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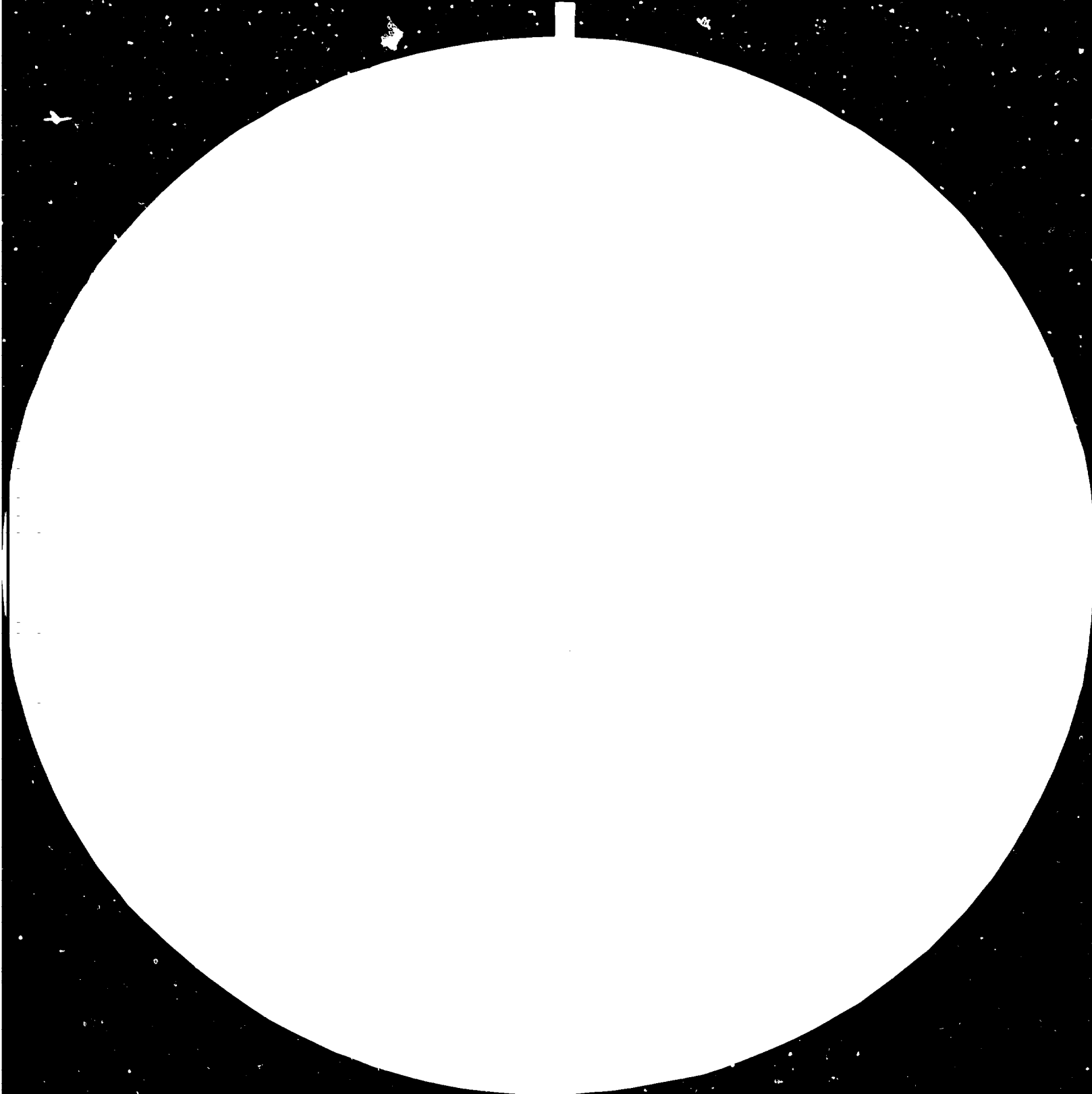

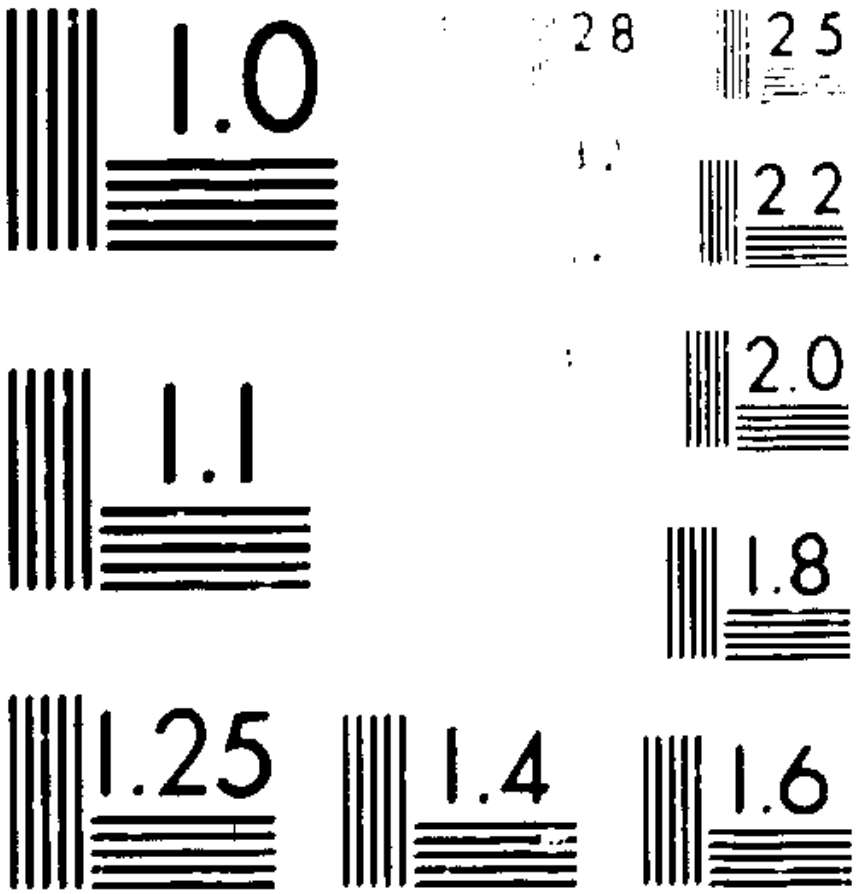
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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

MICROELECTRONICS MONITOR

Issue Number 4 October 1982

12021

Dear Reader,

This is the fourth issue since the inception of the Microelectronics Monitor; one more issue is planned to appear at the end of this year.

While this newsletter was originally devised to monitor technological advances, development and applications in the field of microelectronics and disseminate this information for the benefit of the developing countries as recommended by an expert group meeting convened by UNIDO on the subject, we have started a new section in this issue looking at the socio-economic implications of the new technology, as has been suggested by our readers. It is hoped that social, cultural and political impacts of technological advances will be studied in detail by appropriate fora.

Matters relating to microelectronics will figure in two important meetings convened by UNIDO in the coming months. One is the expert group meeting preparatory to the International Forum on Technological Advances and Development, Moscow, 29 November to 3 December 1982. The other is the Seventh Meeting of Heads of Technology Registries, to be held in New Delhi, 7 to 10 December 1982, which will consider, inter alia, a paper prepared by UNIDO on licensing computer software.

I may reiterate that comments, suggestions and contributions from our readers will always be welcome and, to the extent possible, will be taken into consideration.

G.S. Gouri
Director
Division for Industrial Studies

Inside this issue:

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NEWS AND EVENTS

Experts to review technological advances

The expert group meeting preparatory to the International Forum on Technological Advances mentioned in the editorial of Microelectronics Monitor No. 3, is being organized by UNIDO in co-operation with the USSR State Committee for Science and Technology and will be held at the Moscow Center for International Trade. As has been mentioned earlier, microelectronics will be one of the sectors looked into by UNIDO experts and their USSR counterparts from the USSR Academy of Sciences. The report of the meeting will contain recommendations and issues formulated for consideration by the Forum.

