came from a reaction by Thompson and Richie to Multics, the large, joint MIT Massachussetts Institute of Technology Bell Labs project of the late 60s. It was written for a DEC mini and evolved to the PDP-11 in the early 70s. DEC didn't give away operating systems to universities, especially the source code; Unix was essentially free. Unix is by most measures a very simple operating system so to do anything useful requires other programs such as database access, special communications, programming and so on. Students and faculty could understand all facets of its internals and use. It was written in a high level assembly language, C, and as such could be modified. It was an excellent pedagogical tool. Unix evolved to be used on other computers by being transportable. A team of people could carry it to another computer system, provided a C language compiler was available. In turn, this created the notion that it might someday be possible to have a complete system that was machine and manufacturer independent. Users like this idea.

Chip makers and system builders who had no means of building software were able to get a system relatively cheaply. Thus, we have more support and the beginning of a standard. Much work is required to have a system that supports 80s computing concepts. In order to evolve towards the generality demanded by the broad market, the extensions will include:

- Virtual memory. This function was worked out about five years ago and has been in operation for at least four years in the Vax version of Unix at Berkeley called 4.1.

- Special functions for real time and transaction processing. Unix is being extended and adapted in incompatible ways by diverse organizations.

- Human interfaces that are competitive with the PC. Unix grew up in a timesharing world using dumb terminals. Windowing and fast interaction are critical.

- Multiprocessing. With the micro, many companies started to extend Unix for multiprocessing.

- Networks. Given the origin of Unix in communications, we should demand modern communications capabilities.

- Fully distributed processing across a LAN to form LANCs. The University of Newcastle, Berkeley and several companies have all implemented incompatible systems for fully-distributed processing.

The Unix phenomenon illustrates the power of standardization, and we can learn from it. Like all operating systems, the only people who really love Unix are its parents and those who grew up with it. This is a large set. It also illustrates a recurring theme of standards: in order to make forward progress, one has to regress for a while. Unix is almost a standard. There is not, however, a single version that is available in "bubble packs" that operates on a variety of systems. Each version requires the overhead of support, making the distribution again a matter of critical mass. We have turned a large part of our future systems development over to AT&T for one of the key interfaces by adopting Unix. Unixco must take this responsibility, commensurate with its selling of Unix as a standard operating system.

The notion of a standard is good. But it must be evolved more rapidly than any single, large manufacturer can. It can be evolved, provided there is parallelism in the development using multiple companies which is a complete Unix industry. On the other hand, Unixco is the single company doing and blessing all the extensions, we have simply substituted multiple competitive companies with one single behemoth! The system has to be evolved in a reasonable fashion, not ad hoc. Having Unix as a standard can let everyone enter the market on a commodity basis: yes and no. It's easy to develop the product, but how does one compete with the large organizations. At the bottom line: Unix is the opiate that lets 100 companies form and assemble a product in a trivial fashion. The result will be far more brutal than in the case of minis, where at least some technical skills were required.

There are over 100 vendors in what is a commodity-like product valuing themselves at $10 billion to $100 billion for a limited market to engineers, scientists and business analysts. All have the organizational overhead to start, but none have the critical mass to succeed, except those which are currently well established such as Apollo, Apple, Convergent Technology and Sun. Finally, the 32-bit personal computers (circa 1984-85), led by IBM using 256 Kbit chips and the Intel 286, will provide the power of the emerging 68000-based Unix workstations at a fraction of the cost. Basically, this structure competes with old line mini and main frame-makers, both of which are becoming distributors for supermicros, as in the Convergent Technology model. Reliable computing like Tandem should no longer be treated as a niche, but rather something a user should be able to trade-off. Because there is a somewhat different structure involved in building reliable computers, especially with respect to software, there is a possible niche market as evidenced by Tandem. As the overall reliability of computers increases, however, it is unlikely that anyone will pay even a 25 per cent premium for reliability let alone 100 per cent.

There is still interest in making a self-diagnosable, self-repairing computer that never fails, however. While this is possible for the CPU portion of a system, the software and peripherals do not permit this for some time. With much lower priced machines, a broader range, and the introduction of full distributed computing in local area network (LAN) clusters, the need for high availability computers for incremental expansion will decline. Several of the Bunch have been relegated to decline through a declining base as all customers standardise on IBM compatible hardware. The microprocessor-based systems are a convenient product to market. Companies in decline because of poor product competitiveness will witness rapid decline as high-performance, commodity-oriented, 32-bit microprocessors provide the same function as the traditional TTL-based mini, cheaply.

To sum up:

- There are no barriers to entering what is decidedly not a high tech industry.

- Economy of scale is most important in distribution and service.

- Economy of scale of manufacturing may hold for a single product and single company such as for the personal computer and IBM, but not in general.

- Time to market is far more important than economy of scale in engineering and manufacturing - which decidedly favours the entrepreneurial energy of start-ups who provide a single product.

- Large vendors such as IBM and DEC believe it's important to supply computing on a full service basis - virtually no organization provides a full line of networked, compatible, multi-vendor products.

- Old line minicomputer and mainframe supplier markets will not easily be supplanted by new supermicro suppliers because system pricing makes distributing one-product, low-priced, complex systems difficult.

- Energetic and unique software applications (e.g. CAD) which run on a few energetic structures (PCs, workstations and supermicros) will fuel this generation.

- Unique structures (e.g., home robots) are rarely revoluntionary or protected by patents long enough to become established before the large supplier enters the market and takes over. (Computer Weekly, 15 March 1984)

World-wide Semiconductor Recovery

According to the latest data released by the Semiconductor Industry Association (SIA), growth of world wide semiconductor shipments by U.S. and European based manufacturers should exceed 18 per cent in 1983. This forecast is based on data of the third quarter and preliminary data for October which show an upward trend in world wide semiconductor shipments. Third quarter shipments topped $2.8 million which brings the 1983 year-to-date total to just over $7.8 billion. Preliminary data for October indicate a shipping rate of over $950 million. Estimates for all of 1983 put total 1983 shipments at close to $11.2 billion compared to 1982's total of $9.4 billion.

Leading the recovery is the U.S. market, where shipments to this market-place are expected to approach $6.8 billion for 1983, up more than 21 per cent over 1982. Shipments to distributors have been particularly strong through the first three quarters - up 26.6 per cent over the same period last year. The OEM portion of the market should show greater strength in the last quarter, further buoying the continued growth in the distributor segment.

Shipments to the European market are up 4.4 per cent to $2.2 million through the first three quarters. The fourth quarter is expected to show significant gains - up 20 per cent over the previous quarter, thus bringing the overall growth in this market to 10 per cent for the year. Strength of the U.S. dollar against all major European currencies has understated the growth of shipments to the European semiconductor market by more than 8 per cent. When adjusted for exchange rate fluctuations, the European market will grow more than 18 per cent in 1983. Shipments into the Japanese market by U.S. and European semiconductor manufacturers should exceed $400 million for 1983, up 13 per cent over 1982. However, this shipping rate ultimately means a loss in market share, since the Japanese market is expected to grow more than 20 per cent during 1983. Shipments to other international markets, which represent the most rapidly growing geographic sector at 40 per cent, are expected to reach $800 million. (Semiconductor International, February 1984)

Chip shortage easing?

According to a recent article in the Financial Times, the worst of the semiconductor shortages that the computer industry have been experiencing, are over. The SD says that huge amounts of money in the U.S. and Japan are being invested in semiconductor manufacturing capacity and that some of this additional capacity is now coming on stream.

However, the number of leading computer and telecommunications companies are still having major problems sourcing chips for their products. According to the Financial Times, IBM is rationing supplies of its personal computer in the U.K., apparently because of a chip shortage. The fact that the world's largest computer company owns a large stake in the world's largest chip manufacturing company, Intel, does not appear to assure IBM of smooth regular supplies. Plessey Telecommunications, also in the U.K., has reported such severe shortages of component chips that it has warned it may have to delay its new Digital public telephone exchange system, the System X. But it seems that in general it is the smaller, less powerful microcomputer manufacturers which are experiencing the most acute problems.

Olivetti, Nixdorf and ICL all say that they have no problems in securing supplies. (Electronics Report Ireland, April 1984)

Semicon/Europe 1984 Report

The current state of the European semiconductor industry is not bright, according to Professor Roger Van Overstraeten, who was speaking at Semicon Europa 1984 in Zurich. He is director of ESAT at the Department of Electrical Engineering, University of Leuven. The European industry was and still is strong in bipolar technology. In 1983, more than 50 per cent of the sales related to bipolar devices. Less than 5 per cent of the MOS technology parts are supplied by Europe, and since this is a growing market, the European share could drop still further. Last year was the first year in which European production on ICs was larger than the value of discrete devices. Companies with headquarters in Europe account for less than 6 per cent of the total IC production and for less than 20 per cent for discrete devices. The total European production, irrespective of ownership is about 80 per cent of European consumption and this could increase in the future due to large investments planned by Japanese and U.S. companies.

Fundamental to this situation is that a European spends only about half the amount on microelectronics compared to a U.S. or a Japanese citizen. A European is even a worse consumer of innovative products. The rapid growth in the U.S. and in Japan is based on the existence of a domestic homogeneous market, which does not exist in Europe. Our companies had only small unco-ordinated national markets and the companies limited themselves to these domestic markets. The lack of venture capital, the large social benefits and the cash drain to the steel industry, to the mining industry and to other old-fashioned loss-generating companies, did not create the right climate for a healthy microelectronic industry.

The Japanese companies benefited from their vertical integration. They developed products for their own electronic systems' needs and then marketed them outside. The large European electronics systems companies did not invest the large amount of capital resources in this fast-growing IC industry. Japanese firms spend a larger percentage of semiconductor sales as capital expenditures than U.S. companies and much more than European companies. European industry always lags up to six months behind other semiconductor companies in recovering from a recession. "The result is also that the supporting industries in general, did not develop very well either. For materials supply we only have a good position for silicon production (due to Wacker Chemie), for resists and for quartz. A large share of the IC manufacturing equipment still comes from the U.S. and from Japan. The CAD-tools which will be vital to the VLSI industry are developed by our Universities and our industry. The danger however exists that European industry will not be capable to dominate in this rapidly growing market," stated Van Overstraeten. "The semiconductor industry is important in its own right. It is expected to become a $100bn market 10 years from now. Already now more than 500,000 people are employed in the semiconductor industry. The importance of semiconductors is growing also because the content of semiconductors in electronic equipment is increasing to more than 10 per cent. The electronic systems will depend more on the semiconductors not only in dollar value, but also in function. The high complexity ICs (one million active elements) contain almost all functions of the total electronic system. Therefore Europe cannot stay behind; its market share must increase," he continued.

Although it is very difficult to make predictions, there are a number of rather fundamental facts which could indicate that the European semiconductor industry could do better in the future. These are:

(1) Growing international co-operation among European, U.S. and Japanese semiconductor producers. It often is a co-operation on the production of standard components. This reduces the R&D effort and solves the second-sourcing problem.

(2) Europe is strong in certain market sectors, as for example consumer products (audio, video), telecommunications, and automotive electronics. If, instead of limiting themselves to the European market, firms started making marketing efforts in the U.S. and in the rest of the world, this would not only make them less dependent on the domestic economy, but would create also additional growth opportunities.

(3) Some European companies finally realize that they can only play an important role if they become a high-volume supplier of standard devices. Only large-volume production of standard ICs pushes the processing technology and the production yield to their limits.

(4) The percentage of application specific ICs is increasing, and this is an area of strength for Europe. Europe is good in CAD use, and in service and therefore will work out well in semi-custom ICs. Europe is rich in potential applications of microelectronics in many of its traditional industries. Introduction of microelectronics in these products is

only just starting. Europe is strong in innovative systems design and probably has more semiconductor circuit designers than the U.S.

(5) Most European countries now realize the importance of microelectronics. Several nations have strong R&D programmes, in which industry and university collaborate. It is not only countries like France, Germany, and the U.K. that have national programmes, but smaller countries like Belgium. The Belgian government recently decided to set up IMEC, as an Inter-university Microelectronic Center with an initial investment of $40 million in the field of processing technology and CAD. This government also started a training programme for VLSI designers. Sixteen institutions of higher engineering education are linked to a central computer. Training is also organized for engineers in industry.

(6) The EEC recently approved the ESPRIT programme. It will have a large impact on our semiconductor industry. Many companies and universities will collaborate in the fields of technology, computer aided design and all kinds of systems applications. It is an aggressive programme, which will be complemented by several national programmes. Industry did not wait for the approval of the program to start collaborations.

They realized that a single company, however large it may be, cannot fund on its own all the R&D which is necessary to compete with U.S. and Japanese companies. "Although already huge, the semiconductor industry will still grow considerably. We are only at the beginning of the invasion of complex ICs in many products: Europe certainly lost the first round. Based on the experience in advanced electronic systems design, on the recent government and European Community funding, on the collaborative programmes between the universities and industry, on the marketing efforts of our companies in the U.S. and in the Far East, I feel confident that we will gain back part of our share," concluded Van Overstraeten. (Electronics Weekly. 28 March 1984)

Japan seen controlling 50 per cent of world market for semiconductors by 1988

By 1988, Japan will control just over half (50.2 per cent) of what is projected to be a $49.85 billion world market for semiconductors, says a New York investment house, Paine Webber Mitchell Hutchins Inc. The prediction is based on its analysis and extrapolation of production and shipment data collected from four electronics industry organizations. The world market, growing from 1983's level of $18.42 billion world wide, is now dominated by the U.S., with a 52.6 per cent share, while Japan is estimated to control a 39.7 per cent share. Paine Webber bases its figures on data from the Electronic Industries Association, the Semiconductor Industry Association, Integrated Circuit Engineering Corp., and the Electronic Industries Association of Japan. (Electronics, 9 February 1984)

Stricter clean-air rules to cost Silicon Valley $100 million for new gear

The semiconductor industry in the San Francisco Bay area will have to spend more than $100 million for air-pollution abatement equipment over the next three years, says the Semiconductor Industry Association. New regulations adopted by the Bay Area Air Quality Management District, to be phased in over two years beginning next January 1, require a 90 per cent reduction by weight of precursor organic emissions from negative photoresist operations. (Precursor emissions are those that react with sunlight to produce ozone.) Thus manufacturers must either provide abatement devices at the point where emissions enter the atmosphere or switch to positive photoresist processes. (Electronics, 9 February 1984)

Intel plans big investment spree

US chip builder Intel plans to spend as much on new manufacturing capacity this year as the whole of Europe. It expects its spending to reach $350 million - nearly two-and-a-half times 1983's expenditure - to give new capacity to beat the chronic shortage of its 8086 family processors. And by shedding light on its complex alternate source arrangements for these processors, made popular by IBM's espousal of the 8088 for its Personal Computer, Intel hopes to allay fears that industry giants like IBM will corner the market and freeze out smaller competition.

"We will be investing $350 million this year," says senior vice-president Jack Carsten, boss of Intel's components group. "That's roughly equivalent to all Europe's investment for 1984. We have six-inch wafer lines going in at Alberquerque and another location in the U.S. plus one at Jerusalem."

Increased production within Intel, plus a series of second-source deals, should bring waiting times down to about six months by early 1985, reckons Carsten. Present lead times for the main processors are at nine months, and Intel has just opened its order books for the first half of 1985. "Lead times will stay long - and I call six months long - until early next year," says Carsten. "Then I don't know what will happen. With lead times as long as they are now there will probably be some double ordering and panic buying. That has to go as capacity rises." Carsten adds that the 8051, used in many keyboard and floppy controllers, is still available on allocation for this year - derying reports of a three-year wait. Production of this part in 1984 should be seven-and-a-half times this year's, he says, while capacity for the 8086/8088s should more than double.

Carsten is quick to defend IBM's part in the present 8086/8088 famine. He points out that the proportion of Intel's business that came from IBM fell from 13.5 per cent in 1982 to 8.6 per cent in 1983. And he claims that despite IBM's near 20 per cent stake in Intel, the proportion of Intel-IBM business will only rise to about 10 per cent this year. IBM has an internal second-source agreement to produce 8088s for its own use, as do Sanyo and Commodore. As well as the nine licensed second sources that have access to Intel's logic parts - including Japanese NEC, which Carsten feels may be soft-pedalling on production of Intel designs in favour of its own recently launched chips - there are deals under way with six unnamed companies to build parts on a sub-contract basis for Intel to sell. (Computer Weekly, 5 April 1984)

Inmos and Intel sign dynamic RAM deal

Inmos, the UK Government-funded semiconductor manufacturer, has made an informal agreement with Intel to develop dynamic RAMs to common functional specifications.

Inmos will use its own design and process technology, developed for the transputer, to build CMOS parts that will be functionally compatible with Intel's new CMOS 64K dynamic RAM, and planned 256K part. What the companies do not agree on is whose spec will be followed. Intel said: "There is no technological contribution from Inmos, which has seen our spec and will produce a compatible part". But a spokesman for Inmos claimed: "We were both well down the road, and there were lots of points of similarity. We haven't merely copied their spec". (Computer Weekly, 8 December 1983)

WE revives its Inmos interest

Western Electric has renewed its interest in buying Inmos.

Indications are that WE wants Inmos for its processing capabilities rather than its products. The UK company has plants in Colorado Springs, USA and Newport, Wales. They are equipped to the most advanced standards. WE has production capacity limitations, problems which led it, at the end of last year, to sub-contract out a lot of its semiconductor production to other companies. The Inmos products are a 16K static RAM, which set a world standard and still leads the market, and a 64K dynamic RAM which is being produced in quantities which approach genuine volume production. (Electronics Weekly, 8 February 1984)

Japan to nationalize its state telecommunications company

Japan is to follow Britain's example and attempt to denationalize its state telecommunications company. Half of NTT's equity, worth some £3.14 billion, will be offered to the public in April 1985, with an undertaking that two thirds of the company's shares should be sold within five years. It is not yet clear whether non-Japanese companies will be permitted to invest in NTT. They are prevented from so doing in Japan's international carrier, Kokusia Denshin Denwa.

NTT has been notorious for its reluctance to buy from overseas suppliers. According to Allum, a former chairman of NTT remarked that all he wanted to buy from foreign companies was telegraph poles and mops. But the situation has improved with tender documentation now in English as well as Japanese. (Computer Weekly, 5 April 1984)

Japan set to mass produce 256K chip

Japan's big chip makers, including Fujitsu and Hitachi, have now completed initial preparations for the mass production of the 256K bit dynamic random access memory (dram) chip. Six companies are already delivering sample shipments at rates of up to 100,000 a month. The variety of experimental applications in computer products is also increasing rapidly. A Fujitsu spokesman told Computing that the company is now shipping 100,000 of the 256K chips a month and using the device in its 32-bit S3000 minicomputer. The new chip will also be installed in the M-series of mainframe computers after this summer. Other 256K applications include use in a Sord high grade personal computer, marketed from December, and NTT is using the 256K in a small electronic switching system the IPS-II model 5, as part of its Information Network-System experiments.

A Hitachi spokesman suggested that full scale application of the 256K chip will arrive sometime in 1985 when the price difference over the 64K dram is expected to become suitably competitive. The first sample shipment of the 256K chip in Japan was made in late 1982, and the chip price has dropped since then from approximately £60 to under half the price. Industry observers suggest the price for a unit will drop to £21 or less within the next three months.

Fujitsu has also claimed a new advance in high electron mobility transistor (hemt) technology with the test manufacture of a 256K bit static ram which incorporate a total of 2,072 hemt on a 2.3 millimetre square chip. Fujitsu claims it is the largest hemt chip yet manufactured, and says it is devoting further research efforts towards the development of much larger scale hemt static rams for use in ultra-high speed computers in the future. The chip features 2 micron line widths technology and an access time of 1.5 nano seconds at a temperature of -196°C. (Computing, 2 February 1984)

AT & T: can it do battle with IBM? (by Tom Foremski)

The deregulation of US telecommunications giant AT & T which took place at the beginning of the year has provided IBM with what it considers its only major competitor. AT & T weighs in with almost twice the annual sales of IBM, so at first sight it would seem as if IBM were up against a formidable opponent. But how will this opponent fare in a market which IBM has dominated for so long, with a well established user base and sales force? The two companies are forced into each other's markets because of the unavoidable trend of telecommunications and computer technologies to converge and integrate - the linchpin being the future office automation markets which are the focus of these hybrid technologies.

In spite of the two companies' huge individual resources in terms of assets and research and development efforts, neither of them has the ability to develop the necessary technology effectively and to accumulate expertise in a short enough time. The solution for both companies lies in partnerships with other smaller companies that possess the expertise they lack themselves. These take the form of joint development agreements, such as IBM's work with Rolm for a voice data switch, or a direct stake in a company, as in IBM's holding in Intel to guarantee future supplies of semiconductors. This same strategy is being followed by AT & T with its acquisition of a 25 per cent share in Olivetti, which included a common commitment to each other's present and future products and development efforts. ... Under the terms of the agreement, Olivetti will become sole European distributor for a number of AT & T products and will provide AT & T with nearly £250 million worth of products over 12 months, starting in mid-1984. Joint development of private branch exchanges (pbxs) and other office equipment will take place and Olivetti will also act as a second source for the Unix operating system. ... Analysts also expect a mainframe product from AT & T, a move that would step directly on IBM's toes.