ESCAP workshop on mini- and microcomputers

The Economic and Social Commission for Asia and the Pacific (ESCAP), will organize a regional workshop on the role of mini- and microcomputers as tools for economic development in Bangkok form 8-16 November 1982. For details please write to ESCAP, United Nations Building, Rajdamnern Avenue, Bangkok, Thailand.

A CAD/CAM conference

A UNIDO CAD/CAM conference aimed at identifying those developing countries for whom the transfer of CAD/CAM technology would appear beneficial and trying to establish, as an ongoing organization, a CAD/CAM community consisting of such developing countries is contemplated for 1983 subject to availability of funds. UNIDO is negotiating with a prospective host country which has expressed interest in sponsoring such a conference to which a number of developing countries would be invited. It is planned to make an effort at the conference to develop at least one concept for a CAD/CAM project in each country participating in the meeting.

During programming missions to developing countries, UNIDO staff will assess the applicability of CAD/CAM technology to a country's industry. Efforts are being made to establish a number of large-scale UNIDO/CAD/CAM projects each year - one of them in a country new to such technology.

CNC machine tools

INTERTOOL AUSTRIA'82, a trade fair first held in 1980 and including to an increasing extent computerized numerical control (CNC) machine tools was held in Vienna, Austria, on 5-9 October 1982. The organizers' optimistic approach despite the worldwide economic recession was awarded with a good response from interested enterprises. Main customers for CNC machine tools on the domestic market are metalworking enterprises, especially a large number of small and medium-scale companies which are successful on the export market and have to be competitive with international standards. 498 companies from 25 countries were represented including Europe, the USA, Japan and the Republic of Korea.

The following information has been excerpted from the sources indicated.

COUNTRY REPORTS

Australia

Australia now has the capability to design special-purpose chips locally. This will enable local industries and research establishments - previously reliant on mass-produced general-purpose silicon chips which, although cheap, are sometimes inefficient for specific purposes - to custom-design their own chips here in Australia. According to the head of the Commonwealth Scientific and Industrial Research Organisation's Integrated Circuits Project, Dr. Craig Mudge, the development of Australia's capability in this field will give local users of general-purpose silicon chips access to special-purpose chip-design techniques previously denied to them. Using special US software for computer-aided chip design distributed in Australia by the CSIRO, users will have their designs sent to the US to be fabricated on a master chip, or wafer capable of holding about 40 different designs. "If an Australian business wanted a custom-designed chip fabricated, it would have to pay around $US 40,000 for prototype quantities," he said. The current cost of developing special-purpose chips is about $US 500,000 - if a chip manufacturer capable of producing them can be found. "We can have about 40 different designs fabricated on a single master for about

$US 40,000," Dr. Mudge said. According to Science and Technology Minister David Thomson Australia has acquired a tool "which could revolutionise manufacturing". Thomson said: "We are now in a position to penetrate overseas markets with a whole new range of high-technology devices based on special computer chips designed by the very industries which made the devices." He said that Australia could gain a competitive edge by specialisation, exploiting it before other countries caught up. But Dr. Mudge warned that in exploiting market niches, Australia should stay out of areas already dominated by others. "We should forget about chips in the car industry - the Japanese, Americans and Europeans are already well advanced in the field," he said. "We are strong in medical research so we should concentrate on range of medical appliances." The first run of the project has already led to the development of a new Australian-produced device for on-the-spot assessment of mineral deposits which is expected to go into production next year. Other Australian-produced devices include an advanced artificial ear implant in the human ear, an insulin diffuser for diabetics, an eye-movement detector to allow quadriplegics to operate various machines, and a device that will greatly enhance the CSIRO's radio telescope at Parkes. (Electronic Weekly, 15 September 1982.)

The Australian Science and Technology Council (ASTEC) has submitted a report to its government recommending enhancement of the development of microelectronics technology in Australia. Microelectronics has already become central to Australia's industrial automation, telecommunication and defence equipment. ASTEC believes that manufacturers and industry must become involved in this technology and they must be backed by a sound education, R&D and appropriate government support.

ASTEC outlines reasons why Australia should encourage such an industry and makes suggestions for government action:

- That the government recognise the fundamental importance of microelectronics technology to Australia's future industrial and strategic needs.

- That the government introduce a bounty to replace tariffs as the principal method of government support for Australian production of microelectronic devices.

- That the government use offsets to overseas purchases, continued application of preference to local goods and taxation incentives, to encourage local design, fabrication and use of microelectronic devices.

- That any proposal from an overseas manufacturer for the establishment of a microelectronics manufacturing facility in Australia involving government support be required to have provisions for favoured nation access to the manufacturer's range of products and adequate and effective technology transfer.

- That public interest grants under the Australian Industrial Revenue and Development Incentives Scheme give particular attention to the development of Australian microelectronics. (Science and Technology Quarterly, February 1982.)

Brazil

(The following information has been excerpted from an article on the "Electronics Industry in Brazil: situation in 1982" by S. Wajnberg, Executive Secretary of GEICOM,[1/] which was published in the Supplemento Tecnico of Revista Telebrazil,[2/] June 1982.)

Technological development

Technological development in the sector of telecommunications in the policy framework of the Ministry for Communications is implemented by the CPqD (Centre for Research and Development) in Campinas, São Paulo, which uses also private sector research centres. It started its work in 1977 and was officially established in an area comprising 26,000 m^2 in 1980, with approximately 100 employees.

1/ Grupo Executivo Interministerial de Componentes e Materiais in the Ministerio das Comunicaçoes.

2/ A publication of the Brazilian Association of Telecommunications.

The ambitious work plan includes at present the following programmes:

Computer electronics;
Optical communications;
Digital transmission;
Data transmission;
Satellite communication;
Components and materials;
Telecommunication systems;
Infrastructure and R&D.

Research products at the commercialization stage include: preferential telephones; multiplex equipment; portable testing equipment for telephone lines; prototypes of laser for use in optical line equipment; prototypes of optical line equipment; and 30 km optical fibres.

The informatics sector

10 years ago there was great competition between foreign suppliers; then came the oil crisis and with it a strict import control by the Government; however to ensure the productivity of existing systems, a limited import of peripherials and software continued. Imports in this area amounting to ca. $US 200 million in 1980 were reduced to ca. $US 70 million in 1981. This situation will not change since the total import figure for all computer equipment in 1982 will amount to $US 200 million including parts for systems and peripherals built by national enterprises. The two biggest transnational companies in this sector in Brazil are IBM (in Brazil since 1917) and Burroughs Eletronica Ltda. In 1981 the national enterprises in the informatics sector were exporting equipment in the amount of $US 600,000 and an increase to 24 million is foreseen for 1982. Five national enterprises are licensed by the Government to explore the market for minicomputers (Cobra; Edisa; Labo; Sid and Sisco): they supplied 17 per cent of the market at the end of last year. In accordance with a model adopted these five companies were allowed to use initially foreign know-how. However new versions of the product or equipment for new requirements of the market have to be based on endogenous technology.

In 1979 the manufacture in Brazil of microcomputers by national enterprises was authorized. As a result, in 1981 over 1,200 microcomputers were sold. In mid-1982 at least a dozen manufacturers were offering products while about 30 other projects were waiting to be approved by the SEI (Secretária Especiál de Informatica). However, there is a vicious circle of high production cost, hence low demand which in turn is reflected on a low production scale. To interrupt this vicious circle, it is necessary that those firms which will continue to stay on the market enjoy a short term return of investments made; to avoid high prices an excessive verticalization has to be avoided, i.e. insist on all parts and components to have been manufactured in Brazil without regard to economic considerations and the benefit of a new technology developed abroad.

Apart from these difficulties, which are common to each sector of industry being developed, the results achieved by the national informatics industry can be considered as good. At the end of 1981, 50 companies employed ca. 8,500 employees. The majority of them were specializing in branches such as development of basic software; computer architecture; quality control; testing equipment etc.

Electronics components sector

At present 150 companies manufacture electronic components at various levels of verticalization. The internal market, with a growth rate of 16.5 per cent in 1980 amounted to $US 1,035 million. To satisfy this demand, the local industry's production volume amounted to $US 645 million; imports amounted to $US 500 million, and exports to $US 120 million; exports in 1981 reached $US 175 million.

Process control

The Secretária Especiál de Informatica (SEI) trying to create a national capacity in production of process control equipment, faces a series of obstacles: insufficient human resources; ignorance of fundamental process engineering; rigid targets of big industrial projects which prevent users to develop appropriate software. It is also necessary to expand the family of process computers for the national industry; also the instruments produced by the enterprises approved by the Conselho de Desenvolvimento Industrial so far do not include any digital technology. The first step in a national policy would be to control the import of hardware, however with caution.

SEI is considering the establishment of an Informatics Institute with regional research centres operating jointly with the universities functioning as interface between manufacturing enterprises and engineering enterprises. (Revista Telebrazil, June 1982.)

A community trial of videotex which French Telecom is to launch in Sao Paolo, Brazil, this month, will be the first organized in a developing country. The trial, which will involve 1,500 terminals installed in private homes and business premises, will be patterned on the Teletel test which has been under way at Velizy, near Paris, since last summer. Matra is supplying the initial 1,500 terminals, including 500 of the Minitel type operating at Velizy and also used for France's test programme for an electronic telephone directory.

The other 1,000 terminals are Teletel models. These are basically TV screens with decoders which enable them to communicate with videotex service providers.

Brazilian industry will deliver 3,000 French-designed terminals as the Sao Paolo programme develops. The venture will include most of the facilities available to terminal users in Velizy. But notably absent will be the "electronic mail box" (and the Telepayment service for which "smart" cards have been issued to 300 residents of the Paris suburb).

Some 40 service providers will be linked to the Sao Paolo test at the outset, and they include a dozen banks. The Brazilian banking industry, which has wider ranging business activities - including insurance - than in the US or Europe, has been active in promoting the videotex experiment. The Sao Paolo test is being launched in a simplex configuration with a single CII-Honeywell Bull DPS 6 minicomputer as host centre. Within two or three months a full system with three minicomputers will be operating. The remote host centres are computers already at work in Sao Paolo's banks. Their front ends are being modified to handle the Teletel operation. Software for the Sao Paolo venture is supplied by Steria, the French firm whose Videopac package is already in use at Velizy. France's SESA handles Sao Paolo Teletel's data packet switching. SESA set up France's Transpac network and is scooping all the international orders for this technology. Customers include Australia, New Zealand and Luxembourg. A Transpac-type network will be installed by SESA in Brazil next year. (Computer Weekly, 19 August 1982.)

Bulgaria

The Bulgarian Institute of Industrial Cybernetics and Robotics has developed a family of microprocessor-based modules which have a wide series of applications in industrial process control. The family's generic name is "Mik". There are about 30 modules, each of which contains its own interfaces, controllers and software. One of the main modules is a module for controlling and measuring the temperature, fibre diameter and other parameters in the production of optical fibres. Program for the module is written in microbasic. A second module, called 'Betoncontrol' controls the consistency of liquid concrete during its mixing: another module, called 'Eko', measures and controls the climatic and soil conditions for hot-house plants; and a fourth module sorts out tobacco leaves by spectral analysis on the basis of colour. (Electronics Weekly, 15 September 1982.)

Canada

Northern Telecom Limited has announced a $US 220,000 programme to assist Canadian universities to improve the quality of education in microelectronics technology and computer-aided design tools. Integrated circuits designed by students as part of their course requirements will be fabricated by Northern Telecom at its Ottawa plant and returned to universities in packaged form along with test results. The universities currently do not have ready access to fabrication capability. (Canada Weekly, 29 September 1982.)

Simon Fraser University in Vancouver is offering a new engineering science programme that will cover the fields of biotechnology, robotics and automation amongst other studies. The programme, which is expected to be in place by September 1983, will graduate 75 high technology engineers a year. The programme will be unique in Canada and will be a relatively small programme producing a small number of graduates. (Canada Weekly, 25 August 1982.)

Colombia

French Telecom is helping Colombia to overcome daunting geographical barriers including the Andes mountain range, which rise above 16,000 feet, and the Rio Magdalena, a winding river whose primeval forests stretch from the Pacific to the Amazon and are almost impene-

trable. France is co-operating actively in Colombia's programme to boost its 1.3 million subscriber lines at an annual rate of 200,000 and in a $US 200 million venture to extend the rural telephone network. But in 1990 only one peasant in every 100 will have his own phone.

Microwave radio has a key role to play in Colombia. France's SAT firm has been digitising this network for the past six years. The link between Bogota and Cerro Granado has been operating without maintenance or breakdown. SAT has also installed 480 chanel digital links for the airports of Cali, Barranquilla and Medellin with its FHD 234 systems. The French company has now been asked to link the islands of San Andres and Providencia in the Caribbean with FHD 208 digital links which have a capacity of 120 telephone channels and five telegraphic channels. Colombia is showing great interest in development by France of optical fibres and hopes to be able to use these for links between switching exchanges in its major cities within a few years.

However, Colombia is not relying entirely on foreign support for its telecom network. Reluctant to let the expansion of its communications system depend on export revenue, it is manufacturing equipment locally and providing as much added value as possible to imported products. Protelecommunications Ltd., a joint subsidiary of the National Telecommunications Enterprise (Telecom) and the Industrial Development Institute is responsible for encouraging local manufacture. They have set up a number of small firms, usually run by engineers trained in the United States, to assemble radio-communications equipment under foreign licence. A big step forward has been taken with the creation of the firm's telephone set factory in Bucaramanga. Its output of 100,000 sets a year ought soon to cover half the country's needs. Intelsa is now moving into PABX and transmitter-receiver manufacture for rural telphone networks. Local industries will also make 180 antennae for the first phase of the SATCOL satellite which is scheduled to handle much of Colombia's telephone traffic and two television channels when it enters service in 1985. (Electronics Weekly, 22 September 1982.)

People's Republic of China

China has taken its first export order for a locally developed computer, the BCM-11 microcomputer, which costs three quarters of the price of similar foreign equipment, according to a Peking Daily newspaper. An order for 1,000 BCM-11 microcomputers has been placed by an unidentified West German company with the Peking Computing Technology Institute. Computers have been produced in Peking since 1980 by the Institute. The report said that 10 sample computers have already been accepted by the customer.

According to the report, technicians of the institute designed the computer's main component including the central processing unit (CPU) memory and related chips on a single board and adopted the double-sided, double density floppy disc recording methods, so that the system's operating speed has been increased and its external storage capacity raised to 2.4 Mb. While its cost is claimed to be only three fourths that of similar computers made abroad, its performance cost ratio is high. Several West German Computer experts reportedly saw the computer at the Peking Institute in autumn 1981 and suggested that it be displayed at the Munich International Fair last November. It was not disclosed whether the West German order resulted from displaying the computer at the Munich fair, however. Last year in December the French company Thomson signed a contract with China for the production of solar minicomputer in Canton. The yearly production of 400 units is due to start in 1983. (Electronics Weekly, 1 September 1982 and 29 September 1982.)

China is now providing 33,000 kinds of electronics elements and devices according to 300,000 specifications for both military and civilian use, the Chinese Ministry of Electronics Industry claims. The Chinese electronic industry, according to the Ministry, has concentrated over the past three years on research and development of new products as well as quality control, resulting in higher overall standards. Of the 87 electronics elements and devices manufactured for high technology military equipment, the Ministry claims that 84 are up to the standard and are able to withstand temperatures colder than 55°C below zero. The application rate of electronic elements specially for strategic arms rose from the original 20 per cent to over 95 per cent. The service life for black-and-white television picture tubes, it claims, averaged over 5,000 hours, with the picture and electric parameters close or equal to advanced world standards. The Ministry also said that quite a number of new products have now emerged, including frequency converting magnetron, used in a new radar system, dynamic storage, and large-scale integrated circuits. The national output of electronic tubes, semiconductor devices, and radio elements, according to the Ministry, rose from 13 to 37 per cent. (Electronics Weekly, 1 September 1982.)