In the office automation market, analysts predict the emergence of powerful 32-bit microcomputers from IBM and AT & T, and the Unix operating system from AT & T will play a central role in the success of the company, coming up against IBM's VM operating system. This would be part of an integrated office automation strategy that would see word processors, microcomputers, work stations and other office equipment products capable of being linked through local area networks and operating in multi-office environments through satellite communications, an area in which both companies have well advanced plans. ...

Tie-ups			Products
AT & T -	Olivetti	1983	Telecom equipment Office automation products
	Philips	1983	Telecom switching equipment
	Gold Star Semicon.	1983	Semiconductors
	GEC	1983	Office systems

(Continued)

Tie-ups			Products
Olivetti -	Nth. Telecom	1982	PABXs
	Plessey	1982	PABXs
IBM -	Rolm	1983	Voice switching PABXs
	Intel	1982	Semiconductors
	Matsushita	1983	Information systems
	Aetna	1979	Satellite com.

(Computing, 12 January 1984)

Merger makes Nordic electronic giant

Swedish and Finnish electronic companies have joined forces to create a Nordic giant that they hope will be strong enough to defend domestic markets while expanding in some specialties internationally. In a three-part stock sale and stock transfer deal - which came as a complete surprise at the end of 1983 - the Swedish State will sell a majority interest in Luxor AB to Finland's Oy Nokia; in a related deal, Nokia will get a majority of Finland's Salora Oy. The result of these manoeuvres will be an electronics group with a combined sales of close to $500 million. Sweden's Industry Minister, Roine Carlsson, said that the merger will create "a powerful Nordic TV and electronic company with greater opportunities than each company would have by itself." (Electronics, 9 February 1984)

Ford sees silicon through Colorado facility

Ford Motor Co., fearing that it has fallen behind in the race to use automotive semiconductors, is now driving hard to handle its own semicustom- and custom-chip designs at a microelectronics center in Colorado Springs. A year ago, Ford Microelectronics Inc. had about a half dozen employees and a lot of work ahead to create a complete design system for engineers working in the firm's automotive and aerospace subsidiaries. Today, officials expect soon to see silicon on the first complementary-MOS integrated circuit ever designed by the company's automotive engineers. "One of the interesting things now is that we don't know what they are doing as far as specific designs. We are pretty much through the hand-holding phase," says John R. Wallace, president of Ford Microelectronics, officially a subsidiary of Ford Aerospace & Communications Corp. Besides providing standard-cell libraries and custom-chip designs for the automobile business, the center also plays a role in the lower-volume needs of Ford's military and space markets.

Ford Microelectronics is the in-house consultant to Ford engineers, whom it has trained to design circuitry on Daisy work stations. Once designs are finished, the data bases are sent to the center, where chips are hand-routed and tested. The microelectronics operation then sends the designs to outside silicon foundries. The first part designed at Ford's new center is a C-MOS engine controller for European Fords, says Wallace. In 1984, Ford Microelectronics has scheduled 14 designs for production, about half a dozen of them "high-volume automotive." Many semicustom chips for cars will run in volumes of 3 million. In the first full year of business, Wallace expects the center to oversee more than $20 million worth of chip business.

Progress has been fast. Last summer, Ford Microelectronics completed its initial work on a 3-micrometer bulk C-MOS standard-cell library purchased from Synertek Inc., Santa Clara, Calif. The first group of engineers were trained and sent back to their plants with work stations last fall. This August, Wallace hopes to move into the center's new 90,000-square-foot building. By then, the number of Ford Microelectronics employees will have grown to about 125, from about 70.

The C-MOS library, now has about 55 circuits, more than half of which come from Ford Microelectronics. A second high-speed C-MOS library - containing memories, programmable logic, and other macrocells - is expected early this year. The center's own custom designs are done in high-performance n-channel MOS. "Electronics is penetrating more of the automobile, and for good reasons - fuel economy, performance, entertainment and convenience. Since you are talking about high volumes, you can always do better with those features if you tailor your chips to your own application," says Wallace, who before being named president of Ford Microelectronics, in 1982, was Intel Corp.'s standard-cell program manager. (Electronics, 26 January 1984)

COUNTRY REPORTS

Australia makes rapid strides in VLSI chip design

The emphasis on design over fabrication is the major element of a strategy, devised by CSIRO's VLSI program, aimed at achieving a steep increase in Australia's technological capability. The emphasis on design was chosen for two reasons. First, the design of very complex chips is a research opportunity in itself - reducing design time to a reasonable level, that is, a few man-years, is a widely sought goal. Second, a nation with a small population has a better chance of making an impact on international technology if it concentrates on the brain-intensive aspects of VLSI technology rather than on the capital-intensive ones.

In just under two years, Australia has moved from the position of having no user-designed chip capability to the point where many designers have been trained and nearly 200 different chips for application-specific functions have been conceived and fabricated. Although most of these early designs were done by university staff and students, about a dozen chips from innovative companies and research institutions are going into production, embedded in systems primarily for export. Applications have included a bore-hole logging probe for mineral exploration, a robotics vision processor, a cochlea implant, several telecommunications circuits, signal processing for radio-telescope data, computer-graphics subsystems and some novel analogue circuits.

CSIRO's research capability in VLSI architecture and its design technology are resources for industrial firms embedding chips of their own design in advanced electronic equipment. Scientists and engineers have access to chip-design courses in their local universities, as well as to three commercially available short courses. Moreover, the shared-cost fabrication technique has been emulated by three universities, including the Royal Melbourne Institute of Technology, which developed the world's first multiproject gate-array implementation system. ("Scitech", Australia Newsletter)

Brazil: Microcomputer runs 15 programmes at once

In computers, the technology flow between the US and South America is overwhelmingly in a southerly direction. Nonetheless, a Brazilian operating system that can run up to 15 programs at a time has managed to navigate against the tide and make it all the way from Sao Paulo to customers in Massachusetts.

Most efforts to run programs simultaneously on 8-bit microcomputers have been done with software, points out Jalmar Oliveira, one of the owners of Logus Computadores Ltda. To skirt the degradation that Oliveira maintains occurs when more than three or four terminals are tied into a software-based setup, the Sao Paulo company does it with hardware. Its Logus 3 system, the one sold in the US, adds two proprietary boards and an adapted S-100 bus board to the microcomputer card cage. One board holds the memory map, the other the input/output circuits. Reluctant to reveal exactly how the hardware functions, Oliveira says only that it "functions as a kind of link between the Z80 chip and the bus".

"We have used them in Brazil for on-line administrative systems and for very slow process-control applications like telexes and photocomposition machines," Oliveira says. "Only very specialized operators could detect visual effects on the video" display.

The company has already made two sales in the US, to Epoxy Technology Inc., Billerica, Mass., and Arthur D. Little, the Cambridge-based consulting group. For these systems, Logus supplied its Brazilian-built memory and I/O boards and paired them with a US-made central processing unit and peripherals. The boards sell for $2,200. A complete system - the microcomputer with a megabyte of main memory, a 10-megabyte Winchester disk, a 1-megabyte floppy disk, eight intelligent video terminals with 64-K bytes of memory each, and a 160-character-per-second printer - goes for upwards of $10,000. (Electronics, 17 November 1983)

Bull, ABC (Brazil) link-up

Bull have made a commercial and technical agreement with the Brazilian ABC group to set up a joint company in the Brazilian state of Minas Gerais. It will be known as ABC - Empresa Telematic, SA. Its capital of Fr 100m (£8.5m) will be held 60 per cent by ABC and the remainder by Bull.

Two years ago the Brazilian Government announced its interest in creating a national informatics company with the support of a foreign firm. Before picking Bull the Brazilian authorities studied various projects with firms from Europe, Japan and the US. (Electronics Weekly, 29 February 1984)

Canada's computer industry continues to grow

The Canadian computer industry is a burgeoning sector of the Canadian economy that is moving towards becoming a major force on the world scene - both as user and supplier. In 1982 its revenues totalled some $4.5 billion in retail computer and office machine sales, representing an annual growth rate of about 20 per cent. In addition it generated $1.2 billion in revenue from computer services. The several hundred companies in the computer equipment field supply a variety of products such as microcomputers, large mainframes, peripherals and operating software. The services subsector provides a wide range of systems design services, data processing by service bureaus, on-line data bases, consulting and custom software. There are more than 1,400 companies providing computer services, employing more than 20,000 people. At least 90 per cent are Canadian-owned: it is estimated that Canadians produce 82 per cent of the total service industry revenues. An average growth rate exceeding 20 per cent has been realized in recent years and shows no sign of abatement. The Canadian market for computing equipment is largely supplied by imports. In 1982 Canada imported computer equipment worth $3 billion, the bulk of which originated in the US. In a complementary manner, about 90 per cent or $900 million worth of the output of domestic production was exported by the industry. Canada is the fifth largest import market and eighth largest exporter of computing equipment.

Canadian firms have generally chosen not to compete with multinationals in the production of general purpose computers. They have, instead, concentrated on the design of innovative products with a wide range of applications incorporating the latest advances in microprocessors.

The following Canadian products and services have met with particular international success:

- word processing systems, now sold in more than 80 countries;
- "intelligent" terminals, such as the (computer-aided design/computer-aided manufacturing) special high resolution terminal developed for Telidon;
- data communications products to link computers to data networks, including packet switching;
- CAD/CAM graphics with specialized terminals and software languages;
- custom-built on-line computer systems;
- proprietary software packages;
- desk-top microprocessors for financial management applications in small businesses;
- specialized data bases; and
- microcomputers capable of receiving a wide variety of software services through cable television networks. (Canada Weekly, January 1984)

Educational microcomputers in Quebec

The Quebec Government has awarded a $30 million five-year contract to a Quebec-France consortium for 45,000 educational microcomputers, Premier René Lévesque announced recently. The deal with the consortium formed by Montreal-based Bytech-Comterm Inc. and Matra-Informatique of Paris will give Quebeckers an opportunity to develop computer software and penetrate the international market. The contract specifies that 51 per cent of the first 10,000 microcomputers to be delivered within 18 months will be manufactured in Quebec under a licencing agreement. The microcomputers, costing $3,000 each, will be used by computer science students at secondary schools and colleges. (Canada Weekly, 1 February 1984)

New research centre in Canada

Michael Caughey, vice-president of technology and design resources at Ottawa's Mitel Corp., has taken an eight-month leave of absence from the telecommunications company to become the first president of the newly-formed Ottawa-Carleton Research Institute, a research co-operative which will carry out studies in microelectronics, communications and computers.

A long-term president of the institute is to be appointed by 1 July 1984. The institute will use the talents of students and faculty from Carleton University, the University of Ottawa and Algonquin College - all located in Ottawa - for research projects related to the high-technology industry.

Researchers will work closely with industrial affiliates of the institute - companies which will pay an annual fee to share the results of new research and make suggestions for projects of interest to the hi-tech industry.

Mr. Caughey said his first priority will be to contact federal and provincial government funding agencies to give the institute a firm financial base. Local industry, government and the three academic institutions have already contributed $122,000 in seed money for the institute. (Canada Weekly, 14 December 1983)

China in micro race to catch up with West

China has now basically mastered the microelectronics technology, a technology receiving special priority in its race towards modernization, but is still lagging behind the advanced nations, according to China's vice-minister of electronics industry, Wei Mingyi. Currently China is producing nearly 300 types of medium- and small-scale integrated circuits as well as large-scale integrated circuits with 10,000 elements.

The move into micro processors is led by Shanghai which has set up a special group to oversee the research, application and production of integrated circuits and computer technology. Its aim for 1990 is to bring 70 to 80 per cent of its major electronics products up to advanced international levels of the late 1970s or early 1980s. The Shanghai railway centre, according to the vice-minister, has already adopted computers to aid transport forecasting helping it to earn an additional Yuan 60m in 1983. Computers are also used in 150 other enterprises of different trades in the city to improve management. Shanghai also has a computer software technology development centre. Micro processors are now used throughout China in agriculture, finance, trade, posts and telecommunications, education and transport. (Electronics Weekly, 29 February 1984)

China buys semiconductor plant from Fuji Electric

Fuji Electric Co. will export semiconductor production facilities and production know-how to China.

The Tokyo company has signed a 10-year contract with China's electronic technology export-import corporation to provide an integrated semiconductor production line and related technology. The contract involves two Tokyo trading companies, Chugai Boeki Co., and Koyo Trading Co., which served as the agents for the contract.

The production line will be capable of producing 10 million units annually of silicon diodes for high-voltage power sources used in TV picture tubes. The line consists of a wafer processing facility diffusion furnace, metal evaporating furnace and automatic testing equipment. The production line will be installed at the Tianjin No. 3 semiconductor plant. (Semiconductor International, January 1984)

Japanese help sought for Chinese TV plants

The Peking Government is asking Matsushita Electric Industrial, Hitachi, and other major Japanese colour TV set makers to help modernize China's colour TV plants. Hitachi has been manufacturing colour and black-white TVs at its joint-venture plant in Fuzhou City, Fujian Province; while Matsushita, Sanyo Electric, Sharp Corp., and Victor Co. of Japan have provided technical co-operation to TV plants in Peiping, Shanghai, Tianjin and Nanjing. ...

In addition to these plant remodelling schemes, China hopes to introduce other electronics technologies, and will approach Japanese firms specializing in the various fields in which it finds interest and has necessities. (Electronics Weekly, 15 February 1984)

ESPRIT programme gets green light but demands science sacrifices

The EEC may have to cut by one-fifth its sponsorship of general research next year, following approval of its ESPRIT programme for research in information technology. The only solutions are for ministers to vote a big increase in the Community's R & D budget for the next year or to transfer money for ESPRIT from another budget.

Last week, research ministers gave their approval to the £870 million ESPRIT programme and earmarked £58 million for next year. But the European Commission has given an undertaking not to spend more in 1985 than it would have spent had ESPRIT not been approved. Spending on projects outside ESPRIT will fall from £290 million this year to £230 million.

A meeting of research ministers on 29 May will set priorities for the future. Likely targets for cuts will be new projects in biotechnology and telecommunications as well as non-nuclear energy and nuclear safety.

The final approval for ESPRIT last week means that 36 pilot projects that were started last year will no longer face suspension in May. Meanwhile, the 2,000 or so firms that the Commission believes could benefit from its sponsorship will soon receive invitations to submit proposals for research projects.

The five areas that ESPRIT will concentrate on are advanced microelectronics, advanced information processing, software technology, office automation and computer-integrated manufacturing.

Among the initial projects are a scheme to look at the advanced interconnection of very-large-scale integrated circuits. This project is shared between Plessey and GEC in Britain, France's Thomson CSF and West Germany's Telefunken. The Polytechnic of the South Bank in London has teamed up with the University of Amsterdam to work on 11 different aspects of tools and methods for producing programmes that emulate human intelligence. (New Scientist, 8 March 1984)

EEC eases rules on research

The EEC is to make it easier for large companies to team up for research and development by exempting such agreements from competition rules. At present firms have to notify the EEC if they want to combine on R & D, which can result in long, tedious discussions. ICL, Siemens and Bull had to go to the EEC for approval before setting up their joint research centre in Munich, which is just beginning research in artificial intelligence.

In future agreement would be automatic. The EEC member countries have already agreed in principle the new proposal, which would automatically exempt R & D agreements from article 85 of the Treaty of Rome, which forbids joint projects that distort or prevent comptetition. Even production agreements could be exempted, so long as they are based on the joint research. But there is a qualification that only one of three leading companies in the field can be involved, and the combined turnover of the companies must not exceed 500 million Ecus (£285 million). Failing this the plans would have to be scrutinized individually, as before.

The new measure is being pushed hard by Frans Andriessen, commissioner in charge of competition, who believes strongly in a free market unfettered by artificial constraints. The main objections to the proposal have come from the French, but these seem to have been overcome. Similar moves are afoot in the US, with the Reagan administration now pushing the National Productivity and Innovation Bill before Congress. But this does not go as far as the proposed EEC measure because there is no automatic exemption from competition rules. (Computer Weekly, 9 February 1984)

European Academic and Research Network

IBM is providing a computer network for European university researchers. By the end of this year, it expects 250 computers to be linked to EARN (European Academic and Research Network). It will start with seven major switching centres. These are in Geneva (CERN), Darmstadt (GSI, a heavy ion research centre), Didcot (Rutherford Laboratories), Paris (HEC, a business school), Rome, Madrid and Haifa (Israel). Didcot will provide a link to Dublin. The company offers computer hardware, lines for four years, and technical expertise. The network gives researchers an opportunity to talk to nearly every academic institution in Europe. "It's hard to say no," said Dr. Dennis Jennings, director of the Computer Centre at University College, Dublin.

Despite heavy financial and political backing for European designed networks, the standard European protocols still do not provide the flexibility to allow easy conversation between a number of computers and terminals, says a network expert at CERN in Geneva. "The main advantage of the IBM network is that it can be set up quickly," he says. Jennings adds: "It's not the most up-to-date, but it works." The IBM move, designed to improve the company's image with academia, has taken some of the supporters of a European designed network by surprise. They fear that IBM's generous offer may make the company's network standards triumph over standards being planned internationally (which may one day allow any terminal to talk to any other), thus helping the firm to win lucrative orders for its hardware and software. "It's unthinkable that IBM should be the company that provides the university network," says a spokesman from SESA, a French company that has benefited from EEC contracts in the past. "The network will train scientists in IBM standards on IBM equipment." But potential users of the network say they hope to introduce non-IBM-dependent protocols. (New Scientist, 22 March 1984)

France to spend £2m on micro medical identity cards scheme

France will spend FFr 25 million in 1984 to launch a series of pilot schemes for the use of microprocessor memory cards as medical identity cards. ...

To dispel concern among citizens about the confidential nature of health records, the Minister for Social Affairs promised that the health card project, which will be the responsibility of the Bull computer firm, will be supervised by the national Commission for Computer Technology and Civil Liberties. "This is a first step towards the creation of an individual health card for everybody. This card can simplify people's contacts with the health service, avoid duplication of medical tests and enable emergency operations to be undertaken with less delay."

In another venture, which will get under way in 1984, the medical faculties of universities in Paris, Bordeaux and Lyon will be linked to a pharmaceutical data bank. New sophisticated software is also to be introduced for processing medical information in Paris, Marseille, Lille, Bordeaux and Montpellier.

Small computer systems will begin managing patients' medical records on a purely local basis in Martigues, near Marseille, and Cannes. "These autonomous systems will be much more effective than using a big centralized mainframe," said the Minister. (Computer Weekly, 8 December 1984)

French say no to computer directory

French plans to replace telephone directories with computer terminals look less and less like meeting subscriber approval. The original idea, launched in 1978, was to provide free terminals for all of France's telephone subscribers - now numbering 22 million. The massive cost was to be met by savings on the production and updating of paper directories. Currently some 150,000 terminals with 9 inch screens and alphanumeric keyboards are installed in France. PTT, the French telecom company, promises that 600,000 will be in service by the end of the year.

Subscribers barely use the free terminals because it is quicker and easier to get information from conventional paper directories. ...

Results of an experiment in the Paris suburbs, where a wide variety of the "guinea pigs" have handed back their videotex hardware despite the fact it was free. According to one report, a sociologist involved in the experiment estimates that if it were not for the demand from children more like 70 per cent would have turned in their terminals. ... (New Scientist, 8 March 1984)

20,000 schools in the German Democratic Republic to get micros

The GDR government is to put microcomputers in 20,000 secondary schools over the next two years following the launch of the country's first two home computers at the Leipzig Fair last week. GDR's computer manufacturer, Robotron, and the microelectronics specialist, Mikroelektronik, both introduced eight-bit machines based on a Zilog Z80-type processor made by Mikroelektronik. The machine cost about £400 for a basic keyboard and processor unit.

The government scheme was drawn up by the Education Ministry with Robotron and is backed by the head of the government, Erich Honecker. It calls for the introduction of one machine at each of the country's 20,000 secondary schools, for use by 14- and 15-year-olds. A few trial machines will be delivered this year but bulk deliveries are expected to start next year. Every school is due to be equipped by the end of 1986. Extra machines are expected to be installed for other classes after that. Robotron sales executive Klaus Lorenz says the machines will be used to introduce children to programming and as a general teaching aid in traditional subjects. He says Robotron will train the school teachers.

If the scheme gets off the ground GDR will be one of the very few countries to have national school microcomputer programmes. (Computer Weekly, 22 March 1984)

Hungary

The Institute for Co-ordination of Computer Techniques (SZKI) was established in 1968-69 for the co-ordination in Hungary of the programme of the CMEA countries' Unified Computer System. This implied for the staff hardware and software development tasks, too. While keeping to this special line, the Institute has since gone through various periods. Its affiliated company, Systems, Computers and Informatics Laboratory Company (Sci-L), was brought into being in 1981, in order to put to practical use the Institute's achievements. It specializes in two main areas: software exports, of course in co-operation with the competent Hungarian trading companies, and the implementation of the personal computer programme.

"Already in the initial period we could establish good relations with companies in several countries", said Dr. Julia Sipka of Sci-L, "geographical vicinity and historical contacts led us first to Austria and the FRG, and later on to France, Sweden and the Netherlands".