China sees future in computer technology

China is adopting a more aggressive stance in marketing its computer technology which, its technicians believe, has vast potential in view of the country's availability of manpower and expertise. Hence, in an ambitious bid to upgrade its computer industry and to market computer hardware and software internationally, a joint venture has been established based in Hong Kong. Sino On-Line, which has a paid-up capital of HK$1 million, has 42.5 per cent of its shares held by the Peking Computer Industry Corp. and the Peking branch of the China Electronics Import and Export Corporation; 42.5 per cent held by Chartered On-Line Ltd., a computer consultancy firm that provides services to local businesses; and the rest by the local Chai Luk International Trading Ltd. The scope of the new venture, includes:

- Producing competitive product designs for hardware to be manufactured in the People's Republic of China and the marketing of China-made hardware abroad;

- Purchasing computer accessories, components, spare parts, and other materials to assist the development of the country's computer industry; and

- Setting up a maintenance organization for computing hardware within the country and training Chinese technicians in modern computing techniques.

An executive of the Peking Import and Export Administration Commission, Chen Suiting, acknowledged that computers are still not yet widely used in China, although they have achieved a certain standard in production techniques.

Computers have been used for medical purposes, in the textile industry, sewage treatment, hotel management, railways, banking and aviation. Chinese cities such as Shanghai, Tianjin and Shenyang and some ministries have also used computers and are making their own hardware and software. It is difficult to give an overall figure for the number of people involved in the computer industry in China. Chen stressed that efforts are being made to train university graduates, who are said to be keen in learning the technology. Computer experts from China say that they have mastered most computer languages, although they still need more training in some areas, especially COBOL, before they can become commercial programmers. (AEU, September '82).

France

The French Government declared war on world electronics markets with a FF140,000 million ($US 20,000 million) three to five-year investment programme in the French electronics industry.

The battle will begin in the United States. M. Abel Franoux, principal architect of the French programme, is expected to move to an office in New York in September and one of his partners, M. Girard Compain, is to set up shop in California. Altogether, some ten French electronics policy-makers are to move to the United States this year. Their objective will be, in part, to learn, but the real French goal is the American market. France would seek both to establish French companies in the United States and to set up co-operation agreements. But so far the French Government has given no details of Farnoux's new role. The decision last week was to adopt the main lines of Farnoux's recent report on the industry and to announce an investment figure. The most difficult domestic question has been avoided - how to reorganize the French electronic industry at home. The problem is that some of the major companies - such as Thomson CSF, which produces military equipment, telephone exchanges, minicomputers, microchips, television sets and hi-fi equipment - have clear ideas of their own about their competence and company strategies, and have resented the Government interference implied by their recent nationalization.

Meanwhile, money will certainly pour into the industry, and that alone may give it a competitive edge. It seems likely that the Government will provide FF10,000 million in support of component manufacture (basically chips); FF7,000 million in consumer electronics; FF15,000 million in computers and office automation; FF15,000 million in the space industries; FF3,200 million in industrial automation; FF2,000 million in scientific instrument manufacture; FF3,000 million in medical electronics; and FF4,500 million in software production. On top of this, the industry itself is expected to invest some FF90,000 million over the planning period (to 1986), a rate not far from its present figure. (Nature, Vol.298, 5 August 1982.)

French officials and business leaders have set up a think tank to organize the future of the national data processing industry in the framework of the FF140 billion (£11 billion) five-year electronics and computer plan. Government experts propose to establish close links between CII-Honeywell Bull, Thomson-CSF's subsidiary SEMS and peripherals maker Logabax. But they admit they have not yet found a way to harmonize the activities of this powerful triumvirate with smaller but active private firms such as Intertechnique and SFENA-DSI. However, co-ordination is particularly urgent in order to meet US competition at a time when CII-HB has just reported losses of FF500 million (£40 million) and Digital Equipment has increased its turnover by 57 per cent. Government and industry have not yet taken a decision on a project to produce an all-French large mainframe, pending talks with other European manufacturers. Jean-Pierre Chevènement, Minister for Industry and Technology, favours an alliance with France's industrialized neighbours for this purpose. Chevènement's ministry has published proposals to consolidate CII-HB's position in the European market in medium-sized management systems based on its DSA network architecture. The Industry and Technology Ministry is urging that duplication in expenditure on research and development and in industrial and marketing investment must be avoided. The Government is making FF600 million (£48 million) available to develop basic computer components - Chevènement calls them "building blocks" - for use by a wide range of manufacturers. Chevènement's office says that the emphasis must be placed on mass-production of microcomputers without sacrificing individual initiative in innovation. (Computer Weekly, 16 September 1982.)

The French Government has approved what amounts to a merger between Schlumberger, the American oil field servicing and electronics multinational, with Benson, the world's number two computer-aided drafting firm. Benson's staff of 900 meet the demands of a massive market embracing one-quarter of worldwide sales, half of Europe's and three quarters of France's. But the French company is encountering serious cashflow difficulties. These are the price of a decade of uninterrupted expansion which has averaged 33 per cent each year. In 1981 turnover totalled FF330 million (£24 million) and half of this was earned in the United States. Market experts believe that although the French government has given its stamp of approval for acquisition by Schlumberger of 70 per cent of Benson's equity, the multinational will soon take 100 per cent control. Schlumberger made a £720 million profit last year with a turnover of £32 billion. It has already bought Applicon, the world's second ranking firm in computer-aided drafting. French electronics industry experts in Paris voiced disappointment over the merger between Schlumberger and Benson. They said it was regrettable that CII-Honeywell Bull, which is now inder control of the French Government, had not made a bid of its own. Benson runs two development and manufacturing centres in France and California. Over 10,000 Benson systems are installed in the world's industrialized countries. (Computer Weekly, 2 September 1982.)

France is lagging in fifth place in the world league for technological research, and impairing the prospects for its computer and electronics industries according to a report just published in Paris by the National Credit organization. France occupied third place ten years ago. It is now behind the US, Britain, West Germany and Japan. It is also the only industrial country in which research has accounted for below 2 per cent of gross national product since 1960. On average the French percentage has hovered around 1.8 per cent. This compares with 1977 levels of 2.4 per cent for the US, 2.2 per cent for West Germany, 2.1 per cent for Britain and 1.9 per cent for Japan. The result is that French firms' overall expenditure on research is half that of Japan and West Germany and six times lower than that of the US. General Moteors spends three times as much on research as the entire French automobile industry, and the Hoechst chemical firm more than the entire industry in France. National Credit says a major reason for France's poor performance is the fall in the contribution of the public sector whose share of gross national product devoted to research has fallen from 1.55 per cent to 1.05 per cent. This is partly a consequence of a reduction in investment by the Defence Ministry. Private financing of research by industry rose from 0.63 per cent of GNP in 1968 to 0.75 per cent in 1980 - well below the 1.1 per cent level of Japan and the US. The French Gonernment's objective is to hoist expenditure on research from all sources to 2.5 per cent of GNP by 1985. (Computer Weekly, 2 September 1982.)