"The first period of upward trend was followed by a short slack", said Tibor Németi of SZKI. The general economic recession did not leave computers unaffected either. All over the world small software houses were ruined. Naturally, this phenomenon became manifest in Hungarian software exports, too. Under external and internal constraints the leaders of SZKI decided for altering the course. Instead of the previous methods attention was concentrated on the development of multiply marketable completed software products. Relying on our own financing we began to make perspective programmes, for book-keeping, inventory management, wages accounting, and the like. We practically got thus ahead of expected mass requirements. This incurred of course a good deal of risks, as apart from the fact that we invested money and labour and that the development had to prove successful we could only hope that no competitor would engage in the same line of development and that we would be able to find a ready market for a given product.

"The Institute's most successful product at the moment MPROLOG, has also been developed as a 'result of an assessment of prospective demands'. The modular PROLOG had already been completed when in 1981 Japan announced that PROLOG would be one of the kernel languages of the fifth-generation computers. Several Japanese firms made offers to SZKI for the marketing of the product, finally it was with the Rikei Co-operation that signed a sole agency agreement for Japan". All this was said by Dr. Julia Sipka, who then continued: "We have also come to an agreement with the Canadian G and B company who act now as our exclusive agents on the American market. Moreover, we have MPROLOG distributors in several European countries (Britain, France, the FRG, Sweden and Italy). In 1983 the development specialists of MPROLOG were awarded a prize for their work by the Hungarian Academy of Sciences."

There are two more areas that should be mentioned. One is the manufacture of personal computers which SZKI was the first in Hungary to launch. From the very beginning they wanted not only to manufacture hardware but also to make user's programmes to match. Today they can already offer for sale some 100 user's programmes for their devices, the majority of which they have sold in large number in Hungary. Those having proved to be the best are being prepared for exports.

Another joint development work launched four years ago and still going on is one with the FRG SES company. The basic idea, i.e. that of the development of the complex technological system backing up the development of software, was brought by the partner from the US and it has been further developed jointly with two Hungarian institutes, one of which is SZKI. The technologisation of software is not an easy task, and great interest has been aroused by the system finding a solution to this. In the FRG, for example, several major companies have already bought the product called Szoftorg. ("SOFTWARE" - New Hungarian Exporter, March 1984)

India negotiates for computer technology

The Department of Electronics (DOE) has narrowed down the choice of technology for the manufacture of fourth-generation mainframe computers to two foreign companies out of four, which responded to the global tender floated by the Government in March 1983.

The project, which will require an investment of Rs 20-25 crores, will be implemented by the Electronic Corporation of India (ECIL) to save time, which would be much more in case a new public sector firm is formed for the purpose. The project, on completion, would, however, be transferred to a new undertaking to be formed under the administrative control of DOE. The DOE Secretary, Dr. P. P. Gupta, said that the first lot of computers, with some Indian value added to the products, would roll out of the factory within 12 months of the selection of the foreign collaborator. To begin with, the unit would manufacture 20-30 computers a year. ... (Financial Express, 5 March 1984)

Indian microcomputer hits market

India's first portable microcomputer has been introduced for the Indian market by Bush India Ltd., in technical collaboration with the Otrona Corporation of the US. The eight-bit system weighs 8.1 kg and comes with two 5-1/4 inch floppy drives and an attachable keyboard. The cost in Bombay is Rs. 66,516 and deliveries of the system have already commenced according to the sales manager (computer division) Mr. Ashok Aggarwal. Called the "Bush Attaché", the brief-case-sized system is supposedly smaller and lighter than the Osborne introduced some years ago, but now no longer in the market. (The Economic Times (India), 7 March 1984)

India to place computer order

India is likely to place an order for 500 computers and ancillary equipment from Britain for immediate installation in 250 schools, as part of a major project in computer education, reports PTI. Britain's 'micros in schools' computer teaching programme is likely to become the basis of a three million dollar (about rupees three crores) pilot project being organized by India's departments of electronics and education. The proposal to import British equipment and know-how follows a recent evaluation of six companies' products from the UK, France, Japan and the US. Indigenous design, assembly and manufacturing would follow for the bulk of the programme. (The Economic Times (India), 7 March 1984)

Sinclair seals Korean deal

Sinclair Research is expanding its markets in the Far East by way of a deal with Samsung Electronics of South Korea. The deal licenses Samsung for local assembly and distribution. The deal covers the ZX81 and Spectrum. Sinclair will ship out the components and it is expected that the first machines will be on sale in South Korea later this year.

The deal involves only the South Korean market, and there are no plans for Samsung to sell anywhere else. The deal will not affect Sinclair's Chinese venture, which in any case is hardly off the ground. The company made an agreement last year with the South China Computer Company and the China Electronics Import and Export Corporation to do trial assembly of the ZX81 and Spectrum with a view to assembling and marketing the machines in China.

The Sinclair spokesman says: "They didn't get the first product for trial assembly until the end of December and so they haven't completed their evaluation yet. We're waiting to hear from them what their level of interest is." (Computer Weekly, 15 March 1984)

South Korean electronics

South Korea's electronics industry is trying to leap into technological adulthood. Better known as low-cost makers of cheap colour televisions, radios and microwave ovens. the country's four biggest electronics groups - Daewoo, Gold Star, Hyundai and Samsung - are all jumping into production of advanced memory chips and personal computers. One of their ambitions is to break free from dependence on Japan for technology and components.

All four big firms are planning to leapfrog into production of high-tech components such as advanced microchips - very-large-scale integrated circuits. This is to help a big push into computer making; to regain control over components supplies; and, eventually, to enable South Korean firms to innovate in consumer electronics. Normally, all this would take more than a decade. To save time and make up for a shortage of top-quality development engineers, South Korean firms are setting up shop in Silicon Valley. In July 1983, Samsung Semiconductor established a new firm, Tristar Semiconductor, near the centre of the Californian industry; they hired 50 American and Korean-American engineers, and built a small semiconductor plant. Hyundai, Gold Star and Daewoo all followed suit. By being on the spot, they hope they can plug into American technology more easily.

They are also recruiting talent from America to bring back home. Samsung, Hyundai and Daewoo are all scouting for Korean PhDs working for American companies. Daewoo, which has been in electronics for only a year, has already increased its R & D staff from 180 engineers to 600. It expected to have 1,000 by the end of 1984, many from America.

Licensing of American technology is another short cut. In August, Samsung will start commercial production of 64k random access memory chips, using equipment and technology bought from a small American start-up firm. ... (The Economist, 18 February 1984)

Malaysia attracts the multinationals

Investments by foreign multinational electronics giants like Motorola, National Semiconductor Corp and Advanced Micro Devices Inc., all of the US and Japan's Matsushita Electric Industrial Co., and Hitachi Ltd., are pouring into Malaysia to take advantage of cheap labour in the politically stable country. According to the Malaysian Industrial Development Authority, the total investment in the electronics and electrical industry in the first 10 months of this year totalled M$202m (US$86.3m), up 35 per cent from last year. According to Hardziah Abdul Aziz, director for electronics in the Malaysian Industrial Development Board, 10 more projects are to be approved shortly.

The Malaysian electronics industry is mainly concentrated in four centres - Bayan Lepas free trade zone in Penang, Malacca, Johore and the two free trade zones outside Kuala Lumpur and provides employment for about 70,000 people. Foreign investors in Malaysia are, however, not completely free of problems. One of the biggest problems is that it is much harder to find qualified engineers in Malaysia than in other parts of Asia like Singapore, Taiwan and Hongkong. Infrastructure facilities like telephones and other communications modes are not up to date. Supporting industries and services like metal stamping, die casting and plating are also poor. One of the reasons attributed to the rapid growth of the Malaysian electronics industry is the generous incentives being offered by the government. The nine-year tax holiday for the investors in the "pioneer industries" which includes electronics, for example, is a big attraction. (Electronics Weekly, 28 December 1983)

Netherlands: In Delft, pottery moves over for ICs

Delft, the medieval Dutch city that lent its name to its distinctive blue pottery, is ready to achieve a 20th century sort of fame, as the site of the Netherlands National Center for Submicron Technology.

Once it is fully staffed and equipped, by mid-1985, its founders say, the center "will be unique in Europe in what it does." In fact, it aspires to become the European counterpart of the US National Research and Resource Facility for Submicron Structures at Cornell University, located in Ithaca, N.Y. What's more, the Dutch center, founded last December, intends to outdistance other European submicrometer-technology institutes. Unlike the facilities at, say, Belgium's University of Leuven or West Germany's Aachen Technical University, which are concerned primarily with very large-scale integrated circuits, "we want to take a broader approach," says Karel L. Hagemans, associate director at Delft.

Though his scientists will be analysing structures smaller than 1 um or those with submicrometer tolerances, research will also focus on integrated optical systems, on superconducting microstructures like Josephson junctions, and on microsensors for human implantation. In addition, the center will support investigations of new phenomena that result when characteristic device dimensions are of the same order of magnitude as the physical parameters involved, such as the mean free paths of electrons.

Leading edge. "We will also encourage work on biological structures and systems, such as cells and the communication channels between the brain and the muscles," explains Hagemans. This work will be aimed toward future "biological" computers and to help biochemists manipulate matter.

Some $2.7 million for equipment and materials comes from Holland's Ministry for Scientific Affairs. Holland's equivalent of the National Science Foundation, Fundamenteel Onderzoik der Materie (Fundamental Research of Matter), will spend another $1 million over the next two years. The center is also participating in a team that has put in a bid for a $3.8 million research grant from the European Community for a project in high-resolution electron-beam lithography. (Electronics, 28 July 1983)

Electronics industry set for shakeup in New Zealand

Import licensing for radio and television sets is likely to be phased out by 1 January 1990, under Government policy for the electronics industry announced here. In addition to reducing from 40 to 10 per cent the sales tax on computers for selected industries, the policy includes.

Abolition of the present 10 per cent sales tax on plant and machinery including computers for use in the electronics industry.

A NZ$1m electronics industry research and development scheme.

A NZ$2m prototype development fund to finance development contracts let to industry by Government departments. Much of this fund is expected to go to the electronics industry.

Acceptance of most of the recommendations in the December 1982 report of the Industries Development Commission on liberalizing import restrictions on electronics products.

The two development funds will be set up next April and will be reviewed after four years. The NZ$2m prototype fund was recommended by the commission. But it proposed a research and development fund of NZ$1.5m in the first year and NZ$2m in the second year. It also recommended a NZ$5m "venture capital" fund, to be administered by the Development Finance Corporation, for firms in the early stages of new product development. A Government spokesman said that this proposal was being considered further and a decision was expected shortly.

The Customs Department's director of trade, Warwick Crooks said that under the new import policy, existing tariffs would remain in place until 1 January 1987, while they were tested by putting an increasing number of import licences up for tender. The present tariff rate on radio and television sets is 65 per cent, except for Canadian sets which attract 32.5 per cent duty and Australian ones which will be reduced to 20 per cent duty from next January under the Closer Economic Relations (CER) agreement. The first tender for licences to import sets worth 2.5 per cent of local production will take place next January. Further tenders will be held for another 2.5 per cent of production in July 1984, followed by two tenders for 5 per cent of production in each of 1985 and 1986.

If this experiment shows that local production is totally uneconomic, for instance, if the imported material costs are higher than the cost of imported finished product, then the Industries Development Commission recommends that tariffs be set at minimal levels of around 3 to 5 per cent. But if local production is found to be economic, it recommends that tariffs should be set at whatever level is needed, up to an effective protection of 60 per cent, and import licensing should be phased out over three years. This decision will not be taken until 1987. But Crooks confirmed that in the light of the decision to accept most of the recommendations of the commission, a phase-out of import licensing over three years from that date was probable. ... (Electronics Weekly, 28 December 1983)

Semiconductors become Philippines' top export

Exports of semiconductors from the Philippines will hit a record $1.3 billion for 1983, making these products the country's top export, according to a forecast made by Bernardo Villegas, senior vice president of the Manila-based Center for Research and Communications, the leading research foundation in the Philippines. Growth has been rapid despite the worldwide recession, says Villegas, largely because of the entry and expansion of several US-based multinationals, like Texas Instruments and Fairchild. (Electronics, 8 September 1983)

Singapore

The Robin Group has made its third venture into the electronics industry with the setting up of a new subsidiary to manufacture printed circuit boards. Integrated Electronics Manufacturing Pte. Ltd.'s establishment is costing a Sing$20m (about US$9m) investment. Operations at the plant will include board stuffing, computerized testing and production of double sided and multi-layered printed circuit boards. The company will eventually manufacture its own computer-controlled PCB manufacturing equipment.

According to a Robin Group spokesman, Integrated Electronics will be the first local company to manufacture industrial grade multi-layered printed circuit boards in Singapore. The company also offers drilling facilities to other printed circuit board manufacturers and will eventually provide services including printed circuit board design and layout to users in Singapore. The company has planned for output of printed circuit boards to each 10,000 sq. m per month by June this year, doubling to 20,000 sq. m monthly by the year end. The company is aiming to export 80 per cent of its production to the United States and the Common Market countries. (Electronics Weekly, 7 March 1984)

Algar taps growing Sri Lankan market

Algar Burns and Associates, an Australian software maker currently riding high in the Singapore software market is collaborating with Sri Lanka's Associated Business Centre to launch operations in Sri Lanka. Sri Lanka, according to John Algar, head of the Australian firm now in Colombo, has tremendous potential for the marketing of good software equipments. The Australian firm is claimed to be one of the best in Australia and will soon be among the best software marketers in Singapore. It is hoping to sell some 300 SYBIZ software packages by 1984.

The company has a business accounting software package which enables the computer user to produce monthly trading profit and loss balance sheets, financial returns, debt statement, trial balance, inventory and stock reports among others. ... (Electronics Weekly, 7 March 1984)

Spain: Electronics plan gets approval

Spain now has an approved national electronics plan. The plan has been agreed by the Council of Ministers (cabinet). It is now under consideration in the Cortes (parliament) but no serious political opposition is expected.

Introducing the plan, Sr. Carlos Solchaga, the Minister of Industry, placed strong emphasis on exports. Negotiations were in an advanced stage with 14 companies, both Spanish and multinational, which guaranteed the achievement of at least 79 per cent of the plan's exports objectives. The government accepted the continued presence of multinationals was "inevitable". They also considered that job creation was not the primary objective of the plan, but rather "the modernization of the country which in the medium term will lead to more jobs in other sectors, such as services".

Financial support, though reduced, will still add up to about Pta 100,000m over the plan's four-year initial period. The Bank for Industrial Credit (BCI) will provide credits of around Pta 30,000m, Pta 50,000m will be available from public funds for assistance to exporters, including setting up commercial networks abroad, and some Pta 20,000m for research and the development of new products. ...

He believed the "stars" of the plan were microelectronics and informatics. Discussions were under way with one of the world's biggest manufacturers, with the object of setting up a plant to make integrated circuits, 90 per cent of which would go for exports. Another factory would be established under Spanish control and a link was to be set up between all the development laboratories at present in existence. ...

Two new laws are expected to follow from the plan's approval, probably in July this year. One will aim to protect the interests of national industry in public sector purchasing. The other will deal with support for research and development. Other consequential activities will include the introduction of informatics into primary and secondary schools, tariff aid for exporters and help for people setting up new electronics and software firms. ... (Electronics Weekly, 29 February 1984)

Russia's 64K RAM

The Soviet microelectronics community can fabricate a 64K dynamic RAM, according to a display at the country's main industrial showplace - the Exhibition for Economic Achievement in Moscow.

Few details are available on the device but it is understood to be in P-channel MOS - which if true is a highly unusual choice. Most high density RAM chips are in NMOS. Designated the KI1801PE1, the RAM is of 4096 x 16 bit structure, in a standard 24-pin package.

Both plastic and ceramic packaged chips were on view even though the Russian data available covered only commercial temperature ranges. The Moscow exhibits, intended for public consumption, suggests that Soviet engineers are competent enough to handle every major IC technology-12L, ECL, NMOS and CMOS, without stating whether these were mass producible.

Schottky TTL, and ECL, certainly received high profile at the exhibition with a chip set, understood to be microprogrammable, called the K589 series on show. The set includes a "microprogram management block" (K589IK01) used for selecting successive programmed commands with a cycle time of 85ns and a power consumption of 850 mW housed in a 40-pin plastic package.

The remaining chips include the K589IK02 - a CPU 28 pin, 100ns unit dissipating operation (10ns, 475 mW, 28 pins); a "multi register buffer" of eight registers (20ns, 450 mW, 24 pins).

Another series, the KP 1802, is said to be specially designed for high-speed addition and multiplication with applications in straight and inverse mathematical transformations. The chip set is based on a 10 MHz clock rate and has a data throughput of 2 Mbytes/second. ... (<u>Computer Weekly</u>, 22 March 1984)

<u>Britain's chip firm up for grabs</u> ...

Once again the future of Inmos, Britain's memory chip manufacturer, is in the balance. The government is keen to sell the five-year-old company, but has yet to find a suitor prepared to meet its terms. AT&T, the giant American telecommunications company, is the latest to have been sent packing. On offer is the British Technology Group's 75.6 per cent holding in Inmos. The sale of the stake would recoup for the government some, if not all, of the £110 million in cash and loan guarantees that the company has so far cost the British taxpayer. Inmos was set up by the last Labour government to secure for Britain supplies of mass produced semiconductors and the know-how that goes with them. Despite talks with British companies such as GEC, the present government has not ruled out the possibility that Inmos will be sold to a foreign company.

What would a buyer, British or American, get for its money? To begin with, Inmos is one of the few independent semiconductor companies in the world. Most are already linked with a larger, systems company which wants a guaranteed supply of chips for its products. Inmos would insulate a buyer from chip shortages like the one now hitting the computer industry. In return a buyer would provide the funds Inmos needs for research and development and growth. Inmos makes two types of very large scale integration (VLSI) chips: a 16K static random access memory (SRAM) and a 64K dynamic random access memory (DRAM). The company also makes an electrically erasable programmable read-only memory (EEPROM). The 64K chip went into production at Inmos' plant at Newport, Wales, at the end of last year, almost two years after the factory opened. The company had some difficulty transferring processes from its American site in Colorado Springs where the chips and their associated production lines were designed.

The delicate manufacturing process failed to give the same results, partly because of differences in climate between the desert uplands of Colorado Springs and the damp sea level surroundings in Newport, partly because of the new workforce in Wales. According to Dan Schroeder, fabrication manager, in one case it turned out that workers in Wales were washing chemicals of the saucer-sized wafers on which the chips are etched with different movements to those used by their American counterparts. However the Newport plant is now churning out 64K chips at a rate of half a million per month. By the end of this year Inmos expects to be producing them at the rate of 3 million per month, earning the company much of its forecast £100 million turnover and profits of between £7 and £10 million this year.

Work on 16K chips, meanwhile, has been moved from Newport to Colorado Springs where Inmos employs some 800 people, compared with 540 in Britain. Key production staff from America are supervising British production.

In Newport, Inmos is using some of the new techniques for making chips although the plant was designed some two years ago. These include plasma gas etching which gives cleaner cuts than etching with chemicals, and wafer stepping, a method of transferring the photographic images of the circuits to silicon in batches rather than one by one.

So far, Inmos has concentrated on the so-called NMOS chip technology, but a 256K memory chip under development will use CMOS, which needs less power to drive it. Inmos' other project, the transputer, will also be built in CMOS. The transputer is a microprocessor chip which also contains some memory and circuits to connect it with the outside world. The transputer, due to go into production next year, is designed for fast processing involved in word processing, speech recognition and digesting radar signals. "In many applications people just run out of puff," says Inmos' managing director Iann Barron. Transputers can also be connected in arrays so that they carry out different processing work in parallel. Inmos has plans to extend the transputer idea to build complete systems on a wafer. These would be produced to order for customers. An American company called Trilogy is expected to use the same so-called wafer integration to build a mainframe computer due out this year.

Barron is keen that Inmos and its research remain in British hands. Local access to products such as the transputer will be very important, he says. But he also claims that Inmos is misunderstood both by financiers and by its potential customers in Britain. "The UK is not taking up advanced products as fast as we would like," he says, "we are in a very different business from Ferranti and Plessey." (New Scientist, 1 March 1984)

UK Schools' policy shifts tack

Government policy on technology in schools will enter a second phase on Monday, with the emphasis moving away from Basic programming and educational games towards the use of computing in industrial control. Having put a microcomputer in every secondary school and most primary schools, the Department of Trade and Industry is launching the British School Technology scheme. The scheme will advise local education authorities on the introduction of technology courses to O level and A level school children. It has the backing of the Department of Education and Science, the Department of Employment and the Manpower Services Commission.

Educational materials for teachers and classrooms are already being produced by the Open University in the form of microelectronics teaching packages and a computer called Desmond (Digital Electronic System Made of Nifty Devices). Desmond is a £70 microcomputer with switches, lamps, a buzzer, a stepper motor and sensors for light, heat, tilt and magnetism. It is programmed in an assembly-type language to set switches, light lamps and so on. Desmond is already on trial in secondary schools, and has been quite a success, according to Helen Boyce, micros in schools project manager at the Open University. "Some schools have developed their own interfaces and got Desmond to control washing machines and so on," she says. "So far children have learned how to program in Basic. Now they can learn how their computer works."

The British School Technology scheme, to be announced by information technology minister Kenneth Baker, is part of the government's aim to move emphasis in schools away from pure academic qualifications towards an appreciation of industry.

The Open University has introduced a package for teachers to help them evaluate software products. It includes examples in the form of school programs and the Logo educational language. The first versions are for Apple and Research Machines computers. Sinclair and Acorn/BBC versions will follow. Prices start at £49. (Computer Weekly, 29 March 1984)

Greater London Council to fund dp training centre for the jobless

The Greater London Council (GLC) is backing a new technology training scheme aimed at people who would otherwise slip through the adult education net. The GLC will contribute more than £350,000 to the scheme - in the East End - which will offer a one-year course covering computing and microelectronics.

Unemployed over-25s, women and ethnic minorities in the Tower Hamlets area will be prime contenders for the 35 places in the centre. According to Charles Buxton, a community worker involved in the project: "We're not going for competitive entry criteria. We're trying to get a mixture of abilities." Funding for the centre has also come from the European Social Fund, which is giving £121,685 and from Tower Hamlets Council; which is providing £28,000. It will occupy about 7,000 square feet on the third floor of the Whitechapel Technology Centre, which was designated to accommodate local firms working in high technology areas. (Computer Weekly, 19 January 1984)

UK: Alvey directorate to support encoded chip work

The Alvey directorate will fund work on a data encryption chip - made only in the US and almost impossible to obtain in the UK. Brian Oakley, head of the £350 million Alvey project, said it is drawing up the specification for a Data Encryption Standard (DES) chip. He told Computing: "I have heard that DES chips are difficult to obtain, and the Alvey directorate is certainly taking an interest."

Oakley is revealing no more details until chip design is reached, but David Clayden, a DES expert working at the National Physical Laboratory, said it would interest chip suppliers like Ferranti, users like British Telecom (BT) and the UK military. He said: "Because the DES chip is American and Government-sponsored, it is very difficult to get copies of it. Quite possibly Alvey would work on it merely to ensure a UK supply." The DES algorithm is geared to the military, but also communications. So BT users like the major banks would be interested in this kind of chip. (Computing, 19 January 1984)

UK: Alvey directorate men plan to lead the world

The directors of the Alvey programme have announced plans to set world standards for artificial intelligence languages. They will spend £3.75 million of their total £350 million over the next five years on a project involving private industry, universities and government research laboratories. A team of around 30 experts will be led by Mike Todd of GEC, with the academic side being co-ordinated by Cliff Pavelin of the Rutherford-Appleton Laboratory. The work will centre on Edinburgh University's DEC-10 Prolog and Imperial College's Microprolog.

The directors are keen to establish firm ties between academic products and software houses which can sell them, as has happened with Sussex University's Poplog and Systems Designers. GEC will be closely involved in the project, and will be keen to get its hands on tools to run on its new Series 63 machines, so that they can offer the same rich working environment that is available on DEC's Vax.

Chairman of the steering committee, David Thomas of Alvey directorate, says: "Setting world standards is a pretty ambitious target, but we have to aim towards it. There is a fair amount of chaos in artificial intelligence at the moment and there are far too many dialects. Now there is an opportunity for Britain to lead in standardization."

Britain has lagged behind the US in the development of Lisp, but is better placed to take on the challenge with Prolog, in which it is still the leader, despite the Japanese Fifth Generation effort. With Prolog, the UK is "in the driving seat," as Thomas puts it.

Thomas says the work will be spread over the full five-year term of the programme, though some results should start to emerge after three years. The artificial intelligence languages would become tools for further schemes in the realm of intelligent knowledge-based systems and software engineering.

The directorate intends also to support the real time languages Pascal, Ada and Modula-2.

It has just spent £2 million on hardware - after buying 10 GEC Series 63s late last year, it has added to this five Systime 8750s. (Computer Weekly, 9 February 1984)

UK: Alvey goes private for small firms' funding

Alvey Programme director Brian Oakley has widened his initiative to encourage private funding within the Alvey programme. Last week he made a presentation to a dozen UK venture capital groups to explore the possibility of them backing companies taking part in Alvey projects. Oakley said he was anxious to involve "good small firms who can't meet the 50% contribution requirement. At the moment the number of small firms is not particularly impressive". Although he didn't expect venture capitalists to fund research and development as such, he hoped that "if there is a small company that we want to involve, then that very fact might encourage venture funds to take an interest". ... (Computer Weekly, 1 March 1984)

UK: Alvey shows how to solve skills crisis

The Alvey Committee is to lead the way in trying to alleviate the UK's crippling shortage of graduates with computing skills. It has launched a major new scheme, with the backing of GEC, Plessey and Racal, to retrain non-computing graduates, and to teach new skills to existing staff. A non-profit company will be set up to co-ordinate the venture. Alvey will put up some money for pump priming, but several million pounds will be needed from industry. Alvey director Brian Oakley hopes that more companies will lend their support to the scheme. Professor John Sparkes, seconded from the Open University to get the scheme started, began work last week. He is expected to convene a conference of all interested parties in the summer. Video aids will feature strongly in the scheme, with material covering everything from TOPS-style introductory courses through to "talking heads" lectures on specialist subjects. Bob Kowalski of Imperial College has already agreed to do one on artificial intelligence.

Oakley has been critical of government spending cuts in higher education, which he believes will result in serious computing manpower shortages over the next three years. "It is too late to avert a serious crisis over the next three years now," Oakley says, "but if the government is serious about the sunrise industries, it must do something urgently so we have enough people by the end of the decade."

Trade and Industry Secretary Norman Tebbit said in a paper submitted last week to the National Economic Development Council (NEDO) that the UK lags behind its main industrial competitors in terms of output of trained engineers and technologists, and in terms of job opportunities open to them. He credits the government with taking "some important steps over the past two or three years to increase the supply of engineers and technologists from universities and polytechnics". But he warned that employers must play a more active role in signalling their needs to the education system and in providing opportunities for those who acquire technological qualifications. ... (Computer Weekly, 15 March 1984)

UK: Firms get help to teach the world

The government is to back UK microcomputer companies in tackling world education markets. The Department of Education and Science (DES) is helping firms which have produced equipment and materials for the Microelectronics in Schools Programme to export these products. But there is still no decision on a Department of Trade and Industry multi-million pound scheme to establish the UK as a world leader for educational software. The scheme, expected to be announced this month, was mooted to develop software for secondary schools. It would follow-up the successful Microelectronics in Schools' Programme.

Education minister Bob Dunn said this week the DES would help by providing advice, organizing teacher training, developing software and co-ordinating equipment provision.

The British Council has also helped with setting up exhibitions in Italy, Spain, Germany, Saudi Arabia and Singapore. And the DES receives delegations from overseas and takes them to see the way micros are used in schools. A catalogue of all this material has been set up by the DES, which is now in the process of establishing a national computerized database to allow easy access to up-to-date information. (Computer Weekly, 22 March 1984)

UK Government approves MISP II

Government funding for new technology has been increased by some £180 million. In a Commons statement on the final day of the Budget debate, Trade and Industry Secretary Norman Tebbit outlined the new measures:

£120 million to continue the Microelectronics Industry Support Programme, now to be called MISP2, until 1990;

£12 million to carry the Software Products Scheme through mid-1985. It has used the £25 million already allocated to it;

£20 million for advanced manufacturing technology. An allocation of £35 million for the present Flexible Manufacturing System Scheme is close to being committed;

Information technology centres to be increased from 150 to 175;

Extension of the Design Advisory Service, with another £5 million for the Quality Assurance Advisory Scheme. Special provision for the clothing, footwear, and textile industries to encourage the use of advanced technology at a cost of £20 million over four years.

The original funding for MISP, * which was launched in 1978 to encourage the microelectronics manufacturing industry, is exhausted. Information Technology Minister Kenneth Baker, who gave details of how the new money would be spent, said MISP will have supported 160 projects and stimulated investment of £270 million in 40 companies. Baker said the new funding would develop production and use of microelectronic components, and underpin the Alvey and Esprit programmes. More than half of MISP2 will finance industrial capacity to supply equipment used to make semiconductors. Baker said the government is encouraged by the way the industry has responded to MISP. He claimed that the UK would produce integrated

* See also Microelectronics Monitor No. 2.

circuits worth £300 million in 1985, while consumption of microelectronics has risen from 20 per cent of the European whole in 1980, to 29 per cent in 1983, and now exceeded that of Germany.

Baker said the new money is "catalytic," and he estimates that MISP2 will help inspire total investment of £600 million. The software products scheme is to be refocused with two priorities: it will support products that seem to have major export potential, and secondly, it will encourage development of software productivity tools. ... (Computer Weekly, 22 March 1984)

USA: Silicon Valley teach-in for the French

French President, François Mitterrand, and a large entourage of scientific and business advisers went to America's fabled high-technology heartland just south of San Francisco last week to learn why Silicon Valley has been so successful. They went away with plenty to mull over, including some criticisms of the French approach to high technology.

The visit was brief, less than two days, but it was more than symbc'ic. France wants to establish itself as Europe's high-technology centre. The Mitterrand government has so far set aside $5 billion for the task.

Mitterrand met a bevy of Silicon Valley luminaries, including the executive heads of Hewlett Packard, Intel, Genentech, and Apple, who told him how the place ticked. They gathered at Stanford University in the partially completed centre for integrated systems (CIS), a new centre that is being billed as the world's largest joint research effort in microcircuits and related fields by industry, government and academia in the US.

J. Gibbons, a professor of electrical engineering and chairman of the CIS Executive Committee was disturbed by some of what he heard. "You can't create a Silicon Valley by merging little companies into larger ones. Big firms don't take chances. The government is going to have to spark the small entrepreneur." Also, the French should send more students to business schools rather than to technical colleges so that they can learn the management side of small businesses.

At the meeting, Mitterrand heard a similar message from the co-founder of Apple, Steven Jobs: "In France, most of the extremely bright students out of college don't think even once about starting their own software companies. In Silicon Valley, a coupling of youthful energy and a good education background with venture capital has produced the software breakthroughs of the last five years." Marketing is also a problem. More software needs to be written in other languages, especially English, to increase the potential market. "Contrary to popular belief," he added, "the Japanese will be extraordinarily good at software once they get the hang of it."

The French education system came under fire too, for not producing enough people capable of writing good software. University education is too theoretical according to Edward Feigenbaum, a professor of computer science and co-author of The Fifth Generation. "Also, French universities do not have enough computer power to provide good experimental laboratories for computer science and engineering."

The CIS was on show as the way the US believes universities will work with industry and government in the future to promote high technology. It will do basic research that one day should lead to commercially useful breakthroughs in microcircuitry.

This is the first and largest of several centres that are springing up. The others are at MIT, California Institute of Technology, the University of Minnesota, the University of Texas, Texas A&M, and the University of California at Berkeley.

But CIS is setting some precedents. To begin with it has some strange bed-fellows. Twenty companies that normally fight each other in the market place are combining to finance the centre. They have all signed cross-licensing agreements, and will share the results of research. Each company has chipped in $750,000 to build CIS. They will each contribute another $100,000 a year toward the research which will be largely funded by DARPA, the research agency of the department of defence.

The philosophy behind CIS is that microelectronics has become too complicated for the materials and the computer scientists to work on separately. At CIS those interested in the physics and theory of circuit design will work alongside scientists and engineers who design and use microelectronic equipment.

More than 70 scientists from five disciplines - electrical engineering, computer science, materials science, applied physics and radiology - will work at the centre and apply for research grants. They will choose research scholars, from the 20 companies backing CIS, to work on the research which will be published and made available to outside companies. (New Scientist, 5 April 1984)

Zimbabwe students get that "Matey" feeling

The University of Zimbabwe has bought 13 microcomputers worth more than $50,000 from NCR. It will be the first time that students in the university's computing science department have had access to microcomputers. The department was formed seven years ago to cater mainly for engineering, agricultural and commerce students. The only computer which has been available to date has been the university's mainframe computer.

The head of the Computing Science Department, Professor Phil Ridler, who was instrumental in securing the NCR computers, said the new equipment would greatly facilitate the work of the department. "The department itself is limited to 50 students by a shortage of lecturers, but more than 200 other students are expected to make use of the new equipment," he said. Professor Ridler said that NCR had followed the precedent set recently in the US where the computer industry was making computers available to universities and students at large discounts. "If it had not been for the generous discount offered to us we would not have been able to purchase these microcomputers which we need so badly," he said.

NCR's marketing manager, Alan Townsend, said his company felt it was vital that students at the university should have access to the most up-to-date computers available as the rapidly expanding local computer industry depended on the university for graduates in this field. "We have supplied one of the most modern microcomputers on the market - the Decision Mate V - as we feel it is essential that students should have the opportunity to keep up with overseas developments in the sphere of computer technology," he said. (Electronics Weekly, 7 March 1984)

GOVERNMENT POLICIES

The Federal Republic of Germany plans DM3 bn for dp projects

The Federal Republic of Germany may not have been first off the mark in launching a concerted programme of high technology research, but its initiative looks to be the most ambitious so far. The German Government's plans to spend DM3 billion (about £800 million) on information technology over the next four years put the UK's Alvey funding - £350 million over five years, £200 million of it from the Government - in the shade. They even dwarf the Japanese fifth generation project, which has been estimated at £600 million over 10 years, although, in its first two financial years to 1984, only £8 million was made available. More spectacularly, West Germany is spending nearly twice as much on its domestic high tech programme as the EEC is spending on Esprit.

The programme is the brainchild of West German Chancellor Helmut Kohl, who first announced plans to make Germany spend its way ahead of the Japanese and US competition in his maiden speech last May.

The plans have features in common with both the Japanese scheme, which began in 1982, and with the UK's Alvey programme, which finally got under way last year. All three projects stress the need for collaboration, between both industry and government, and industry and industry, to reduce the cripplingly high costs of high technology research. At the Japanese Institute for New Generation Computer Technology, a team of engineers, from private industry as well as from government, has been at work since June 1982. This is a new departure for the Japanese. Before the fifth generation project came along, the Ministry of International Trade and Industry fostered technology research by giving contracts to individual Japanese companies. According to the rules of Alvey, at least two companies must work together on any given research project, and preferably more.

Now West Germany is taking the same tack. According to an official at the German Ministry for Research and Technology: 'We have ceased promotion of single companies.' Industrial companies will be encouraged to apply for money for research projects along with a research organisation. As in Alvey and Esprit, 50 per cent of project funding will come from industry.

The Japanese caused a lot of raised eybrows in 1982 when they announced that the fifth generation project was intended to develop technology that might not be turned into marketable products for 10 years. Now both Alvey and Esprit have acknowledged the need to look to the longer term. The FRG programme has been seen as yielding more immediate results, but it, too, is highly concerned with the development of advanced technologies.

Of the DM3 billion total, DM200 million has been earmarked for molecular electronics research and DM90 million for integrated optics. The data processing budget has been more than doubled - it was previously about DM50 million a year. Now DM520 million has been allocated for the four year life of the programme. This breaks down into three areas: DM160 million for new software technology, DM160 million for new computer architectures, and DM200 million for expert systems and pattern recognition.

DM320 million goes into a programme to develop peripheral devices, such as sophisticated sensors, for microcomputers; DM90 million to computer-aided design systems; and DM90 million to key components. But the biggest single slice of the funding - DM600 million - is to go into very large scale integration research. This is not entirely surprising, since the Federal Republic of Germany is Europe's biggest user of microchips, and the third largest user in the world after the US and Japan.

Though Germany is spending an impressive amount of money on its high tech programme, officials at the Ministry for Research and Technology were anxious to play down the purely financial side. This is possible because of the limited success of two earlier IT projects which, despite generous funding, failed to achieve their objectives.

The Ministry sees the present programme as 'an entirely new concept' in that it will involve all the government departments working together to develop a national climate more favourable to technological innovation. As a Ministry official put it: 'We want to get the message across that the promotion of information technology is not just the duty of this ministry - everybody's got to work together.'

The new feature of the DM3 billion programme is that to qualify for a 50 per cent grant from the government for IT projects, companies must collaborate. The emphasis of the programme, which starts this month, is on applications for the market place rather than on fundamental long-term R&D.

"This is not just a case of spreading money around with a watering-can," says Günther Möller, director general of the European Business Machines Manufacturers' Association (Eurobit). "It is linked to strict conditions to combine industry and research and it is a completely new philosphy for us." Möller added that the German Ministry of Research and Development had brought in outside consultants, Arthur D. Little and SRI International, to work out why government subsidies given to IT in the past had failed. "They found that direct cash subsidies to single firms was a mistake," he said, "and that philosophy has been avoided this time." While welcoming the move, Möller says that the cash is still not as much as he would like: "It is not tremendous compared with the Netherlands," he said. "Nevertheless, the programme is very positive for the German computer industry, and we were consulted from the beginning." (Computing, 29 March 1984 and Computer Weekly, 22 March 1984)

India plans hi-tech telecom development

The Indian Government has decided to try to develop its own indigenous technology for manufacturing advanced electronics telecommunications equipment within the next four years, despite widespread international scepticism about whether this can be done. The decision has been sparked by a growing determination for both prestige and economy reasons to prove that India can design and operate its own major technologies. The government has been offered technological help by the British Government and by groups of Indian telecommunications experts living in the U.S., and it has authorised the immediate creation of a national centre for electronic switching to develop a pilot factory. A recent cabinet decision to go ahead with the project coincides with the final stages of negotiations between the Government and Cit-Alcatel of France on the second of two controversial contracts setting up three electronic digital switching factories in various parts of the country. These projects form part of a massive expansion of telecommunications in India aimed at transforming the country's chronically bad telephone communications which at present hamper economic development and industrial efficiency. The communications ministry has prepared a $12.5bn investment budget for India's seventh five-year plan 1986-90 which is more than five times larger than the 1980-85 planned investment. It is expected to gain approval for at least 75 per cent of that amount when the overall plan is finalised in the middle of this year. In the large scale telecommunications switching field, the Department of Electronics has persuaded the Department of Communications to attempt to develop India's own digital switching technology for use in a fourth factory it wants to have in production by 1988, as well as importing the Cit-Alcatel technology from France.

The idea arose about a year ago, partly as a result of an approach by an Indian electronics engineer living in the U.S. to the Indian Government. The Government also intends to consider an offer of help from the British Government based on GEC technology. The budget allocated for the new switching centre, however, is small at only $35m for systems development. Officials believe it may be sufficient if maximum use is made of the help offered and of relatively low-paid Indian software engineers. A pilot production factory is to be set up on a site which will be chosen soon, but no final decision has yet been taken on the main factory's development.

In the meantime CIT-Alcatel is going ahead with contracts it has won. The first is worth about $60m to $70m for a new factory costing a total of about $170m at Gonda. In an industrially backward part of the northern state of Uttar Pradesh near Lucknow. It is scheduled to start production next year and turn out 500,000 lines of switching equipment by 1989. Cit-Alcatel is now finalising negotiations and the French Government is concluding financial aid arrangements on a second contract for another large 500,000 line factory subject to approval from the Indian Government's public investment board. The site is at Bangalore, India's traditional telephone industry centre where Cit-Alcatel had hoped to build the first factory before it was diverted to Uttar Pradesh. There have been problems in recent months over the price of this contract which is likely to be well above the $60m to $70m of the first factory although the total project cost will be lower because Bangalore is a developed industrial area. (Financial Times, 24 February 1984)

India's strategy for a self-reliant electronics industry

Prime Minister Indira Gandhi recently supplied parliament with details of a strategy to develop a modern and self-reliant electronics industry. The plan includes industrial licensing policies to promote techno-economic considerations and volume production at the most economic level in setting up new units. The scheme also calls for the reservation of 24 electronic products for manufacture by small-scale units, the establishment of electronic test and development centres to help small-scale units upgrade their product quality, and the promotion of quality consciousness through seminars. The government is also promoting research and development in key high-technology areas such as microwave tubes, silicon, and main-frame medium-size computers. In addition, centres of excellence are to be established in frontier technologies and applications of electronics in fibre-optics, telematics, agriculture and education.

According to an official statement, Indian officials have decided that mini-computer and micro-processor based systems will be one of the major thrust areas of growth for computers in India. This computer strategy is expected to lead to significant cost reductions, design simplifications, and improved industry flexibility.

Foreign technical or financial collaboration for high performance peripheral units will be permitted only in exceptional cases in which it is 'demonstrably in the interests of quality and sophisticated electronics development'. Foreign brand names will be allowed for the explicit purpose of promotion of export sales. However, indigenous brand names will have to be evolved for the domestic market, according to the government. (New Delhi, IPS, 10 March 1984)

APPLICATIONS

Microchip holds key to grain dryer

Canadian Farm Tec Systems, a small electronics company in Waterloo, Ontario believes it has come up with a computerized control system to dry grain more efficiently than anything available. North America produces billions of tonnes of grain a year which all has to be dried. Allan Niziol, part owner of Farm Tec, figures there are at least 6,000 commercial grain dryers in North America. If the new system sells at an average price of about $40,000, there is a potential $240 million market to be exploited. There is also the possibility of overseas sales if the new technology is used to dry Asia's huge rice crop.

Grain needs to be dried because it comes in from the field with a high, and greatly varying, moisture content. Corn, for example, usually sells on the market at 15.5 per cent moisture. But when it is harvested, it may contain as much as 35 per cent moisture. The grain is dumped into the top of a tall silo through which hot air is blown from two to three hours. But the dryer may be filled with a dozen or more truckloads of grain, each with a different moisture level. And, up to now, there has been no way of adjusting the heat and rate of flow inside it to allow for the moisture variation.