France gears up for processing by satellite

A room full of computer equipment in a laboratory near Paris is providing French engineers with useful practice for the day France's first national satellite leaves the ground. By sending signals through the computers, the workers are simulating what will happen when Telecom-1 is launched around the beginning of 1984. The experiment, code-named NADIR and controlled at the Government's INRIA in Paris suburbs, is also giving companies the data they need to ensure that computer processing equipment can link up with the satellite. Telecom-1 will be one of the most advanced satellites yet built. Every second, it will be

able to transfer up to 125 million bits of information to and from computer centres around France. It will handle these data in individual chunks of up to 2 million bits per second. This means that an engineer with a load of computer data to transmit can do so much more quickly with the space vehicle than with the land-based telephone system, which can handle data transmitted only up to 64,000 bits per second. What is more, the engineer will be able to transmit the data to any building that has a receiving terminal. In one part of the project, engineers are sending signals through the computer equipment that simulates the satellite. This will help them to lay the ground rules for operating the craft when it comes on stream. It will also provide advice for firms that want to connect their equipment to the vehicle. At present, manufacturers have little experience of the kind of coupling equipment that they will need. (New Scientist.)

Republic of Korea

The following is an outline of survey results by the '82 Southeast Asian Electronic Industry Survey Group'organized by the Electronic Industries Association of Japan:

The Republic of Korea's Fifth Five-Year Plan, which got under way this year, calls for an average annual economic growth rate of 5.5 per cent. With "efficiency and stability" as its basic objective, the plan for reconstruction of the repubic's economy is designed to increase the domestic demand by stimulating consumer buying desire through a reduction of the special consumption tax on consumer durables, mainly home appliances, the establishment of a consumer financing system, etc. In the field of industry, the plan places emphasis on an expansion of the machine and electronics industries included among the nation's ten major strategic industries. Industrial policy and foreign trade policy are to be co-ordinated to develop an export-oriented economic structure.

The principal planned measures for the promotion of the ROK electronics industry are: (1) increasing the value added and the international competitiveness of home electronic appliances, (2) giving priority to the development of a brain-intensive, resource-saving electronics industry, (3) developing an industry capable of producing hitherto imported industrial electronic equipment and establishing a self-sufficiency in this field and (4) domestic development of the principal key parts. Production of the following products is to be encouraged: For industrial use: wire communication equipment; computers and their peripherals and terminals; electronic measuring instruments; register. For non-industrial use: VTRs; audio equipment; color TV receivers. Parts: semiconductors; speakers; lead frames; switches and connectors; magnetic heads; tape transport mechanisms; cartridges; micromotors; color picture tubes; FBT and yokes; magnetic tapes; etc. Electronics industry production in the Republic of Korea in 1981 showed an increase of 33 per cent over the previous year. Both non-industrial equipment and electronic parts achieved a well-balanced growth. Mainly responsible for the growth was a substantial increase in color TV concerned doubled their production and endeavored to increase their exports as well as their domestic sales. (AEU, October 1982.)

Hong Kong

Local industrialists should introduce new technologies, both in processing and production, as a defense against the protectionism building up against Hong Kong's additional consumer exports, according to the managing director of the Geneva-based Market Development Institute, Dr. G.A. Schmoll. Hong Kong's industrial sector is currently caught between three centres - protectionism, competition from other countries with lower-wage levels, and rising domestic costs. While Hong Kong may be able to negotiate more favorable trade agreements, Dr. Schmoll said that such is only a temporary solution to the real problem. On the other hand, there are alternatives open to the industrialists themselves. These include:

1) A careful study of existing products to determine the danger of running into a protectionist wall. If that danger exists, manufacturers can move up-market or move out entirely.

2) Stronger marketing - manufacturers should not rely on agents but go out to the markets themselves.

Marketing, in Dr. Schmoll's view, is finding out what will sell and then marketing it, instead of the other way around. Thus, he recommended industrialists to undertake secondary research and development to find out what other people make and sell and improve on the

product, producing it faster and better. In this respect, the consultant believes that Hong Kong still need to work at changing its image of a producer of cheap goods. Hence, manufacturers are urged to buy in new technologies for products that have a higher "brain content". Some of the new technologies Hong Kong manufacturers could look at, he said, include:

1) Communications equipment and electronic mail system;

2) Downstream applications of data processing, such as personal computers with the proper software;

3) Crossroads between optics and electronics process control instruments;

4) Laser applications in communications;

5) Optical fibres;

6) Microwave and ultrasound applications;

7) Industrial robots. (AEU, July 1982.)

In early May, Conic Investment Company Ltd. released a report entitled "A Review of Hong Kong's Electronics Industry in 1981". The following article is an excerpt from the report.

Introduction

In 1981 Hong Kong's exports of electronic goods amounted to HK$ 15,774 million and accounted for 19.6 per cent of the colony's total domestic exports of HK$ 80,423 million. This places the electronics industry firmly in the second position, next only to garments. Compared with 1980, last year's exports of electronic goods registered a growth of 13.0 per cent in value terms. Also, the industry provided employment for some 95,000 people in more than 1,110 factories. Table 1 summarizes the sector's position in six major product groups.

Semiconductors

As whole, the industry registered a loss of around 12.5 per cent. The high cost of labor and rent in Hong Kong has ended any growth prospects in the sector. This is a sharp contrast to the spectacular growth, over the past few years, in both Malaysia and the Philippines (Table 5).

Transistors, one of Hong Kong's original electronic industries, finally reached a peak in 1980 and then saw their first major drop of 30.8 per cent from HK$ 546 million to HK$ 378 million. Export quantities dropped from 1,313 million to just about 947 million, with the average unit price declining to HK$ 0.40. This represents a loss of HK$ 0.02 per unit. It is expected that more and more transistors will be replaced by integrated circuits.

The export of diodes increased from HK$ 97 million to HK$ 129 million, or 33 per cent, represented entirely by an increase in unit price. The export quantity actually dropped from 1,000 million to 947 million.

Integrated circuits grew from HK$ 522 million to HK$ 584 million. The 11.9 per cent increase is attributed to the increase in prices of the components. However, export quantity actually dropped from 166 million to 137 million. On the other hand, the newly-established semiconductor operations at Tai Po will no doubt boost sales of complementary metal oxide semiconductors (CMOS) and microprocessors in 1982 for local consumption. However, no significant contribution to Hong Kong's exports is foreseen.

Unless the government can provide an investment incentive programme for foreign investors, Hong Kong will not be a major contributor in semiconductor production, through the sector still accounts for 8.2 per cent of Hong Kong's electronics exports.

Table 1: Major electronic product groups

	1981		1980		Growth (%)
	HK$ million	Share (%)	HK$ million	Share (%)	
Audio products	5,514	35.0	5,221	37.4	+5.6
Watches and clocks	4,295	27.3	3,983	28.6	+7.8
Components for computers	2,111	13.4	1,437	10.3	+46.9
Electronic games	1,279	8.1	949	6.8	+34.8
Semiconductors	1,287	8.1	1,471	10.5	−12.5
Miscellaneous	1,288	8.1	894	6.4	+44.1
	15,774	100.0	13,955	100.0	+13.0

Table 5: Semiconductors

	1981	1980	Growth (%)
	HK$ million	HK$ million	
Diodes	129	97	+33.0
Transistors	378	546	−30.8
Integrated circuits	584	522	+11.9
Other semiconductor devices	196	306	−36.0
	1,287	1,471	−12.5

(AEU, July '82)

Hungary

During 1981-85 Hungary does not intend to add substantially to its stock of installed computers - currently 700 mainframes used by 2,500 organizations - but rather to improve the efficiency with which they are used. There will however be a big boost in installation of minicomputer systems, mainly Hungarian-produced. 30 major Hungarian corporations are expected to computerize their operations and computers will be more efficiently used in research, accountancy and administration work. (Electronics Weekly, 1 September 1982.)

India

The Department of Electronics (DoE) has plans for the indigenous production of 79 electronic items and equipment during 1982-85 and the value of the additional production will be over Rs 3,000 million. This will be part of an import substitution programme. The items which will be indigenously produced among the key sectors include 15 for defence, three for railways, six for broadcasting, three for agriculture, one for flood monitoring system for river basins and 13 for civil aviation department. The items also cover sectors like oil exploration and production, steel and power, large screen displays, video extractors for radars, automatic electronic voice switch, target simulators for radars and sonars, direction-finding equipment and UHF transmission equipment. (Electronics Weekly, 1 September 1982.)