Inevitably, some grain gets over-dried, which means energy has been wasted, the grain loses weight and so the seller has less to sell. Farm Tec concluded that it needed a series of sensors located at different stages in the dryer to measure temperature and moisture content. Information would flow into a computer, which would adjust temperatures and the rate of movement through the dryer to allow for varying moisture levels. The sensors were no problem; they had already been invented. All that was needed was the computer program, and that took two years to devise.

The program is burnt on a new microchip that fits a standard IBM microcomputer. The computer analyzes information constantly, adjusting the dryer's performance as necessary. Farm Tec's first working system is running in a grain dryer at the Hensall District Co-op near London, Ontario. Mr. Niziol says preliminary results indicate the system should pay for itself within the year. Co-op operations manager Paul Ducharme calculates the co-op's dryer is putting grain through 10 to 12 per cent faster than before. It is also hitting moisture contents more accurately. (Canada Weekly, 18 June 1984)

Computers move onto the cowherd's patch

There is not much employment for cowherds these days, but prospects look even dimmer, for the time is not far off when much of the life of a cow, from feeding and milking to visiting the bull next door, will be controlled by computer. The computer will be able, while the cow is being milked and munching away, to weigh it and assess the quality of the milk it gives, as well as check it for disease. Those cows giving more and better milk will get more feed. The cow may not appreciate it, but the farmer should save a lot on very expensive animal feed, and the consumer should see lower supermarket prices. Already computers play an important role in dairy farming. The National Institute of Agricultural Engineering (NIAE) in Britain is looking at applications for computer software in agriculture and animal husbandry. Michael Moncaster is the head of NIAE's Instrumentation and Control Division, which pioneered work on integrated computer systems for feeding, monitoring, and controlling wandering herds of hunderds of cows. As part of the NIAE's system to automate the dairy parlour, cows are fitted with transponders - tiny boxes of circuitry which they wear around their necks like a cow bell. These give off a particular signal for each cow whenever it walks into an electric field, laid out, perhaps, where it feeds or in the dairy parlour stalls. The farmer's desk-top computer picks up the signal, and the cow's whereabouts are immediately logged and its identity recorded.

Other parts of NIAE's integrated system then come into play. When a cow steps on a weighing pan its weight is automatically recorded in the computer. When the cow moves inside the barn to a milking stall other signals are sent about the amount of milk it is giving, and the computer automatically doles out the rations it receives. ...

Designing software for dairy farms is only one of many projects at the NIAE. Others involve work on a microprocessor-controlled potato planter (a tractor which automatically adjusts the distance of its spraying booms from the ground), as well as development of a variety of management tools for providing better housing conditions for animals.

Today, several companies which sell farm-management programs based on the NIAE's prototypes offer programs for desk-top computers that keep farm accounts as well as large amounts of detailed information about every farm "product". Such programs can keep track of the precise nutritional requirements of every one of hundreds of animals, at every stage of their fertility cycle, and remind the farmer which one is next due to be "serviced". It also tells farmers when to apply fungicides, insecticides and pesticides to their large fields. And a quick look at the desk-top monitor reveals the current price of pig meat on the international market. With such systems, analysis of the cost of raising pigs, balanced, say, against the current market values, can help farmers plan the size of herds sensibly. The Farmfax program can even assess the baking quality of a farmer's grain. Such systems do not come cheap. Each costs between £5,000 and £10,000 to install, and is aimed at the large farming estates. ... (New Scientist, 3 May 1984)

Electronics plants turn to robot vehicles

Automatically guided vehicle systems are on a roll in US electronics plants, as semiconductor firms begin to emphasize domestic chip assembly and computer-hardware makers battle production costs. The move to automate - already under way at such firms as IBM and Texas Instruments - is also spawning new designs in light-load transporters and remote-control techniques. The intent is to make these robot-like material handlers more suitable for electronics manufacturers.

Such a transporter delivers needed parts to the necessary points on an assembly line, pilotlessly nosing its way along an electronic track. Its destination is fed to it from a central controller, which gets delivery requests from the assembly-line points. Loading and unloading can be done in many ways: by anything from a worker to a robot arm. ... (Electronics, 22 March 1984)

'Marie Celeste' to sail the seas again

Penetration of the shipping industry by the computer, seems to become deeper almost daily and in most respects this is all to the general good. Its use in radars and navigation system receivers and other aids is of immense assistance to the man on the ship's bridge, for instance, with the side benefit of making such equipment more agile, reliable, compact and cheaper. For several years now there has been much talk of utilising its capabilities to bring into practical existence the fully automated ship; that is dispensing altogether with human crews, a prospect viewed with horror by hundreds of experienced mariners, shipowners, and marine insurance organizations. Now, it seems, the unmanned ship is very close to becoming a reality. In about a years time an experimental voyage by a completely unmanned ship from Tokyo to Seattle, agreed and approved by shipping organizations and authorities worldwide including that very safety-conscious body the US Coast Guard, is planned under the leadership of Noboru Hamada, head of the Japan Machinery Developing Association. He is the man who developed the method by which the trim of the vertical aerofoil-shaped "sails" is computer controlled to take advantage of every shift and variation in strength of the wind. No manual handling of the sails is therefore necessary while a considerable load is taken off the propulsion machinery, resulting in substantial reductions in fuel consumption. The unmanned ship (which will not be sail assisted) on its experimental voyage will clear the Tokyo area and there after will be controlled by inputs from her navigational radar and ARPA, satnav/Omega and Loran receivers, gyro compass and speed log. These will give her the equivalents of human lookout and position-fixing and pass commands for course-keeping to the autopilot. These facilities will be augmented by visibility, weather, and sea condition sensors. During the voyage she will be accompanied by a fully-manned guard ship which will carry a small navigating crew for manual control of the unmanned ship only in the departure and arrival stages of the voyage or, if necessary, for emergency. This mini-crew will be lifted off by helicopter as soon as she has cleared Tokyo and put on board again for the approach to Seattle so that she is truly unmanned throughout the open-sea portion of the voyage.

This may seem wasteful in fuel and manpower but is to be tried out as a lead up to the later process of running not just one automated ship but a whole convoy of them escorted by one similar guard ship carrying sufficient extra personnel to man each of the fleet for leaving and entering port. Any necessary maintenance work would be carried out by shore labour during stays in port.

The EEC's Sea Technology Symposium held in Brussels recently produced another possible maritime use for the computer in the form of what is being called the European Ports Data Processing Association. In the ordinary way of things once a ship has cleared a port area the authorities there are no longer interested in her while, apart from her owners and those to whom her cargo belongs, nobody much cares about her until she approaches her destination. The EPDPA has very different ideas and with EEC funding has conducted a study on the feasibility and potential benefits of swapping date on shipping between ports. At the port of departure all relevant information about each ship about to sail is passed on via computer terminal/telephone link to the next port of call - data and estimated time of arrival, ship's draught, length and type of berth required, tug assistance needed, the cargo she carries and any special requirements for handling it, etc. The destination port is thus fully ready to receive her on arrival while if this is delayed in any way, as by fog or heavy weather, this information will be passed forward through an on-board database.

The preliminary study project has proved so encouraging that 21 ports in Europe will participate in the next phase which will create an inter-port network of information exchange. Although the EEC is helping with the financing of the project at present it is envisaged that eventually interested parties will pay a fee for the use of the facilities. Moreover, membership will be open not only to port authorities and associated services such as tug officers, pilot stations, and emergency facilities but also to shipowners and shipping and forwarding agents. Undoubtedly it will result in a rapid exchange of useful information and consequently increased efficiency. It does seem, though, that unless in some way it can be made user-selective there will also be a stream of less useful information about vessels and their voyages that is bound at one time or another to be of no interest to many members. Is Rotterdam, for instance, likely to be eager to know all the particulars of a ship leaving Hull bound for Le Havre?

Coming back to the present the US Coast Guard has placed a substantial order with Tracor Instruments, of Austin, Texas, to fit satnav receivers on its entire fleet of cutters. These new receivers are to be integrated with Omega receivers already on board so as to give each vessel a global position-fixing capability which will be particularly useful in areas where Loran C coverage is marginal or doesn't exist at all. Present US legislation under the Port and Tanker Safety Act requires all vessels of 1,600 gross registered tons and over to be fitted with either Loran C or a satnav receiver if they are trading in or entering the US Coastal and Confluence Zone. After June, 1987, a hybrid two-system receiver such as an integrated satnav/Omega set will become necessary. (Electronics Weekly, 15 February 1984)

ABC computer teaches children to read

Elementary schools in San Diego are testing a computer system that phonetically teaches a child to read. The computer relates letters or combinations of letters that are regarded as the building blocks of words to 36 sounds. A voice synthesiser enables the computer to simulate human speech. The system was developed by researchers from the University of Southern California and the University of California at San Diego. It resolves a paradox - it does not require a child to read instructions on the screen in order to start learning to read. Instead, the system draws far more on the child's speaking vocabulary so that the child can decipher words that he or she can already say. It is claimed that after a year of instruction the child will be able to read at least 6,000 words compared with 200 or 300 words learned through traditional instruction which concentrates on the recognition of whole words. The system can also remedy a child's reading difficulties without the teacher holding up the rest of the class. ... (New Scientist, 2 February 1984)

Clues to four murders analysed by computer

A computer program is helping to probe four murders in three different British police forces. The program was developed with West Yorkshire police after criticism over their handling of the Yorkshire Ripper case. For several months the program has run side by side with conventional methods of indexing the mass of information that comes into a force following a "major incident", such as murder. Last week, West Yorkshire police pressed charges against three men for the murder of Noel Murgatroyd, a newsagent who lived near Leeds. The investigation used the program. Now officers will try to discover whether the investigation could have been conducted using the computer program alone.

The program is called MICA - Major Incidents Computer Application - and has been developed by a software company, Issis Computer Services, and a computer manufacturer, Microdata, with the help of West Yorkshire police. Although most police forces have their own computers for storing criminal records and information, these can rarely handle major incidents because of the sheer volume of information that flows into an incident room.

The MICA program is menu-driven - that is, it offers the operator a number of choices of where to go in its data bank. All the people involved in the incident are entered in the Nominal Index. When entering the details, the computer searches to see whether this person, or anyone who sounds like them, have already been entered. One crucial failing of the Yorkshire Ripper inquiry was alleged to have been that reports from several interviews with Peter Sutcliffe, the culprit, were never collated. A more comprehensive Descriptive Index holds more detailed descriptions of people who are entered in the Nominal Index. Details of any vehicles that could be involved in the incident are entered onto the Vehicles Index, and similarly "things", such as garages, "activities" or items found near the incident, can be entered ito the Category Index. Detailed statements of witnesses or suspects can be entered directly into the computer under the Nominal Document Index.

The great advantage of MICA is that it can cross-reference all these indexes simultaneously. Police officers can interrogate the computer to see whether, for example, a red Cortina has ever been associated with a woman wearing a brown coat. In the Nominal Document Index, different statements many thousands of words long can be studied by entering key words. The program will then highlight those sentences where these words appear. With card indexes, this process of cross referencing is very time consuming. MICA also compares two or more major incidents. It can, for example, compare the sequence of events in one with another. So everything that happened on Thursday morning in two seemingly separate incidents can be listed in the order that they occurred. This could give officers working on the two cases a better idea of the events leading up to or following an incident. As one officer said "the hope is to generate new lines of enquiries". (New Scientist, 9 February 1984)

Instrumentation paves way for quality gains in paper production

Microprocessors reduce costs. In every case where Fruin-Colnon has been involved in a mill modernization, expansion, or capacity increase, they have seen the shift to electronic devices as one logical solution toward upgrading existing facilities, regardless of their size and complexity, said Wyszynski. This change over to electronic instruments is making possible a revolution in computerized process controllers and even process simulation. Most mills see this as a first step toward further cost effectiveness.

The next generation of instruments will combine electronic and microprocessor technology. They will be similar in size but capable of performing a much larger number of calculations or operational functions independent from central processors. Single chips will be incorporated into an instrument to control an entire instrument loop. Each instrument will be able to monitor itself and its loop and warn technicians of impending failure or the need for recalibration. Not only can operational downtime be scheduled more effectively, but loss of process control while on the run could be virtually eliminated.

Instrumentation costs will be reduced because wiring will go from these instrument controllers to sensors in a local area only and then a single wire or fiber optic cable will carry information back to control room computer systems. These instruments should provide quicker (real time) and smoother data flow, thus allowing finer process control and narrow-band machine adjustments.

Quicker and smoother response to master parameter changes will effectively result in machine capacity increases while maintaining cost effectiveness and higher quality standards of finished product that consumers will come to expect and demand from the paper industry. (Paper Trade Journal, 30 March 1984)

Japanese medical file saves time

Japanese researchers have come up with a new way of putting digital information on a magnetic tape which has led to a scheme to standardise the storage of personal medical histories. The scheme forms part of the Science and Technology Agency's research on ways of dealing with the problem of Japan's increasing number of old people. Average age is increasing faster than in other industrialized nations. Free medical care after retirement plus the ever-growing tally of available tests are causing the government's medical bill to rocket.

Under the proposed scheme, all a person's medical data, for example, X-rays, electrocardiograms and the results of blood or urine tests, would be stored on the same magnetic medium - probably a disk. People would keep their own disks, which they would take with them to the doctor. Not only would doctors be able to get their hands on correct information more efficiently, they would also be able to give a better diagnosis through comparision with previous results. And tests done at one hospital would not need to be repeated. How the information is to be recorded is the responsibility of Professor Shunichi Iwasaki of the Research Institute of Electric Communications at Tohoku University. For the past seven years he has worked on overcoming the limitations of conventional methods of storing data on magnetic media. His solution is to stack digital pulses upright instead of laying them out horizontally. Iwasaki says that by using this method it is possible to increase the amount of data recorded by as much as 10 times. (New Scientist, 16 February 1984)

Computing pyramids

Clever computer work by French researchers looks like bringing Egyptology to the masses. At the moment only Oxford University and the French Institute of Oriental Archaeology in Cairo are able to print hieroglyphic texts. The variations in size and direction of the 7,000 signs commonly found in hieroglyphics means that it takes something like a week to set up eight to 10 lines of text. This means around 108 years to publish the hieroglyphics contained in nine Egyptian pyramids.

Now a Frenchman, Michael Mainsworth, has devised a system to turn each hieroglyph into digital signals. This is done by making a video picture of the hieroglyph and storing it in a microcomputer. The character can be digitised in five to 10 minutes when displayed on the screen. It can then be manipulated or printed on a standard plotter connected to a central computer. The original idea was for the micro to analyse and search through the text. Printing was only a secondary application. But given the huge cost of printing with conventional methods (about £80 per 300-page book in a 300-book run), the new system may have a commercial future. Instead of the 108 years needed to print the hieroglyphs in the nine pyramids, the new method will take 10 years. (New Scientist, 16 February 1984)

Automatic hotel

Guests arriving at Tokyo's newest hotel are greeted by a row of vending machines. The automats are there to check guests in and out. The hotels is called the Shinjuku Washington, and with 1,300 rooms is the largest in a chain of 25 similar hotel in cities around Japan. To keep prices down rooms tend to be small, and staff are replaced as far as possible by armies of vending machines. To check-in guests fill out a form and insert it into a machine. A picture of a girl bowing in welcome then appears, while the machine checks whether the guest has a reservation or not. To confirm that the reservation is correct the guest pushes a button. If there is no reservation a list of the types of room available appears at the push of another button.

Not surprisingly hotel policy requires prepayment in full, plus a refundable deposit to cover extras. After the guest has inserted cash the machine issues a credit-card sized key which has a magnetic stripe on the back containing the door code. The whole check-in procedure takes about 45 seconds. The card also turns on the airconditioning, heating and lights in the rooms and turns anything off when removed to prevent energy wastage. When the key's validity expires, the hotel's computer changes the door code, so then it is back to the automatic check-out for the visitor. This time when the card is inserted the automat displays an itemised list of room charges and refunds the balance of the deposit before issuing a receipt to the departing guest. (New Scientist, 15 March 1984)

SOFTWARE

Software-institute plan spurs heated interest

In August, the U.S. Defense Department will announce the site for its new Software Engineering Institute, which is expected to spend up to $50 million a year. Some $8 million is budgeted for 1985, and a request for proposals from academia will be published in May. With strong congressional interest in the institute and its site being expressed, the teaming of universities and computer companies contributing equipment is also expected to create some heat as hardware and software makers push to get the institute to use their technology while legislators push the interests of their constituents. Designed to give the Pentagon an in-house software design, evaluation, and test capability the institute expects "to accelerate the transition of emerging or advanced computer-software technology into use in the development and maintenance of DOD weapons systems," according to Lt. Col. R. J. Almassy, the department's computer-software director. Among the universities with significant investments in computer technology preparing for the competition are Carnegie-Mellon, Texas, and Maryland, plus a consortium of Illinois, Ohio State, Michigan, and Purdue. (Electronics, 5 April 1984)

UK: Alvey Directorate issues new software strategy

An Information Systems Factory by 1989 is the key element of the Alvey software engineering strategy, which is published this week. The strategy rests on the argument that market conditions will be more significant than technical excellence. The emphasis of the paper, published by the Alvey software director David Talbot, is on improving the country's balance of payments by developing tools to help programmers. Software engineering is one of the four areas selected by Alvey for development efforts. The others are VLSI, man-machine interface and knowledge based systems. ...

If the attempt comes off, 1989 should see Britain in possession of an integrated project support environment (IPSE). This has been defined as a set of specification, design, programming, building and testing tools that make up a language-independent development methodology. The tools should use the same project data-base and be governed by management control tools throughout the software life cycle. ...

The economic importance of the effort is stressed by calling for a close monitor of the UK software import bill, especially the import of tools. At the same time, the value of the capital being used by every programmer in the country should be tracked. And techniques should be formalised for measuring programmer productivity, says the report.

The Alvey directors have taken on their own shoulders the responsibility for persuading British managers to regard the use of the new software tools as normal practice. The software engineering five-year budget totals £65 million, with around £38 million support from government. It will be run by a small management team from public and private sectors who will farm the work out to others. Incorporation of the real-time language Ada into the scheme has been ruled out.

As far as innovation is concerned, Talbot urges that the scale of UK research must be increased to compete with international competition and to introduce better co-ordination. Innovation should be aimed at backing a number of promising approaches and testing them on life-size projects, rather than trying to evaluate them on apparent success in small-scale use. (Computer Weekly, 8 December, 1983)

Use of software in engineering in the UK

The Engineering Computers survey of industry's level of computerisation revealed that the range of applications is expanding rapidly as more users realise the potential of computers, and as proven software becomes available across the complete engineering spectrum. So to make the most of our survey, it is worth looking at the software league table to see where you stand, and to look particularly closely at those application areas which you have not yet entered.

Significant numbers of firms have implemented computers in most areas of manufacturing, and teething troubles have been largely overcome by at least some suppliers.

Of the 6,776 UK plants using, or about to use, a computer for engineering purposes, between 33 and 71 per cent have one or more of the key manufacturing control modules such as (in order of popularity) stock control (71 per cent), costing, sales order processing, purchase ordering, materials requirements planning, estimating, shop-floor loading, master scheduling and capacity planning (33 per cent).

More and more firms, it seems, are recognising that they need more than a team of production planning clerks armed with Gantt charts to balance the complex equation of the amount of money tied up in stock and work-in-progress with the ability to meet customer needs on time and at minimal cost. Computing power and software for these vital management functions has never been so cheap or plentiful, and the potential benefits will certainly outweigh any that can be achieved by an equal investment in production machinery.

A particularly buoyant area in the developing production engineering field is that of computer-aided programming (CAP) of NC and CNC machine tools. Olivetti (which made a very early entry into this market) is the number one supplier followed closely by Hewlett-Packard and the ubiquitous Commodore.

It is not difficult to see why CAP is, and will in the next year, be used by 24 per cent of users. An earlier study by Engineering Computers noted that from only a handful of suppliers a few years ago there are now a couple of dozen packages and systems offering benefits such as:

Time savings of up to 10:1 over manual programming;

Reduced programming errors;

Less prove-out time on the machine; and

Quick and easy modifications when design changes are needed.

There has been phenomenal growth in packaged software for all application areas. Just a few years ago the number of standard packages would probably account for about 10 per cent - the remainder being tailor-made or developed in-house. The survey shows, however, that across a range of over 30 application areas, 32 per cent of companies opted for the easier, low-cost route of using standard packages (this includes modified standard packages). This will increase to 38 per cent within a year. ... (see also table on page 48) (Engineering Computers, January 1984)

Indian Software

Five more computer manufacturers have made plans to establish software exporting subsidiaries in India's Santa Cruz Electronics Export Processing Zone (SEEPZ), in Bombay. The five firms are Usha Rectifiers, Digital Innovations, Indian Computing, Ghadiali Ltd., and Kapoors Ltd. This brings to 12 the number of software exporting outfits in the SEEPZ. Patni Computer Systems, Intime Computer Systems, and Blue Star Ltd. have recently set up shop there, and Tata Burroughs, Tata Consultancy, Datamatics, and Systime Computer Systems are well established. Exports of the last four totalled US$1 million in the fiscal year ending March 1983, and they are expected to rise over 50 per cent by the end of fiscal 1984-1985. The new units are expected to generate $9 million in exports within five years of start-up.

V. S. Gopalakrishnan, SEEPZ Development Commissioner, says that Indian software exports are becoming attractive for two major reasons. First, India has a large pool of technical talent. Second, it is easy for software firms to obtain space at the Zone, even without firm orders. Manufacturing space in the Zone is hard to get, however. New operations must now wait as long as two years for new buildings to be built.