India will invite big business houses, which will make electronic components, computers, and microelectronics, to make the country the premier producer in professional electronics in the 1980s, according to Deputy Electronics Minister. Opening the research and development complex of Peico Electronics and Electricals Ltd. (formerly Phillips) at Lone he said: "Electronics can give maximum employment potential throughout the country without polluting the atmosphere". He urged the big business establishments to take advantage of the duty reliefs offered by the Government, and to purposefully use the services of trained personnel. He added India was still dependent on imports of electronic components to the tune of Rs 480 million a year and called for steps to not only help reduce imports but also make the country a net exporter of electronic components and computer software. (Electronics Weekly, 1 September 1982.)

The Electronics Corporation of the South Indian State of Tamil Nadu has set up a plant in Bedok, Singapore, to manufacture computers with the objective of exporting its products to Australia, New Zealand, and elsewhere. The new company will initially produce the

M23 Mark III model, but will subsequently expand its production capacity to produce other models such as portable personal computers. The company is expected to invest $US 60 million in its first five years of operation. (Electronics Weekly, 15 September 1982.)

Bharat Electronic Ltd. is setting up a space electronics division in Bangalore, which will primarily work to meet the requirements of Indian Space Research Organization (RSRO). The division will construct and supply experimental and operational models of equipment, sub-assemblies and sub-systems designed by ISRO. It will also develop and engineer electronic equipment, conceived or specified or designed by ISRO. The division will start the batch production of equipment and sub-assemblies already engineered and qualified to ISRO specifications. (Electronics Weekly, 15 September 1982.)

The Indian Telephone Industry is stepping up production of small-scale rural electronic telephone exchanges following successful performances of the instruments produced in the first batch. About 100 ten-line telephone batch, according to R. Narayanan, general manager of ITI unit at Palghat, are already in operation in different terrains and climatic conditions in rural areas in Kerala, Maharashtra, north-east region, Rajasthan and Uttar Pradesh bringing them into the country's telecommunication network. Two hundred more such exchanges are expected to be operational soon. The Palghat unit, according to Narayanan, is India's most modern electronic unit which is having semi-automatic guiding assembly stations capable of guiding the operator to insert various electronic components into the printed circuit board (PCB) at appropriate places, thus eliminating errors in assembly. The company is now due to launch its third phase of development costing Rs 200 million which will take the total annual capacity to 150,000 lines in collaboration with a foreign partner. (Electronics Weekly, 13 October 1982.)

Malaysia: "Automation the key to the future"

Penang is the hub of Malaysia's electronics industry and one of the world's major assembly centres for semiconductors. However, 10 years after the first foreign company arrived to set up an off-shore assembly plant in 1972, the semiconductor manufacturer's projected growth requirements appear to have reached the point of exceeding the northern peninsular Malaysian state's local resources. At present six semiconductor manufacturers are located in the Bayan Lepas Free Trade Zone in the south-eastern tip of Penang Island, which together with Province Wellesey facing over the dividing channel on peninsular Malaysia make up Penang State. Five of the companies are wholly owned subsidiaries of American semiconductor corporations with headquarters in California's Silicon Valley, the sixth is a Japanese subsidiary belonging to Hitachi. National Semiconductor was the first IC manufacturer to begin operations in December 1972, followed by Advanced Micro Devices (AMD) and Intel Technology in January 1073.

Hitachi Semiconductor and Mostek began operation later in July 1973 with Monolithic Memories following shortly afterwards in September 1973. With the IC manufacturers all beginning operations at about the same time, most have seen their operations develop in a similar way since then. At first the factories were used only for assembly purposes with the assembled ICs being sent to the parent company or to a regional centre for testing and then distribution to customers. While part of the Bayan Lepas Free Trade Zone's attraction is its very close proximity to Penang's newly rebuilt international airport, the unforeseen oil crises in 1973 and 1979 greatly altered the companies original air freight cost calculations. The result is that the assembly plants, beginning with Intel Technology, have pulled in most testing functions from elsewhere in the past few years. Penang's semiconductor manufacturers now test most of their ICs on-site, enabling the majority of them to export finished products direct to customers around the world, rather than incurring unnecessary air freight costs sending ICs to their headquarters for testing and then shipping them on to Europe, back to Asia or around the United States. Mervyn Curtis, managing director of Monolithic Memories, which opened its testing facility in 1981, sees a greater role for the plant with the establishment of on-site testing.

"We are going to do more testing to cut down on the airfreight costs through having to send the ICs back to the United States for testing. Our plan is, as testing grows here in our Penang plant, to set up a local logistics centre to ship the ICs direct to our European and Southeast Asian markets," Curtis explained. Managing director of national Semiconductor, Wally Crookes, noted that most of his plant's output has been tested on-site for the past four years and points to time saving involved. "In future the name of the game is high quality and reliability with fast delivery times as these are important to catch the customer

at competitive prices," Crookes said, "It is important to have on-site testing facilities to cut the shipment cycle times." While it is not known whether the companies anticipated the eventual need for on-site testing, all the factories were built on plots of land with sufficient space available for future plant expansion. Whether planned or not, most companies have used most of their surplus land expanding their factory floor area and building testing facilities, and now have to consider other locations for a new production plant. Although several companies told Electronics Weekly they would like to build a second assembly plant on a new site in Bayan Lepas Free Trade Zone, it seems unlikely that they will be encouraged to by the Malaysian authorities. Only Intel Technology has land available on its present site to build a completely new IC assembly facility should the decision be made. However, Intel is constructing a new assembly plant in Mexico at present and so a decision is not required right now. The granting of tax-free investment incentives by the Malaysian Government has been restricted generally to one nine-year tax holiday for constructing a single factory in any state, though exceptions have occured, such as when Monolithic Memories was granted a nine-year tax holiday in 1981 for the construction of its testing facility. Penang Development Corporation (PDC), charged with overseeing the general economic and industrial growth of Penang Stae, is understood to favour the further diversification of the local industrial base now that 29 electronics factories are established in the state providing 24,140 or 44 per cent of the 54,780 jobs created in the various industrial estates under PDC management. The policy adopted by the Malaysian Government towards companies already established in Penang and wishing to build a new factory appears to be to offer tax holiday investment incentives for setting up operations in one of the peninsular's more backward states which the Government would like to see developed. The Malaysian Government is reported to be trying to encourage interested companies to build new factories in Kelantan State, one of peninsular Malaysia's most underdeveloped areas, though companies themselves would prefer to set up any second plant in Kedah State, to the north of Penang State. Perhaps surprisingly, labor instability has proved to be a considerable headache for many semiconductor manufacturers, although the availability of cheap and easily trainable local labor was what lured most companies to Penang in the first place. In fact, until the start of the present recession the problem of frequent job hopping by workers had become a serious problem for some firms. IC manufacturers acknowledge that they compete with one another as well as with other companies in Penang for local labor talent. Wage levels offered by competing companies have to be matched if the best staff are to be retained. Wages for assembly workers have increased about 20 per cent annually for the past few years and the subject of pay levels has not surprisingly become a regular topic of discussion.

One result of the labor shortage and rising wage costs has been the increased installation of automated high-speed production lines by IC assemblers to expand output. The degree of automation varies among companies though most are bringing in new equipment continually and expect to see their production capacities grow steadily in future. According to general manager Ng Foo Seng of Intel Technology, the labor problem cannot be solved by bringing in workers from neighbouring states due to settling-in difficulties which can occur when outsiders try to adjust to living in Penang. "We are going to automate more and more and we will be producing about double our present volume in five years time," Seng said. "The reason for automation is the scarcity of labour rather than the effects of wage increases. About a year ago it was difficult to find people, but it is easier now."