United Kingdom

Software users league table

Application areas	Total companies %	By company size (number of employees)				
		1-99	100-199	200-499	500-1999	2000+
Stock control	71	55	73	74	84	72
Costing	69	51	75	73	78	62
Sales order processing	56	41	58	63	75	44
Purchase ordering	52	38	49	49	66	62
MRP	49	27	46	58	75	67
Estimating	43	34	42	31	41	51
Shopfloor loading	39	21	35	47	57	59
Master scheduling	36	15	39	48	56	59
Capacity planning	33	13	37	40	46	49
Design calcs	33	26	27	31	33	44
Documentation/word processing	32	26	23	21	34	41
NC/CNC programming	24	27	11	14	23	26
Data capture	22	8	19	29	39	56
QC/inspection	18	10	13	27	26	31
Draughting	18	9	8	14	22	28
Engineering analysis	16	10	10	12	21	33
Design graphics	11	3	4	9	20	26
Process control	11	7	13	13	13	8
Maintenance	8	4	1	8	17	18
Elect design calcs/simulation	7	4	5	6	11	21
Process planning	5	3	5	4	8	15
Surface modelling	5	2	0	3	5	15
Solid modelling	4	2	0	4	4	18
PCB design	4	[illegible]	1	3	9	10
Robotics/automated manufacture	4	2	1	5	3	3
Storage/handling	4	3	4	3	4	10

(Engineering Computers, January 1984)

Some Indian companies are establishing joint ventures for software development and export. Blue Star has teamed up with Hewlett-Packard to provide software to H-P's Middle East and Far Eastern installations, and Thermax is working with Productive Information Management to program in Ada, the US Department of Defense's new high-order standard computing language. Gopalakrishnan says software represents a great potential for India, if only the country can develop more computer literacy. According to one projection, by 1990 worldwide micro-computer software business could total $25 billion. He suggests, if India can tap just one per cent of that market, "we can earn $250 million per year in software exports alone".

Chinese Software

SINOAM, a firm headquartered in the northeastern San Francisco Bay Area community of Walnut Creek, is providing American companies with a direct connection to cheap foreign professional labor. SINOAM says it has contracted with three organizations in Beijing and Shanghai, in the People's Republic of China, and that it offers the programming services of over 250 computer science graduates. (Silicon Valley Tech News, 20 February 1984) (As reproduced in Global Electronics Information Newsletter, March 1984).

Spelling it out in Arabic

With one quarter Mbyte of memory on even the least sophisticated business machines, software designers are no longer constrained by computer hardware. High density Winchester disc storage and graphics-quality video displays ensure that the creative talents of system designers can be used to the full. It is only at the output stage of a computer system that the limitations start to appear. Until the laser printer - with its 90,000 dots per square inch scanning resolution - falls to a quarter of its current price in the market, electromechanical impact printers will remain the link between applications software and hard copy.

The problems of interfacing a computer with an impact printer are minimal - provided that the output is to be in a "conventional" language, like English or French. A handful of keys for accented characters is the limit of the changes required to make a system saleable across the western world. Problems only start to arise when users demand that information on their terminal and at the printer appears in a medium like Arabic. With a market for word processors and business systems in the Arab communities worth an estimated £250 million during 1984, however, suppliers must be able to overcome any technical hurdles and meet these requirements.

Displaying Middle Eastern character sets on a video screen, and generating printed output to an acceptable standard, introduces a complication for peripherals - the degree of processing required at the output stage to accommodate subtle changes of character shape within a word. "Contextual analysis" is the software routine which a word processor or business system undertakes automatically to adjust the shape of each character. Both the terminal and the printer have to recognise the context in which each letter appears and modify the characters without operator intervention. Character shaping on the computer is achieved either as a feature of the application software or by modifying the operating system to support Arabic. The first route has been taken by companies writing bilingual packages for the IBM-PC, but it cannot restructure PC-DOS.

Falcon Systems of Maidenhead is one of a handful of systems houses which have extended the operating system - in this case CP/M-86 - so that software originally written for an English system runs transparently in both languages. Dr. Faez Tuma, managing director at Falcon, explained that the real problems with Arabic arise at the printer stage. "While a low-resolution dot matrix may produce tolerable English characters, it rarely generates acceptable Arabic. These machines cannot offer the flowing style and deep character tails which are characteristic of the language."

How a printer handles context analysis depends on the degree of intelligence in the device. Perhaps the best example of an intelligent machine is the Santec multi-media printer. Its Arabic typeface chips handle their own contextual analysis: the application package sends a character down the line and the printer logic deduces the correct shape before output. Tuma says problems can occur with less sophisticated machines. "Dumb matrix printers work from a fixed character set, so the context analysis must be handled at the computer. Relatively few of them will allow an Arabic font to be down-loaded." The intelligence of printers like the Santec S700 needle matrix creates its own obstacles. The context algorithm treats the last character in a word which is followed by a full stop or a comma as though it were a medial character: the punctuation mark prevents the system setting it in the correct final form.

Provision may have been made for punctuation in the application software, but this cannot override the logic in the printer font chip. As Faez Tuma commented: "What we require is either less intelligence or more flexibility!" (Computer Weekly, 26 January 1984)

Ada Conference

Mike Rogers, of the Common Market's Esprit programme, said at the third Ada UK conference at York University that Japan was making significant use of Ada in its fifth generation effort as well as of the more-publicised Prolog. Ada would be available before the revised version of Prolog, he said, and it was already claiming that the language gave a 27 per cent improvement in programmer productivity. ...

Outlining the EEC's Ada schemes, he said they intended to launch the development of a full-scale Ada program support environment (APSE) and to back research into applications for manufacturing and telecommunications and into formal definitions. They were looking into setting up a European validation service similar to that of the US Department of Defence. ... (Computer Weekly, 19 January 1984)

Software suppliers meet

A new industry is emerging dedicated to the development of Ada applications softwre. Ada proponents like the language because it allows use of application programs on any computer model, making programmers independent of computer hardware. Adding to its credibility is support from IBM and Intel. Since Ada is so comprehensive, however, it is not among the most user-friendly computer languages. Its critics believe it will never become widely used by the programming community. The US Department of Defense (DOD) has spent some $20 mil on Ada development, and it expects to save $24 bil by 2000 from use of Ada. The DOD is in a position to make Ada mandatory in development of embedded computer systems, whose software may cost $4 bil in 1984 alone. Since DOD is the largest software consumer in the world, its preference for Ada is being closely watched by software companies. Some vendors are setting up specialized shops developing Ada programming tools, workstations and training programs in anticipation of a market takeoff in 1986, which may reach $1 bil well before 1990. (Computerworld, 2 June 1984, as reproduced in Technology Update, 25 Febuary 1984).

Glossary of some software terms *

Most of the following definitions of software terms are taken from IEEE St. 729-1983 "IEEE Standard Glossary of Software Engineering Terminology", published by the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017, USA. Explanatory remarks are added.

ADA: A new programming language for real time applications.

algorithm: A finite set of well-defined rules for the solution of a problem in a finite number of steps; for example, the set of rules which have to be followed in the solution of a mathematical equation.

application software: Software specifically produced for the user of a computer system; for example, a payroll program or a program for the control of a specific machine. Contrast with system software.

assembly language: A machine specific language whose instructions usually in one-to-one correspondence with the hardware instructions of the computer.

BASIC: A programming language which is simple to use.

C: A programming language for systems programming, mainly in UNIX.

COBOL: A programming language used for commercial programming.

change control: The process by which a change to the software is proposed, evaluated, approved or rejected, scheduled, and tracked.

command language: A set of procedural operators with a related syntax, used to indicate the functions to be performed by an operating system. Synonymous with control language.

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* Source: UNIDO/IS.440. - Guidelines for Software Production in Developing Countries by H. Wkonetz.

comment: Information embedded within a computer program command language or a set of data that is intended to provide clarifications to human readers and that does not effect machine interpretations.

compile: To translate a higher order language program into a form which can be executed by the machine. The corresponding translation program is called a compiler. Contrast with assembler, interpreter.

concurrent processes: Processes that may execute in parallel on multiple processors or asynchronously on a single processor. Concurrent processes may interact with each other, and one process may suspend execution pending receipt of information from another process or the occurrence of an external event.

data: A representation of facts, concepts or instructions in a formalized manner suitable for communication, interpretation or processing by human or automatic means.

data communication protocol: A set of rules defining the data structures and the duration between events for the communication between computers.

design: The process of defining the software architecture, components, modules, interfaces, test approach, and data for a software system to satisfy specified requirements. Also: the results of the design process.

efficiency: The extent to which software performs its intended functions with a minimum consumption of computing resources.

embedded computer system: A computer system that is integtral to a larger system whose primary purpose is not computational; for example, a computer system in an aircraft control system.

execution: The process of carrying out an instruction of a computer program by a computer.

failure: The termination of the ability of a functional unit to perform its required function.

fault: An accidental condition that causes a functional unit to fail to perform its required function.

file: A set of related records treated as a unit.

FORTRAN: A programming language for scientific applications.

functional decomposition: A method of designing a system by breaking it down into its components in such a way that the components correspond directly to system functions and subfunctions.

functional specification: A specification that defines the functions that a system or system component must perform.

hardware: Physical equipment used in data processing as opposed to computer programs, procedures, rules and associated documentation. Contrast with software.

interface: A shared boundary between two or more subsystems or a system and its environment. A specification that sets for the interface requirements is called an interface specification.

language processor: A computer program that performs such functions as translating, interpreting, and other tasks required for processing a specified programming language; for example a FORTRAN processor, a COBOL processor, etc.

LISP: A programming language for Artificial Intelligence applications.

machine language: A representation of instructions and data that is directly executable by a computer.

PASCAL: A programming language for teaching programming.

procedure: A portion of a computer program which is named and which performs a specific task.

project plan: A management document describing the approach that will be taken for a project. The plan typically describes the work to be done, the resources required, the methods to be used, the schedules to be met and the procedures to be followed.

Program: The instructions which tell the computer what has to be done.

Programming language: An artificial language which can be used to express the instructions to a computer.

PROLOG: A programming language for artificial intelligence applications.

requirement: A condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification or other formally imposed document. The set of all requirements forms the basis for subsequent development of the system or system component.

specification: A concise statement of a set of requirements to be satisfied by a product, a material or process indicating, whenever appropriate, the procedure by means of which it may be determined whether the requirements given are satisfied.

security: The protection of computer hardware and software from accidental or malicious access, use, modification, destruction, or disclosure. Security also pertains to personnel, data communications, and the physical protection of computer installations.

software: Computer programs, procedures, rules and associated documentation and data pertaining to the operation of a computer system. Contrast with hardware.

software documentation: Technical data or information, including computer listings and printouts, in human-readable form, that describe or specify the design or details, explain the capabilities, or provide operating instructions for using the software to obtain the desired results from a software system.

software life cycle: The period of time that starts when a software product is conceived and ends when the product is no longer available for user.

source program: A computer program that must be compiled, assembled, or interpreted before being executed by a computer.

system software: Software designed for a specific computer system or family of computer systems to facilitate the operation and maintenance of the computer system and associated programs; for example, operating system, compilers, utilities. Contrast with application software.

testing: The process of exercising or evaluating a system or system component by manual or automated means to verify that it satisfies specified requirements or to identify differences between expected and actual results.

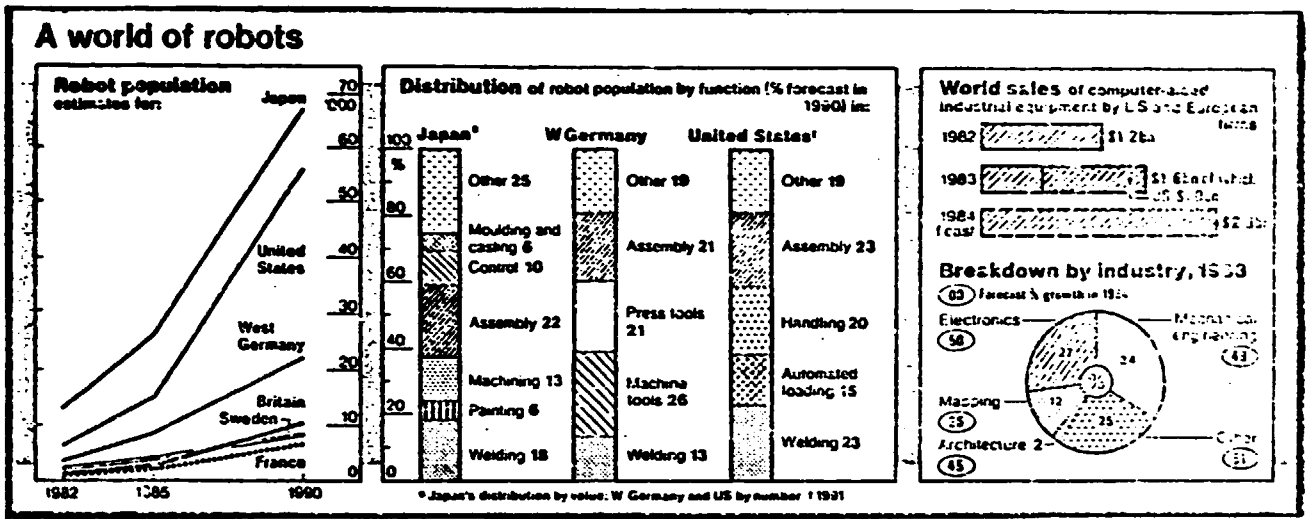
ROBOTICS

BBC wheels in Buggy the robot

The BBC has chosen a robot produced by Economatics, of Sheffield, to complement its highly successful BBC microcomputer (model B). The new educational robot kit has been created by Economatics and the Microelectronics Education Programme (MEP) in conjunction with the Continuing Education team of BBC television. The robot will be called the 'BBC Buggy', and it is hoped that the product will appeal both to schools and to the retail market (negotiations with major High Street stores are underway to establish a nationwide distribution network).

Economatics will supply the BBC Buggy in simple-to-build kit form, complete with all the necessary software. The robot moves around on three wheels and all its functions are controlled by a microcomputer. It can be programmed to move in any direction, detect collisions, search for a light source, follow black and white lines, read bar codes and write (when fitted with an optional pen).

Happily, the introduction of robots has led to an increase in job opportunities in the Sheffield region in this particular instance, since Economatics has doubled its workforce since production of the BBC Buggy began. The BBC Buggy has already been introduced with some success at a number of schools, and the Department of Industry is offering a 50 per cent grant to schools wanting to purchase the BBC Buggy. ... (Electronics Weekly, 14 September 1983)



Sources: Merrill Lynch, OECD

(Reproduced in The Economist, 24 March 1984)

New system for measuring motions of industrial robots

A new system for measuring the motions of industrial robots - analyzing position in relation to points and paths, for example, as well as velocity, acceleration, overshooting and emergency stop behaviour - has been developed in Sweden by Selcom AB, Partille. Called Robot Check, it features a software program developed in close co-operation with the robot industry with the objective of analyzing robot characteristics of interest to both manufacturer and user.

The system makes it possible to run a number of different robot performance analyses, which are presented either as graphs on a plotter or as numbers on a terminal screen. There are also tools for optimizing measurement data.

"Personal liability" insurance for industrial robots

A special "personal liability" insurance for industrial robots has been introduced by Skandia, the Swedish insurance company. A comprehensive insurance which provides compensation for almost all of the damage to which robots and the products they work with may be exposed, it also covers the extra costs a company may bear as a result of production stoppages due to robot breakdowns.

As a consequence of the increased automation of industry, manufacturers have become more vulnerable to expensive production halts. Damaged robots can lead to extensive repairs and lengthy interruptions in operations, which many companies find difficult to cope with. This is because it is often impossible to revert to manual handling while the cost of the investment in robots increases. (Science and Technology, SIP, March 1984)

A dirty job falls to robot technology

Robots will soon be arc-welding seams on cars with the aid of a robotic eye developed at Oxford University. The eye is a visual sensor incorporating a solid-state camera that picks up reflected laser light to form an image of the seam. Robots with vision sensors already perform other tasks, but this is the first sensor that can operate when the robot is welding. Arc welding is one of industry's nastier jobs, which British Leyland for one has difficulty in attracting people to do. Robots area already familiar on the motor industry's shop floor performing such jobs as paint spraying and spot welding. But the task of welding seams has proved too complex for the standard robot. This is because the seam to be welded can vary slightly in width and direction. An ordinary robot is unable to alter its welding to compensate for this lack of uniformity. Two solutions exist. Either the seam is made more accurately than now, or robots are developed w3ith sensors that feed information about the seam to a computer for analysis, and the computer directs the robot to change its welding when necessary.

It was the second solution that robotics expert Peter Davey adopted. With money from the Science and Engineering Research Council (SERC) and British Leyland, Davey and his team at Oxford developed the robotic eye for arc welding. And Davey has now formed a company - Metamachines - to manufacture the high-technology part of the robots. GEC and

Fairey Automation will distribute the robots. Some of the problems Davey's team has faced become clear when you consider that the sensor for looking at a seam is close to the electric arc. The first problem, however, was to feed information about the shape and direction of the seam to a computer in a form it would understand. The solution Davey and his team devised was to fire a slim strip of laser light at the seam. A solid-state camera set at the correct angle picks up light reflected from the surrounding metal and forms a two-dimensional image made up of intersecting curving and straight lines. The camera sends the image back to the computer which compares the reality with an image of what the seam should look like, and then directs the robot to adjust its welding as necessary.

The eye of the robot is protected by filters from extraneous background radiation from the arc so that the camera can register the few milliwatts of reflected laser light. Glass screens protect the camera from flying molten metal, and water cooling keeps the temperature down. The whole assembly sits in a tube 50 millimetres in diameter and is wrapped around the welding torch. As the robot is welding the seam its eye is looking 10 to 12 mm ahead. With the present system the computer processes five images a second and instructs the robot to alter its actions as necessary. The gap width of the seam is measured to an accuracy of 0.2 mm which is adequate when welding together pieces of metal that are 1 mm thick. Indeed BL and Davey's team are sufficiently confident of the latest version of the sensor to predict that the first welding robot with vision will move onto the shop floor for assessment in May or June of this year. (This first appeared in New Scientist of 2 February 1984, London, the weekly review of science and technology.)

An "earthworm" robot for places hard to get to

To be able to move about in 200-mm-diameter pipes at nuclear power plants so as to check or repair welds; to excavate veins of coal for subsequent gasification; in a word, to act in environments hostile to man - such is the ambition of the Ransom. This "spatial mobility and modular organization" robot, a first patented "ring" of which was presented at the Sicob 83 by Professors Demarcq and Lambert, will be an analog replica of an earthworm, from which it has borrowed the form and the peristaltic mode of locomotion. The robot consists of a variable number of identical "rings", and each of these rings, which in turn consist of two "vertebrae" controlled by six "flaps" driven by electric-powered jacks, has three degrees of freedom. Competing robots, mainly those produced in Japan, have the ability to twist in and out of obstacles, but their length always remains the same - they cannot really crawl. An EEE 488 busbar makes possible an exchange of functions between the robot's command module (card Intel 80/84) and the three microprocessor cards governing each section. A six-section prototype, developed with the assistance of Anvar, will be shown at the Sicob 1984. The studies, which are being carried out by the mechanical engineering laboratory of the Amiens University Institute of Technology, should lead by 1986 to a Ramson robot capable of independent reconnaissance. (Laboratoire de Productique, IUT d'Amiens, 33 rue Sain-Leu, 80039 Amiens cedex. Telephone: (22) 91-76-32.) (La lettre des Sciences et Techniques, No. 45-46, Nov.-Dec. 1983)

Setting robots free

RESEARCHERS in Australia have developed a technique for communicating computer data, using infra-red light, that could eliminate expensive computer terminal cable connections. Known as the diffuse infra-red broadcast system, it has been developed by Dr. Ian Parkin, senior lecturer in computer science at the University of Sydney. It uses an inexpensive transmitter and receiver which can send data in invisible light flashes to or from any point within an enclosed space. As well as eliminating the need for expensive computer cables, it means that there is no longer need to "rip up" and re-lay cables connecting computers whenever terminal arrangements are changed.

Parkin said effective infra-red communications within enclosed spaces also offered the possibility of freeing robots from cables connecting them to computers, which would vastly improve their mobility. "One could imagine mobile robots wearing infra-red hats that would enable them to communicate with each other and their main computer," Parkin said. The system is a development of infra-red communications systems now being investigated by the United States and Japanese computer corporations IBM and Fujitsu. Both have been experimenting independently with infra-red data transmission using a "satellite" system, which involves a central receiver and transmitter located as a globe on the ceiling. Dr. Parkin believes his system is superior to this concept because it scatters the infra-red light diffusely and does not suffer from information shadows, like the highly directional satellite systems. (Electronics Weekly, 23 November 1983)

Towards a perfect robot

The New York Police Department recently received a call about a suspicious-looking briefcase outside a restaurant in Manhattan. It called in its new bomb-disposing robot from

Canada, the Remote Mobile Investigations Unit (RMI-3). With ease and dexterity, the remote-control device picked up the case and deposited it in an explosion-proof box at the rear of the bomb squad's truck. The case was found to be harmless, but the robot's performance was a confirmed success. The robot most recently demonstrated its strength in Arizona during a hostage-taking incident. Complete with two-way radio and mounted guns, it confronted the criminal and forced his surrender, while the police kept vigil a safe 90 metres away.