Staffing levels have generally been allowed to decline by about 10 to 15 per cent through natural attrition since the beginning of the recession, but with new equipment being installed for the expected growth in production once the end of the recession comes in sight, most companies expect to see their staffing figures return to 1980 levels within the next two years. Managers say they have avoided retrenching staff but note that actual staffing increases are unlikely in future, however, as automation will give higher outputs while older and slower manual processes are phased out. "Now we have more automatic machines coming in, so although production will be up the number of workers will not be increased", explained Hitachi director Hidenori Tanaka, "We will not fully automate because there is no advantage to do this outside of Japan. The advantage here is the human element of rpackaging, inspection, visual tests and quality assurance." Whether the Hitachi view is subscribed to by American subsidiaries is debatable though. as while some 70 per cent of Hitachi's total worldwide output of ICs is still completed in Japan, most American IC manufacturers assemble almost their entire production off-shore, mainly in Asia....

With the trend of on-site testing and greater production automation having been established already, Penang's off-shore IC assembly plants already have been given greater developed autonomy to handle their growing output through being able to export finished products direct to customers after orders are placed through their international headquarters. However, in spite of the higher output semiconductor corporation will be able to achieve from automating their existing off-shore facilities, it seems that a new spate of

assembly plant construction will begin shortly and it is by no means certain that all the companies will construct new factories in Malaysia. Sri Lanka, the Philippines, Thailand and also Taiwan are known to be under consideration as new plant locations by several companies including AMD and Monolithic Memories, though no definite decisions are believed to have been taken yet. While some would prefer to build a new plant in Malaysia, a country they know and trust already, the underdeveloped infrastructure and less attractive location of potential factory sites in more backward areas such as Kelantan State may outweigh the tax holiday investment incentives being offered by the Malaysian Government. Ten years after the first semiconductor assembly plant began operations, Penang is now Malaysia's second industrial centre after Kuala Lumpur. However, Penang's future growth as a major international IC assembly centre now seems likely to come from technological advances in automation rather than from a second phase of assembly plant construction in its Free Trade Zones. (Article reproduced in part with kind permission from Electronics Weekly, 29 September 1982.)

Kuala Lumpur: Intel Technology of Penang, a wholly owned subsidiary of Intel Corporation of Santa Clara, has announced plans to double its present output of semiconductors over the next five years through a continuing scheme to increase automated assembly lines.

Devices being assembled by the company include Dynamic RAMs, ROMs, EPROMs, microprocessors, microcomputer devices, microcontrollers, periphery circuits and telecommunications products. "Our products are at the higher end of large scale integrated circuits," commented general manager Ng Foo Seng, noting that other off-shore assembly plants established by the Intel Corporation are located in the Philippines and the Barbados. A fourth off-shore assembly plant is understood to be under construction in Mexico at present. Established in Penang's Bayan Lepas Free Trade Zone since 1972, the plant's total covered area has grown to 100,000 sq ft of which about half is devoted to on-site testing of locally manufactured devices. Wafers are imported from the United States while plastics and ceramics used for packaging are imported from the United States, Japan and Singapore. "Ceramic packaging has a higher reliability at present, but (the use of) plastic packaging should increase in future as the reliability improves at a lower cost," Seng said. "Production costs have gone up in the past year, there is no doubt about it, but the increased is not a lot calculated on a single unit basis." At present almost all the semiconductors assembled by the plant are shipped back to the parent company in the United States for distribution to customers including IBM, NCR, Honeywell, Univac and ITT. A small amount of devices are exported direct to customers in Japan and the UK. (Electronics Weekly, 29 September 1982.)

Netherlands

The Netherlands' Ministry of Science is currently drawing up a programme for spending up to $US 10 million a year on promoting the application of microelectronic devices by small and medium-sized Dutch firms. The programme has three parts. The first is the establishment of three consulting centres by the end of this year to which the firms can turn for technical, managerial, and marketing advice on the microelectronic-based products they are designing. The second will give financial help to small and medium-sized companies engaged in the design of chancy products using new microelectronic technologies. If a product proves commercially successful, the company must repay up to 70 per cent of the Government's financial aid. The third portion will help universities expand their research and development facilities to accommodate more graduate students. (Electronics, 25 August 1982.)

Singapore report: Following the Japanese example

If there wasn't enough bad news around for the Western manufacturers due to the recession, there is going to be even more when they learn the real meaning of the expression 'newly industrialized'. Singapore falls somewhere between Japan and Taiwan in its level of industrialization. The labour rates are much lower than in the West, possibly around half those of Europe, but they are by no means low in comparison with Taiwan, the Philippines and Central American states such as El Salvador. The Singapore Government actively discourages the notion of the small island country at the tip of the Malay peninsula as a cheap labour area. It is quite adamant that its 2.4 million population receives more than just a bowl of rice for its labours. The electronics industry in all its forms accounts for some 60 per cent of Singapore's gross national product, a total of around $US 10 billion (£3 billion). It is by far the largest employer and shows the greates added value. The country exports in the region of 90 per cent of its produce. It sells more than $US 100 million of television sets to the People's Republic of China and the Middle East alone. The original attraction of cheap labour brought in many of the multinationals such as Hewlett-Packard, General Electric, Texas Instruments, NEC, Matsushita, Siemens and a host of others. These companies mostly carried out assembly work and other labour intensive tasks and with the full approval of

the Government prospered to the point where there was a shortage of labour. As a result the Singapore electronics industry has grown from nothing to the major industry in under 15 years. At the same time the workforce, conscientious and socially ordered, has been given the benefits of the expansion with a continuously improving standard of living.

Recession in the US and Europe is bound to affect its own electronics industry very deeply given the latter's complete dependence on exports. For the first time ever in the short history of the country there is talk of 'retrenchment' an inevitability given that offshore operations are the first things which multinationals chop when economies need to be made. Faced with recession the things which the Singapore Government didn't do - it keeps a very short rein on the industrial infrastructure through a bewildering array of boards and committees - are almost as interesting as the things it did. For instance it did not attempt to cut back on the living standards or expectations of workforce or preach austerity measures, now so familiar in the West. Neither did it actively seek more assembly industry at the expense of its Asian neighbours. What it did do was to embark on a campaign to move the entire electronic industry into a higher gear, in short a new programme of industrialization to turn assembly into OEM manufacture. Furthermore what it cannot attract from outside it intends to create for itself. There are essentially three prongs to the Government programme. The first involves a retraining of the workforce with much greater emphasis on higher education.

Government personnel repeatedly state there is "a bias of management against poorly educated workers when it comes to retrenchment" and that such unemployment rates among the unskilled was "a good sign because it shows that employers are responding to the Government's call to restructure the economy." It sounds very naive to Western ears but the locals really believe it. There is a major push to direct higher education towars the working technologies such as software, microtechnology and robotics. What the Singapore Government cannot cater for in its own colleges it is prepared to make up by sponsoring students for overseas study.

The second prong is productivity increases through automation. There has been substantial activity in this area since 1978. In spite of commercial propaganda which would have you believe that the mainstay of the Singapore electronics industry is industrial electronics as opposed to the consumer interests of Taiwan and Hong Kong, the Government's own figures indicate that only four per cent of electronics industry revenues are generated in this way. The rest, it seems, comes from the same markets which keep Hong Kong in business. That the country's workforce has not priced itself out of the free market so beloved by its Government is due largely to the adoption of robotics and automation. The trend to this way of working will increase even further even though it is far more likely to be involved in the manufacture of a television than a mainframe computer. Part of the same prong is a recently announced $US 170 million five-year computer applications package. The Government plans to spend the money on a project which has many similarities with the UK's own MAPCON scheme. It combines awareness programmes, education facilities, management training courses, engineering courses and development facilities.

Unlike the UK's scheme which is aimed at product development in the main, the Singapore project looks firmly towards automation of labour intensive production processes, a tacit admission that consumer electronics is likely to be the industry's mainstay for at least the next five years. The third prong comprises a range of favourable subsidies for companies who are willing to transfer high-technology processes and design centres to the island. Roughly speaking they line up with the inducements given to companies willing to set up in European development areas. However the criterion for aid is the potential for technology transfer rather than the number of people employed. Taken together the package of new indsutrialization measures look very similar to the policies which Japan has pursued during the last decade... (Article reproduced in part with kind permission from Electronics Weekly, 8 September 1982.)