The basic robot sells for $20,000(US) with extra options available on a made-to-order basis. These include radio control, X-ray vision, blasting water guns used to defuse bombs, and firefighting equipment. When assembled, the New York Police Department's model cost $64,000(US), weighed in at 104.3 kilograms and stood 46 centimetres high when folded. (Canada Weekly, January 1984)

Pipeline robot spots early signs of failure

A major problem with underground gas and oil pipelines is that of spotting corrosion, weld failures, and other flaws before they develop into leaks. British Gas (BG) claims to have a solution: a robot that uses a magnetic field to search pipelines for early warning signs of failure. Moreover, the robot conducts its inspections from inside the pipeline, while it is in service. The company is now offering the use of the robot - called an "intelligent pig" - to oil, gas, and petrochemical companies in the U.S. and elsewhere. The pigs are torpedo-like trains packed with electronics (including on-board computer and data recorders) protected by pressure vessels. The vehicles are placed into traps located throughout the pipeline system and are driven by the fluid flow. A typical 50-mile run generates 500 million inspection readings, from which a central computer sorts out significant information and draws a picture of any flaw. Problem sites are located so precisely that engineers can be 98% certain of finding them by digging a hole no more than three meters across.

The search technique is called magnetic flux leakage inspection. A strong magnetic field is applied to the pipe from magnets on the pig. The pipe surface between the magnet poles is then scanned for field-strength anomalies representing changes in wall thickness due to corrosion, dents, flaws in composition, etc. The data is interpreted in one of two ways. One is a mathematical model stored in a central computer, which gives an inverse solution to the magnetic field equations. The result is a contour of the pipe wall thickness in the size and shape of the area of metal loss. In the other method, a "finger-print" of the pipeline's wall thickness is made when the pipe is installed, and stored in the computer...

The pigs are expensive beasts. A robot for a 60-cm pipeline costs $675,000 to build; for a 90-cm pipe, nearly $1 million. BG has engineered pigs for 30-, 60-, 76-, and 90-cm pipelines, and plans to add pigs for 35-, 40-, 46-, and 106-cm pipes over the next four years... (High Technology, January 1984)

Researchers to probe senses of man and machine

Researchers at the University of Toronto, the University of British Columbia in Vancouver and McGill University in Montreal are collaborating on a multidisciplinary project to investigate the sensory perception aspect of artificial intelligence. The effort, initiated by the Canadian Institute for Advanced Research, will involve a total of eight or ten electrical engineers, perceptual psychologists, neuroscientists and computer scientists from the three universities. Social sciences and humanities researchers will also be involved, studying the effects of artificial intelligence technology on human beings. Other Canadian researchers are seeking to develop problem-solving software and methods of communicating directly with computers - both important aspects of artificial intelligence - but the co-operative effort will concentrate on a third aspect: basic research into the nature of sight in human beings and machines. (Canada Weekly, 18 January 1984)

The language of Artificial Intelligence - a glossary of some of the more common terms used in AI

ARTIFICIAL INTELLIGENCE - The subfield of computer science that is concerned with symbolic reasoning and problem solving.

KNOWLEDGE ENGINEERING - The engineering discipline whereby knowledge is integrated into computer systems in order to solve complex problems normally requiring a high level of human expertise.

KNOWLEDGE SYSTEMS - Computer systems that embody knowledge, including inexact, heuristic and subjective knowledge: the results of knowledge engineering.

KNOWLEDGE REPRESENTATION - A formalism for representing facts and rules about a subject or specialty.

KNOWLEDGE BASE - A base of information encoded in a knowledge representation for a particular application.

INFERENCE TECHNIQUE - A methodology for reasoning about information in a knowledge representation and drawing conclusions from that knowledge.

TASK DOMAIN - An application area for a knowledge system, such as analysis of oil well drilling problems or identification of computer systems failures.

HEURISTICS - The informal, judgmental knowledge of an application area that constitutes the 'rules of good judgment' in the field. Heuristics also encompass the knowledge of how to solve problems efficiently and effectively, how to plan steps in solving a complex problem, how to improve performance, and so forth.

PRODUCTION RULES - A widely used knowledge representation in which knowledge is formalised into 'rules' containing an 'if' part and a 'then' part (also called a condition and an action). The knowledge represented by the production rule is applicable to a line of reasoning if the 'if' part of the rule is satisfied; consequently, the 'then' part can be concluded or problem solving action taken.

LEGISLATION AND STANDARDS

Australia to introduce dp copyright law

The Australian Government has said it will legislate to protect software copyright in response to the storm of criticism which followed the ruling against Apple. A spokesman for the Attorney General's Office in Canberra told Computing: "The Government is prepared to legislate and will make the law retrospective if necessary." Apple Computer Australia claimed infringement of copyright by Melbourne-based Computer Edge, alleging that the contents of read-only memory (rom) devices had been unlawfully copied.

A spokesman for the National Computing Centre said: "The courts have ruled for software copyright here so there is no worry at present. There would only be problems if some judge ruled against." Justice Beaumont, in a Federal Court ruling, declared the 1968 Australian Copyright Act made no specific reference to software and, therefore, did not apply. Apple is taking its case to the Appeal Court in Australia but a date for the hearing has not yet been fixed. The Hawke Government is unlikely to act before the Appeal Court ruling is made, but meanwhile it is organizing a major symposium to discuss issues which have been raised by the case. The spokesman added: "There is a strong assumption that the Federal Court ruling will be overturned. Australia is out of step with, at least, the US in these matters. There has been a lot of worry about the fact that it would allow piracy of software and copying of products that have taken a lot of dollars to develop." Lawyers and members of the computer industry in Australia have claimed that the Australian software industry may decline rapidly if action is not quickly taken by the Government. (Computing, 19 January 1984)

Japanese software copyright laws

The Japanese computer industry is due for a major shake-up arising from proposed changes in software copyright laws and the disputes between IBM and Japanese manufacturers.

IBM Japan has complained that legislation proposed by the Government will bring the company into dispute with its US parent.

The IBM complaint centres on the fact that the new laws are expected to offer software protection for a period of only 15 years in contrast to the 50 years' cover given by US legislation - a factor which IBM claims will give an unfair advantage to Japanese companies, which generally have a much smaller base of software investment. The Ministry of International Trade and Industry hopes to submit a software protection bill to the Japanese Parliament in spring 1984. IBM Japan has pointed out that since much of IBM's software has been around for as long as 20 years, a cover of only 15 years could lead to the company losing control over much of its software within Japan. Under the new legislation, use of existing software would be allowed upon payment of a fixed charge which could be decided upon by an arbitration body. Concern over the new legislation has also been expressed by the US Treasury Department which has complained of a provision which would allow a third party free access to protected computer software when it is deemed to be in the public interest. (Computer, 12 January 1984)

OECD calls for action on data flows

Urgent action is required to secure international agreements on how data flows may be regulated if business activity worldwide is not to be seriously harmed. That was the message that emerged from the conference on Transborder Data Flow held in London last week by the Organisation for Economic Co-operation and Development, the club of the Western world's major industrial powers.

More and more countries, the conference was told, were trying to impose restrictions on international data flows for reasons of economic protectionism, national sovereignty, revenue raising, protection of secrets and even international politics. If an international agreement was not reached soon, economic activity would be substantially dampened and everyone would be the loser, it was said. James Grant of the Royal Bank of Canada criticized the efforts of his government to protect the Canadian DP industry by restricting the use of computer services across the border in the US, and in compelling foreign banks to keep records in Canada, incurring much extra expense. Such action could only lead to retaliation, which could block Canadian firms' access to the latest technology, which they needed in order to compete. An international agreement could be worked out, Grant insisted, that would among other things allow Canadian government bank inspectors to access records, even if they were held in a computer in the US. It was especially important to reach agreement to prevent a recurrence of what happened to Dresser Industries at the time of the crisis over the Soviet gas pipeline, Grant said. The US State Department stopped the company's French subsidiary from getting access to the corporate database in the US, through which all its day-to-day operations normally went, so the firm was paralysed.

Another major concern of the conference was clearing up jurisdiction over computer crime. Justice Michael Kirby of Australia said it was still not clear where a criminal could be prosecuted when he operated a terminal in one country to transfer funds dishonestly between bank accounts in second and third countries. There were also tricky problems of jurisprudence, he said, for example if a Norwegian accessed an American database under US Freedom of Information laws and obtained data that was a State secret in Norway.

De-regulation of telecommunications in the UK and the US was also beginning to raise major problems, according to Hans Peter Gassmann, head of the OECD computer section. While the UK and US were relaxing their monopolies, other Europoean countries were not, and PTTs in Europe were growing increasingly unhappy with having to deal with a host of small companies instead of one monolithic organization. Multinational companies setting up global networks would want to put the same or compatible equipment at all their nodes, but would find that some countries would only allow kit of their own specification to be attached to lines, said Johan Martin-Lof, chairman of the OECD computers committee. International standards in this area were "an absolute necessity for business," he declared. (Computer Weekly, 8 December 1983)

EEC to standardize telecoms

The 10 EEC governments have agreed to bring their telecoms spending, standards and research under one vast European-wide umbrella. These proposals, in a European Commission paper, will take power away from individual PTTs, harmonize standards and protocols and allow newer services like electronic mail, telesoftware and private point-of-sale networks to link Europe-wide on a single net. This newly agreed policy will start to come into play next June. At present a top level committee, including representatives from British Telecom and the Department of Trade and Industry, are meeting to lay down concrete plans in six areas.

First, all EEC PTTs and governments will agree telecoms strategies together. Second, specific joint research programmes, on digital switches for example, will be set up in parallel with the £425 million Esprit programme.

Finances, such as the $500 million-$700 million European Investment Bank funding, will be redirected. Governments will also agree to specify European standards. A European Commission spokesman said: "These lines of action are now in hand. There is a general need for faster, quicker and cheaper telecoms systems, and for hardware and software to be standardized. Doug Eyeions, director general of the Computing Services Association, said: "This is the first time the Council of Ministers has been ready to tackle this problem, making PTTs less restrictive and cutting their charges. Also projects like Esprit can only work if there is a free flow of data." (Computing, 15 December 1983)

Europe forces standardization

Twelve top European computer companies have bowed to European Commission pressure and agreed to standardize connections for their products - if the EEC and its national governments will buy them.

The dozen companies, which include eight of the ten largest European computer firms, last week announced their agreement to implement Open Systems Interconnection (OSI) standards in their products, starting in 1985. And the companies aim to set up a series of multi-vendor projects to demonstrate the "practical interworking of products implementing these standards". The group hopes for cash from the EEC to help set up these projects.

But the European Commission's current £7 million project for developing standards is currently on the shelf awaiting approval from the Council of Ministers. This is unlikely to be forthcoming for at least six months, as it was put on ice when the Council approved the much more ambitious European IT programme Esprit. More realistically, the companies have called on the EEC to recommend that public buying of computer equipment specifies the agreed OSI standards.

The European Commission encouraged the 12 companies, all involved in the first round of the Esprit project, to set up a committee, and sent a prepared document to each company for agreement. The companies are: ICL, Plessey, GEC, Philips UK, Thomson, Bull and CGE of France, AEG, Nixdorf and Siemens of Germany, Olivetti and STET of Italy, and the Dutch Philips. According to ICL, the companies plan to implement standards which will cover existing and forthcoming International Standards Organization and CCITT standards, including transport protocols, electronic mail, document interchange, document structure and the processing of graphic information.

The agreement resembles an agreement made in January between the national telecommunications authorities to accelerate their moves towards common telecommunications standards. It is almost coincidental with the long-term policy of the European Computer Manufacturers Association (ECMA). (Computer Weekly, 22 March 1984)

Lack of government support may threaten the success of the recent standards agreement between 12 major European computer suppliers. The agreement, if fully implemented, will allow equipment from one manufacturer to communicate with equipment from another. Till now, computer users have been "locked in" to one supplier because they have found it too difficult to get mixed systems to work. But unless the biggest spenders on computers, governments and administrations, insist on these standards in their procurement contracts, the standards may not gain acceptance as fast as the European companies would like. The world's biggest computer supplier, IBM, says it welcomes harmonization. But it is unlikely to observe the new standards unless a large enough customer insists on them. (New Scientist, 22 March 1984)

Software numbering system under development

A subcommittee of the American National Standards Committee Z39 is developing a system for numbering software passages, comparable to the international standard booknumbering system (ISBN). The Subcommittee is already in agreement on the format of the number to be assigned to software for micro- and mini-computers. The structure they have agreed upon is based on the concept that the number will identify a "shippable" unit, i.e., a unique item that can be purchased, shipped and inventoried distinct from any other. The criterion applied to developing the structure was that it must facilitate inventory control, ordering, royalty accounting and sales tracking by manufacturers, distributors and retailers. Each distinct software item that is available for sale is to be numbered. The identifying number is composed of the following sections:

REGISTRANT - The organization or individual who makes the item available for sale. There are some 15,000 potential registrants in existence today and many more are expected in the next few years. It is anticipated that the Registrant Number section of the software number will be a 5-digit number.

PRODUCT - The name of the software program. It was decided that there are now more than 40,000 unique programs available for micro- and minicomputers, with the number increasing dramatically on a daily basis. The number of products available from a single Registrant is now under review, but is is expected that the Product Number section of the software number may be a 4-digit number.

DELIVERY MEDIUM - This element is a combination of the physical media on which the program appears, the operating system(s) required for its operation and any other distinctive information that uniquely identifies one offering of the same program from others available from the same Registrant. Analysis of this field for optimal size and structure is under way by Subcommittee members.

CHECK DIGIT - A mathematical check digit to verify the preceding numbers. The Subcommittee is reviewing the pros and cons on Modulus 10 vs. Modulus 11 verification. (R8 DM Digest, December 1983)

SOCIO-ECONOMIC IMPLICATIONS

'Computer Ladies' Changing Japan

Like most Japanese women, Yaeko Tamada abandoned her job when she married and settled down to the accepted role of raising children and doing housework. Now, 15 years and three sons later, she is contentedly back in the job market three or four days a week, typing away at an IBM 5550 multipurpose office machine, earning $6.23 (about 1,450 yen) an hour and aiming for a new career in computerized design and layout. She is part of the "computer-lady" wave in Japan, a mini-revolution that in one of the world's most traditional societies has quickened the pace at which women are breaking away from the home and into the work force. Mrs. Tamada is a beneficiary of the microelectronic age that is changing Japan's work habits and social life in many ways, not least by adding some flexibility to a tightly structured work force that usually limited women's jobs to tea service or shopkeeping. It has brought new jobs with computers, word processors, facsimile copiers and all of the other gadgetry that goes under the name of office automation, known here as "OA." The OA revolution has not produced many glamorous career positions but it has created an array of part-time clerical jobs and some unexpected opportunities. Sohyo, Japan's general council of trade unions, recognizes part-time work as personally rewarding for women who want to get out of their homes, said Kenichi Yagyu, a Sohyo organizer. But the union federation wants employers to eliminate discriminatory wage scales between full- and part-time work and to define their obligations to the part-timers.

Microelectronics has also introduced another element into women's work: respectability. Husbands who once frowned on their wives checking groceries or serving sake in neighborhood bars approve of their labor at a word processor.

The job center is itself testimony to the growing number of part-time jobs created by microelectronics. From a modern downtown office complete with a women-only coffee shop, the center recruits, trains and places women in jobs. Its registry includes 18,000 part-timers and on any one day about 6,000 of them are on duty. They work on Japanese- and English-language word processors, typewriters and keypunch machines. There is a big demand for computer programmers, bigger than the supply of trained women.

Temporary job centers also provide written contracts between the women and their employers. Japanese companies have traditionally rejected the notion of written job contracts, preferring verbal commitments, and that has meant major quarrels with part-timers. The contracts spell out wages, hours and benefits, if any, and offer workers some protection.

The Japanese attitude toward working women, according to public opinion surveys, is still ambivalent but is changing. A poll in 1983 found that 71 per cent of Japanese women still subscribed to the traditional standard of men going off to work and women staying at home. That represented a slow change from 1972, when 83 per cent of the women felt that way. (Herald Tribune, 29 February 1984)

It is harder to find a job than to do it

Companies in industrial nations are emerging from recession slimmer and more productive. They are now making the profits needed to invest in new labour-saving technology that will make manufacturing yet cheaper and more efficient. Are bosses or workers ready to accept the consequences of jobs being lost in good times as well as bad?

Sweden's Atlas-Copco is developing a system that will let a miner pushing buttons on one continent extract minerals from under the surface of another. Using robots, the entire operation needs only a man behind a control panel and a few people to oil the robots.

A research team at Bradford University in the north of England reckons (although the National Coal Board disagrees) that new technology could be used to reduce the number of coal miners in Britain from 195,000 to 60,000 within five years. It cites the new mine at Selby in Yorkshire where 4,000 miners will produce with new technology as much coal as 16,000 miners would produce by conventional methods.

Not even the most personal of service jobs are safe. In San Francisco, a robot barman now mixes 30 types of cocktail.

With capital investment forecast to rise in real terms by 12 per cent in America, 2 per cent in the EEC and 1 per cent in Japan, this year is likely to see an explosion in the installation of new technology. America's commerce department reports that this year's investment will be heavily biased towards computers and robots. Canadian and west European firms are following suit. Japan, the world's most automated country has never stopped investing.

Equipment suppliers such as Siemens, ASEA, Philips, IBM, Westinghouse and both the British and the American General Electrics are poised for big sales increases in computers, robots and other equipment for factory automation, and for telecommunications and information processing. The market in America and western Europe for automated industrial equipment is reckoned to be worth $25 billion a year. Some bits of it may grow by 50 per cent this year.

Free of antiquated plant and bloated workforces, companies everywhere are coming out of recession with the profits to pay for new technology that will cut their costs further, and the desire to introduce it. In the American car industry, one robot today can do the work of up to six workers. Each employee costs $23-24 an hour in wages and benefits. The robot can do all their work for $6 an hour, including depreciation and maintenance. Many industries already have factories with islands of automated production for, e.g., painting, stamping or welding by robot. But few outside Japan have yet linked those islands with computer causeways to create what is known in the jargon as flexible manufacturing systems. Flexible manufacturing's big attraction is that it lets the same equipment work on several jobs at the same time - by, for instance, dealing with three different styles of car body on the same assembly line. That, by making smaller production batches profitable, changes old notions of economies of scale. The next step is to link the computers involved in manufacturing processes to the computers a company uses for, say, stock control.

Whatever the industry or the technology, unions fear that yet more jobs will be lost. The OECD estimates that 20,000 extra jobs will have to be found daily for five years to reduce unemployment in the industrial nations to its level of 1979. And that is before new technology displaces a single job. The silent hope of many bosses is that new technology will spawn new information and service jobs and create new (if different) industrial jobs as costs are lowered and productivity increases. Researchers at Warwick University * predict that the percentage of the British workforce in manual jobs will fall to 49 per cent by 1990, against 53 per cent in 1980 and 63 per cent in 1961. Other researchers conclude ** that new technology will not necessarily produce more jobs.

Too many economists forecast unemployment rates by adding together productivity-growth and growth in the labour supply. They reckon that, if new technology makes workers more efficient, the economy needs fewer of them. But in 1860-1960 Britain's working population doubled, and output per worker trebled. The result was not mass unemployment, but a six-fold increase in output.

Easy transition to the higher incomes and more leisure that new technology offers is hampered in two ways. First, workers are not capitalists. If they were part-owners of the firms they worked for, they could welcome inventions that displaced jobs; progress would mean less work without loss of income. While workers depend entirely on wages it is in their interests to resist. Second, especially in Europe, trade-union strength has insulated wages from market forces. New technology does not affect all parts of the economy equally, but, because wage-relativities are not free to adjust, surplus labour from the most affected sectors cannot be smoothly absorbed elsewhere.

So far, it is the hot, heavy and hazardous tasks performed by relatively unskilled (and often migrant) workers that robots have taken over. But two American academics, Mr. Fred Foulkes and Mr. Jeffrey Hirsch, *** see conflict between employees and management growing as robots get smarter and threaten more than the rotten jobs.

Mr. Foulkes and Mr. Hirsch report that workers in Japan are beginning to kick against such heavy automation, even though Japanese firms have tried to make their robots less menacing by calling them after pop stars. Other countries need to take heed, especially America, where only 10,000 robots are now in use but six times as many are expected by 1990, even on the OECD's narrow definitions. Robots with even rudimentary vision or tactile sense could displace 3.8m Americans from their jobs. In an internal report, Westinghouse, the American engineering group that makes robots, already worries that "worker unrest and

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* "Changes in the Occupational Structure of Employment" by the Institute for Employment Research, Warwick University, April 1983.

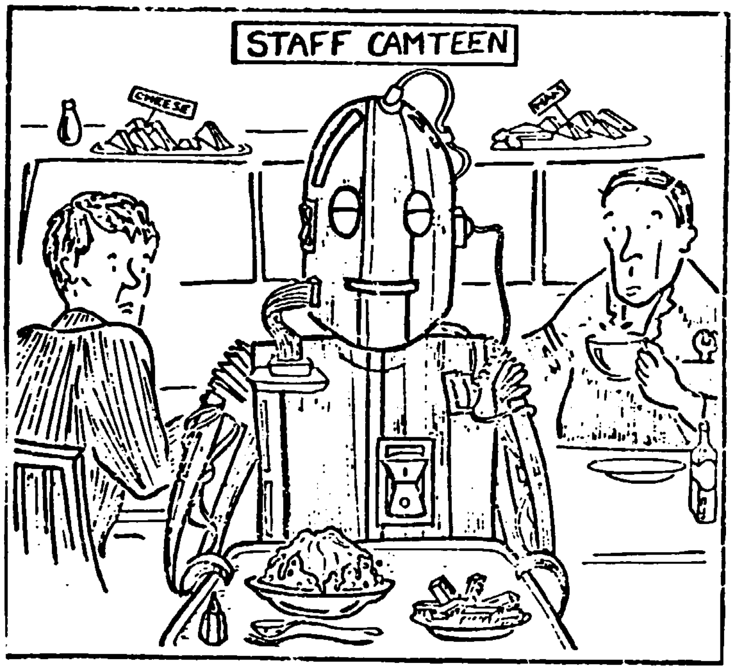
** "Work and Human Values: An International Report on Jobs in the 1980s and 1990s" by the Aspen Institute for Humanistic Studies and the Public Agenda Foundation.

*** "People Make Robots Work" by Fred Foulkes and Jeffrey Hirsch. Harvard Business Review, January-February 1984.

sabotage will be characteristic as people attempt to prove the new technology will not work." Of 400 union contracts Mr. Foulkes and Mr. Hirsch examined, 20 per cent blocked technological change.

How can bosses counter such fear and mistrust? Mr. Foulkes and Mr. Hirsch have some hints. First, automate the awful jobs and new products and processes. Employees are more likely to welcome robots if they threaten only dull or dangerous jobs. And automation causes less trouble if it is introduced as part of a declared plan to expand capacity.

Second, companies introducing machines that will replace jobs are advised to tell their workers and line managers early. They should promise to avoid lay-offs, if possible, and help those that have to be fired to find new jobs. Companies should also retrain workers to be robot operators, technicians and programmers. In the American newspaper industry, technologically redundant printers have been successfully turned into advertising salesmen and journalists. (The Economist, 24 March 1984)



Computers and the British worker

Computers are now a way of life - official. In the High Court last week Mr. Justice Walton ruled that nobody could object to being asked to use a computer in the course of their employment. "It can hardly be considered that to ask an employee to acquire basic skills as to retrieving information from a computer or feeding information into a computer is something the slightest esoteric or even nowadays unusual," he said. The judge was ruling in a test case brought by the Inland Revenue Staff Federation, which concerns tax officers who claim that the change in work required to operate the new central PAYE computer went beyond their existing terms of employment. Therefore, they claimed, it could not be imposed on them without their agreement. Central to the dispute were employees' fears about compulsory retirement, and hopes that the benefits of computerization would be shared with the workforce.

Many in the computer industry used to their everyday use, may find the argument baffling. It hinges on the question of job security now being raised more and more wherever computers are introduced. The judge, one feels, may have missed the point in his judgement. Nobody, not even the IRSF was arguing about the use of computerization within the Inland Revenue. It represents the most efficient way of storing the nation's tax data, but it may well cause redundancies. The comparison between feeding bank card details into an automatic till and storing or withdrawing information from a computer system is also a little tenuous. Two component distribution houses which have recently switched from a manual order processing operation to computerization gave over time for staff training to ensure a smooth transition. So, such transactions can be handled both sensibly and sensitively.

No one can deny the benefits which accrue from applying computerization to all forms of business, and especially one where the data collected is so massive. What is required, as the IRSF general secretary Tony Christopher observed, is an Act of Parliament giving better protection for workers. It would not be a path enabling employees to turn back the advance of technology. But it would lay down the framework for a sensible implementation. The most likely outcome at present is the sort of confrontations we have seen in Fleet Street over new technology, which simply cost money and never get settled. (Electronics Weekly, 8 February 1984)

How many workers can robots replace?

Autoworkers probably won't like it but more robots will be working on their factory floors than in any other industry. In studying the impact of robots on the US workforce, The Futures Group, a management consulting firm in Connecticut, USA, said that about half of the workers who might have been assumed to be available for employment by the year 2000 in passenger automobile manufacture will be displaced by 25,000 robots. Except for this industry, the impact of robots on overall levels of employment will be minor. Assuming that the labor force grows to 134 million (from 110 million today) by the year 2000, and even if 500,000 robots were in place by that time, and assuming further that each robot could replace five workers, unemployment would be no worse than at present, the management firm said. (Industrial World, September 1983)

"Robots protect jobs"

Robots do not cut jobs, but protect job security, British Trade and Industry under-secretary John Butcher told the Commons recently. Answering a question from Labour MP Dennis Skinner, Butcher said figures from the British Robot Association showed a 61 per cent increase in the UK's robot population to 1,152 by the end of 1982. He denied that there had been a corresponding job loss. Experience suggested that robots improved competitiveness, and thus increased job security, Butcher said. It was failure to use new technology that was more likely to lead to substantial job losses. He added that in 1981 the number of robots per 10,000 people employed in manufacturing was 17.7 in Sweden, 8.7 in Japan, 2.8 in Germany, 2.5 in the US, and 1.2 in France and the UK. (Computer Weekly, 8 December 1983)

RECENT PUBLICATIONS

Relevant UNIDO documents

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UNIDO/IS.439 Guidelines for Software Development in Developing Countries by R. Narasimhan

UNIDO/IS.440 Guidelines for Software Production in Developing Countries by H. Kopetz

UNIDO/IS.444 A Silicon Foundry to Service Developing Countries' Needs: A Preliminary Approach by the UNIDO Secretariat

UNIDO/IS.445 The UNIDO Programme of Technological Advances: Microelectronics by the Technology Programme of UNIDO.

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UN/Economic Commission for Europe
ECE:ENG.AUT/12 Production and Use of Industrial Robots
Part I: Trends in the Manufacture and Use of Industrial Robots

<u>Telecommunications for Development. Synthesis Report. (Geneva, International Telecommunications Union, 1984), 94 pp.</u>

While acknowledging that the subject is "understudied" and that there is a "near complete absence of a general theory on the contribution of telecommunications to socio-economic development," the report points out that there is a literature, chiefly in the form of case studies, which shows "some of the indirect benefits of investment in telecommunications." The authors then proceed to review that literature, microeconomic and macroeconomic, and to apply the findings to the problems of telecommunications development. Their conclusion from this examination of the evidence is definite and clearcut:

"The studies carried out within the framework of the ITU-OECD project have clearly demonstrated that investments in telecommunications and notably in rural telecommunications, are extremely profitable from an economic and social point of view, and contribute in a subtle but important way to improving both the quality of life in the rural areas and the overall efficiency of rural economies. Investments in telecommunications are one of the 'causes' of, or contributing factors to, 'development' just like investments in education, public health, roads or agricultural extension services, and the evidence accumulated in the course of the ITU-OECD project confirms the intuitive perception of a few planners and development experts about the importance of telecommunications in the development process."

For the authors of this report, the evidence is plain and the point is proved. Having said this, however, they turn to the complex problem of how the demonstrated need can be filled and telecommunications benefits brought to rural areas. This can be done, the report says, and it can be done relatively inexpensively by using new communications technologies to build high quality networks that extend to even the most remote areas. What the report proposes is the creation of a system called "GLODOM," an acronym combining "global" and "domestic." The system would be based on four satellites providing global coverage and a network of highly efficient earth stations located in the participating countries. The satellites would be regionally directed and all of the countries participating would share in their ownership. This system, the report estimates, could be built for a total investment of $1.26 billion, thus bringing "telephone service to all the rural regions of the developing world, even the most remote, for an initial investment cost which is practically similar to that of telephone service in the industrialized countries."

In this brief paper, the ITU and the OECD have opened exciting prospects. It is compact, crisply written, makes skillful use of the available research and is thoroughly plausible if not completely convincing. This document carries the argument about the role of telecommunications in development well beyond the World Bank's position. Telecommunications do have a vital role to play in the development process, this report concludes, and GLODOM provides a way of building necessary infrastructures without stinting on investments in other sectors. It is a system, says the report, that "is a sound economic proposition and it will benefit first of all the people living in the rural areas of the developing world, who have been almost totally left out of the development process."

Telecommunications for Development is available from the International Telecommunications Union, Place des Nations, CH-1211 Geneva 20, Switzerland, paper cover, for 45 Swiss francs. (Excerpted from a review by John A. Swenson, in <u>Development Communication Report</u>, March 1984 and reprinted by permission from The Chronicle of International Communication, September 1983, Volume IV, Number 7. The Chronicle's address is P.O. Box 2596, Washington, D.C. 20013, USA.)

<u>Microcomputers in Development: A Manager's Guide, by Marcus D. Ingle, Noel Berge, and Marcia Hamilton (Hartford, Connecticut, Kumarian Press, 1983), 174 pp.</u>

Microcomputers in Development: A Manager's Guide is a thoughtful, practical guide, full of excellent and timely advice. Its merits go far beyond Third World applications, and the book is recommended to anyone contemplating adopting microcomputer technology in their work or home. It is written in clear, easily understood English that avoids jargon and computer doubletalk while plainly defining certain terms that anyone learning the technology must know if they're to understand the medium properly. The only criticism I have is the choice and format of the charts inserted into the text. They serve no useful purpose that I can see. They are confusing and appear to be inserted because someone thought the book needed charts. They serve to complicate the message, rather than clarify.

Written from a manager's viewpoint, the book's underlying theme is the installation of micros "to get a particular task done efficiently and profitably." Microcomputers in Development gets its task done admirably by sticking to particulars rather than generalities. Unlike most other books on the subject which talk in global terms about philosophical impressions of what the technology can or should do, or what they've been told they do, this book speaks from hands-on experience and illustrates successful adoption. It is organized into five chapters: The Management Potential of User-Friendly Microcomputers; Hardware and Software: Keys to Maintaining Utility and Diversity; Choosing a Microcomputer for Use in Development Projects and Institutions; Installing, Using, and Maintaining Microcomputers in Development Project and Institutional Settings; and Representative Applications in Development Projects and Institutions. Perhaps the most useful information is provided in the Appendices, which include: How to Provide 110 Volts for Apple Operation, Survey of Microcomputers in Developing Countries, Major Manufacturers and Houses of Hardware and Software, Bibliography, and Glossary. If one could obtain only one guide, this should be the one to select. Available from Kumarian Press, 29 Bishop Road, W. Hartford, Connecticut 06119, USA, for US$12.75, paper cover. (Reviewed by Arlene Horowitz, Program Associate and in-house computer expert at the Clearinghouse. Development Communication Report, March 1984).

Microcomputer Software Directory (Computing Publications, London, £40 plus £2 p+p).

Where can you find softporn sitting next to continuous beam analysis? Or a football pools prediction program next to a personal banking system? The answer is in Microcomputer Software Directory, the latest hefty tome from the publishers of the industry bible, the Computer Users Year Book.

The new directory is the little brother of the International Directory of Software from the same publishers and follows a similar format. Some 3,000 software packages are listed for every conceivable microcomputer and operating environment under application, machine type and by occupation. This last category is an indication of the importance of the so-called vertical market in the microcomputer business. You don't just get a list of general accounting packages, you get accounting packages for estate agents, farmers, solicitors and so on. Under each product description, a complete technical specification itemising any special peripherals required, the amount of RAM needed and the all-important cost are listed.

The only other criticism of this otherwise excellent reference book is the price - £40 plus postage and packing. This leads to the strange anomaly that many of the products, particularly in the home computing section, cost less than the directory itself. The publishers see their main market as corporate data processing shops which can lose that sort of expenditure in their petty cash.

Apart from this criticism, the Directory is everything one would expect from the people who publish the Computer Users' Yearbook, and it will doubtless join its other publications on many a data processing department's library shelves. (Reviewed in Electronics Weekly 12 January 1984).

Robots and Robotology by R. H. Warring, Lutterworth Press, pp. 128, £6.95

Robots and Telechirs by M. W. Thring, Wiley/Ellis Horwood, pp. 298, £27.50, pbk £12.50

If you want a straightforward and interesting account of what robots can do, then read Robots and Robotology. It is a small, unpretentious book that packs a lot of information into its pages. The author expresses himself clearly, and carefully explains the technical terms that are used in robotics. Realising that not everyone is likely to be familiar with the detailed workings of the microprocessor, he draws the analogy between electronic and mechanical switches to explain the step-by-step operation of a robot. This is a helpful approach: all too many technical writers submerge principles beneath a torrent of unnecessary jargon.

Professor Meredith Thring's book, Robots and Telechirs, is aimed at a more specialized readership of research workers, manufacturers, students etc, and is somewhat overambitious. He covers robotics, remote manipulators controlled by a human operator, and machine limbs for the handicapped.

Although the book covers too much ground for comfort, it does contain some very interesting material. Who could fail to be intrigued by the pictures of the early 19th century fantasies of walking machines, or the experimental robot rig for sheepshearing developed at the University of Western Australia? Most robots are pretty dumb and their movements always follow the same predetermined path. A simple robot would be no use for sheep; they neither come in standard shapes and sizes, nor remain still even when restrained in a manipulator frame. Consequently, the robot shearer has to modify its position to suit the contours of each individual sheep. A three-dimensional model of an ideal sheep - known, incidentally, as a software sheep - is stored in the computer memory, and initial movements of the robot are controlled by the model. However, as soon as sensors detect the exact position and size of the sheep, error signals are generated which modify the position of the shearing head. As a result, the contours of the sheep are followed with a high degree of accuracy, and before long the sheep emerges fleeced and in one piece. The capital cost of the equipment cannot be justified on any farm with less than 4,000 head of sheep, so the job of the skilled sheep shearer is still safe.

Thring points out the danger in indiscriminate application of robotics; the smarter the machines that we are able to build, the more care and thought we will need to exercise in choosing suitable applications. In some fields we will deliberately avoid the use of robots. He identifies aids to the handicapped and work in hazardous environments as useful work for robots. Despite its lack of structure this is an interesting and thought-provoking book. (As reviewed in the New Scientist, 22 March 1984).

Microelectronics in British Industry: the Pattern of Change (by Jim Northcott and Petra Rogers, Policy Studies Institute, 1-2 Castle Lane, London SW1E 6DR, £25).

There is lots of talk about the ubiquity of microprocessors but few hard figures. For Britain, the Policy Studies Institute (PSI) in London has gone some way to remedy that. It first surveyed the use of micros by a sample of 1,200 manufacturing firms in Britain in 1981. Now it has released comparable figures for 1983. The results make fascinating reading. Because they show the pattern and pace of change. And because, for the first time, they contain considerable detail about the impact of the micro-revolution on jobs.

The PSI sample was constructed to allow the survey figures to be weighted to represent all British manufacturing firms employing 20 workers or more. Judging from the survey results, nearly half British manufacturers are now using (or about to introduce) micros into their products or production processes. In 1981, only three factories in 10 were users. The biggest rise has come in the application of micros to production processes, the percentage of companies using them being up by nearly 60 per cent to account for over four in every 10. Only one in 10 is tooling chips into its products, but even that is a gain of a quarter since 1981.

Why the lag in product applications? PSI cites a number of reasons. For one thing, it generally takes longer to get a product application into production: an average of 25 months from the time work starts as against 15 months for process applications. While the microelectronics for some product applications (e.g., a control for an electric motor) can be bought off the shelf, many cannot. Product users design and make a third of their micro systems and have another third customized by outside specialists, getting only the remaining third off the shelf. Process users, by contrast, buy in 59 per cent of their microelectronics as standard catalogue items, and design and make only 6 per cent.

Also, not every product readily lends itself to the incorporation of micros: whereas a motor car needs lots of devices to measure, monitor or control aspects of its performance, a tin of beans does not. In Britain, roughly half the total output of manufacturing is accounted for by basic products like foods, chemicals, metals and textiles; and perhaps another quarter by relatively simple ones. By 1983, companies in the PSI sample alone used chips in over 100 different products - more than twice as many as in 1981.

Even so, for British manufacturing as a whole product users were almost entirely concentrated in just three industries: electrical and mechanical engineering and vehicles (50 per cent, 28 per cent and 14 per cent of companies respectively). By contrast, process applications were widely diffused, the proportion of users ranging from 27 per cent of companies in the clothing sector to 62 per cent of those in paper and printing.

Process applications can be very simple: e.g., taking the form of CNC (computer numerically controlled) tools. Altogether, 69 per cent of sample factories using micros in production processes in 1983 were doing so for the control of individual machines and 48 per cent for the control of single processes (and 81 per cent for either or both). Integrated control systems were far less common: only 18 per cent of the companies using micros for centralized control of groups of machines and 18 per cent for the control of several process stages (14 per cent for either or both). Intriguingly, however, whereas the proportion using micros to control individual machines or processes is expected to rise about an eighth (to 92 per cent) in 1985, that using micros in integrated systems is expected to go up by more than half (to 40 per cent).

There is undoubtedly another factor behind the predominance of process as against product applications. Process applications are often adopted primarily with an eye to cost-cutting. Product applications are generally geared to enhancing consumer appeal. On the whole, and especially in the recession years of 1981-83, it has been bigger companies which have gambled on product applications. Indeed, the increase in product applications during 1981-83 came predominantly in firms employing 500 people or more. With process applic ions, the increase came mainly in smaller companies, bringing their user rate up from one si h to one third that of the largest firms.

One point is clear. Use of micros rapidly gains momentum. Once a company does take the plunge, it generally finds the advantages greater (and the difficulties no more) than it expected and deepens its involvement. For example, companies which already had product applications in production in 1981 used them in goods accounting for only about 33 per cent of the total value of their output; by 1983, that had risen to 42 per cent; by 1985, the firms say, it will top 50 per cent.

The PSI calculates that, at present, factories accounting for about 17 per cent of total employment in British manufacturing have micro applications in about 38 per cent of their products (representing somewhere in the region of 7 per cent of the total value of manufacturing output) and that these figures will rise to 20 per cent and 43 per cent respectively by 1985. Similarly, companies accounting for 65 per cent of employment have micro applications in 27 per cent of their production processes and these figures will rise to 70 per cent and 39 per cent in 1985.

The impact on jobs

Fears that the micro revolution will decimate jobs have not been borne out. On the contrary, even in the recession years of 1981-83 the loss in jobs due to the introduction of micros has been remarkably small (though greater then expected by sample companies at the beginning of the period). The sample results suggest that altogether in British manufacturing micros led to a net loss of 34,000 jobs - a figure equivalent to only about 5 per cent of the total decrease in manufacturing employment during the two years and to 0.6 per cent of the total work force employed at the time of the 1983 survey. Some 17 per cent of micro users had job losses (totalling about 54,000 places); 13 per cent had job gains (20,000 places); 69 per cent said that micros had had no impact at all on job totals. The greater part of the net loss was absorbed in natural wastage. Actual redundancies seem to have been about 12,000, half of them voluntary. Which helps to explain another finding of the survey: only one factory in 17 ran into any real opposition from the shopfloor or trade unions. Not surprisingly, job losses were greatest: in companies using micros primarily in processes; among shopfloor personnel; and, on the shopfloor, among unskilled workers. Proportionately, men and women were affected roughly equally. Less obviously, not only the southeast and southwest of Britain suffered fewer job losses than average but so did Yorkshire and Humberside.

Is this pattern likely to hold true in future? Judging from the replies from sample companies, net job losses in 1983-85 will be rather smaller: about 30,000, bigger net losses among process users being partially offset by a net increase in jobs among product users. The PSI researchers think that the actual out turn may be less rosy. Two of the reasons they cite are telling. First, companies have tended to underestimate job losses in the past and have every incentive (to keep the peace on the shopfloor) to talk up possible job gains. Second, the loss of jobs among firms using micros in process control will be accentuated if, as expected, there is greater emphasis on integrated control systems.

On the other hand, it is possible that potential job gains are being underrated. As the PSI researchers point out, second generation product applications of micros are more likely to be fundamentally redesigned products - or even completely new ones - rather than minor modifications of old ones (e.g., the substitution of an electronic for an electro-mechanical control on a washing machine). Each new or radically improved product may need fewer hands to put it together. But, of course, new or radically improved products should also win much bigger sales. Admittedly, some of the losers in the competition may be those domestic companies that fail to innovate. But others could be today's importers and competitors in third markets.

The PSI promises to throw light on how some of Britain's foreign competitors are doing. Comparable surveys of micro use in manufacturing are being carried out by collaborators in France and West Germany to allow progress in all three countries to be compared. The results will be published later this year. (As reviewed in the Economist, 3 March 1984).

North Holland has recently launched two new journals:

Microelectronics Engineering - An International Journal of Semiconductor Manufacturing Technology, which will bring together in one publication, the results of European, American and Japanese work in the rapidly expanding field of microelectronic devices; its scope will include materials, methods and designs for microfabrication, processing and inspection for microelectronic elements from centimeters to nanometres. It will be published four times a year and the subscription rate is $85. (Available from Elsevier Science Publishers, P.O. Box 211, 1000 AE Amsterdam).

Integration - the VLSI Journal: also published on a quarterly basis, this professional journal will cover every aspect of the VLSI design and testing field including technical, commercial, legal, social. educational and managerial aspects. Annual subscription rate is $88; available from North Holland Publishing Co., P.O. Box 211, 1000 AE Amsterdam, The Netherlands.

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