The Singapore Government has announced a $US 170 million package to boost computer technology in the country. The five-year plan, worth around £50 million at current exchange rates, is aimed at bringing the local electronics industry, the country's biggest employer, out of recession. The massive cash injection - the population of the island is only 2.7 million - represents a thirteen-fold increase on the amount which the Government earmarked just two years ago for training and education programmes. For comparison, it is the same order of magnitude as the UK's Mapcon microcomputer and microelectronics awareness programme. Although few details have been released yet the UK is likely to be involved in

the training of software engineers. Earlier this year the Singapore Economic Development Board said the country would aim for software self-sufficiency by the late eighties. Other countries likely to be persuaded to take in local graduate engineers for training are the US and Canada in return for preferential buying policies. Singapore's National Computer Board chairman, Philip Yeo, said that nearly 65 per cent of the $US 170 million would be spent on computer-training programmes, subsidised/development costs of software packages for local industry, teacher-training and other incidental costs. Development facilities including the hardware and the buildings to house them will account for most of the remaining sum. However $US 10 million (£3 million) has been allocated for graduate scholarships to countries like the UK. Yeo commented that the education package put together by the NCB was not only aimed at increasing the pool of computer manpower but also to address four aspects of a larger problem: to look at the academic requirements of the computer business, provide opportunities within industry for retaining of existing engineers, create user awareness and the understanding of the interaction required between the user and the computer staff and instill a positive attitude in top management towards computer technology. Where the British Mapcon programme generalises and operates much as a catch-all, Singapore's NCB plan aims directly at automating its burgeoning electronics industry. With 90 per cent of electronics production exported, Singapore is very vulnerable to recessions in Europe and the US.

Cornerstone of the EDB strategy is to complete the infrastructure of the electronics industry in the country. While supporting high-technology or self-sufficiency investment programmes, the Government actively discourages the notion of the island as a cheap labour area. The rates paid to the workers are the highest in Asia excluding Japan and, uniquely, the small population does not provide enough labour. The Government would argue that the island cannot compete in labour-intensive industries, particularly in recession. It insists therefore that the full force of the computer technology programme is directed towards robotics and computer automation. (Electronics Weekly, 29 September 1982.)

EB Communications of Singapore, a wholly owned subsidiary of Elektrisk Bureau of Norway, has been awarded a grant of S$ 320,000 (about £75,000) by the Singapore Government for a research project to be jointly undertaken with the Telecommunication Authority of Singapore (TAS). The project is designed to develop an integrated telemetering, alarm and telecontrol system. A prototype has been developed already and will be tried out on 100 families living in Government flats. The overall system is designed to read public utility meters by remote control, maintain surveillance of fire and burglar alarms, and switch electrical appliances on and off by remote control. The integrated system is intended to eliminate the need for a large number of workers to be employed to read public utility meters. It will also help keep premises under electronic surveillance for fire and theft. (Electronics Weekly, 29 September 1982.)

Otrona (Singapore) Pte Ltd., a local company, is to [illegible] portable microcomputers for export to international markets - the first time a [illegible]ngapore-owned company has ventured into this field. Initially, Otrona is assembling and making the modules for the computer. These include the main circuit board, the power supply, the keyboard and the CRT display. Otrona Corporation of the United States, in which the Singapore company has a shareholding, is to transfer a substantial part of the technological processes of producing the computer, known as Attache, to Singapore. The first module to be made in Singapore, involving the computer's power supply, entered production earlier in May. Manufacturing of the complete computer is expected to begin by the end of this year. At present, production of the microcomputer is taking place in the US company's factory. (Electronics Weekly, 29 September 1982.)

Spain

The Spanish Government has announced the appointment of a Director General of Electronics and Information Technology. In his new post, Sr. Gonzalez de Leon has, as prime responsibility, the elaboration and carrying through of the Spanish Government's national plan for electronics and information technology.

According to Spanish and Swiss Press reports, Sr. Gonzalez de Leon was recently in Geneva, meeting with top executives from Motorola. Subject of the discussions was said to be terms for a new Motorola semiconductor manufacturing facility in Spain. Before his Geneva trip, he had been in Brussels for discussions with telecommunications officials at the EEC headquarters. (Electronics Weekly, 13 October 1982.)

Trinidad

Northern Telecom International has been awarded a contract to upgrade and expand the telephone network in Trinidad and Tobago. The initial phase of the contract covers the Port of Spain area, on the main island of Trinidad. There are approximately 22,000 telephone lines in the district and this will increase to 92,000 by 1987 and to 125,000 by the end of 1993. The contract also covers the training of Trinidad and Tobago Telephone Company staff to operate the Northern Telecom equipment. In addition to the installation of digital switching equipment, Northern will also carry out a study of the current telecommunications system and make recommendations for further improvements. Northern Telecom says that, because it is not possible to predict the outcome of these studies, no firm estimates of the total contract value are possible, but the firm says that initial installations are expected to be worth about £60 million. Equipment includes digital switching systems, transmission equipment, telephone sets, cable and outside plant equipment. Phase two of the agreement is expected to begin in 1984 when modernisation will be extended to other parts of the country. (Electronics Weekly, 1 September 1982.)

United Kingdom

A £1 million microelectronic centre is to open at Middlesex Polytechnic in October. The new centre, a 400 sq m clean room built to industrial standards with facilities for design, electronic test and material analysis will offer "a wider range of facilities and teaching than any other academic microelectronics operation in the United Kingdom," says Dr. John Butcher, the founder of the Polytechnic microelectronics centre. The clean room houses a range of equipment, including photomask making, photolithography, diffusion, assembly, packaging and thick and thin film hybrid circuit facilities. Most current technologies of semiconductor manufacture are used, including ion implantation, plasma and ion beam etching, chemical vapour deposition and epitaxy. Failure analysis techniques include optical, infra-red and electron microscopy. "We are committed to providing teaching across the whole range of academic levels, not just postgraduate research, and to maintaining a research programme which is closely integrated with industrial trends. We provide facilities for design, fabrication and testing of silicon integrated circuits and hybrid microelectronic devices at a level of sophistication comparable to modern industrial practice," said Dr. Butcher. Currently, there are some 14 teaching staff and 10 research students attached to the centre. Research groups are concerned with silicon technology, hybrids, design and development of design tools and microprocessor applications. Staff at the centre provide teaching for part-time MSc and Postgraduate Diploma courses in microelectronics, and it is hoped to start an MSc in Integrated Circuit and System Design next year. There are also facilities for PhD and MPhil research, and staff teach on first degree and higher diploma courses. A series of short courses for industry is planned for this year, covering introduction to microelectronics technology, hybrid devices and MOS integrated circuits. Major research interests include: dielectric isolation by implanted oxygen; silicon on insulator technology; reactive ion beam etching; wafer scale integration; characterisation of thin gate dielectric layers; thick film technology and hybrids for medical applications. (Electronics Weekly, 8 September 1982.)

Information Technology Minister Kenneth Baker has opened the first of a series of displays at London's Microprocessor and Electronics Centre which will highlight products developed under the Department of Industry's MAP scheme. The first two products are a computer-control system for an animal feed mill developed by Format Computer Systems of Ascot, and a microprocessor-based taximeter which is now in production at Probe Engineering of Cirencester.

Baker said the DoI would be publishing further case studies over the coming year and displaying them at the centre. "They illustrate," he said, "the message I and my Department are trying to give to British industry about the need to apply microelectronics in its products and processes." In its first three years of operation, the MAP scheme has committed more than £40 million in encouraging microelectronics applications, and about 3,300 projects have now received financial support. (Electronics Weekly, 19 May 1982.)

Government commissions study on fifth generation

The Government's special study group on the fifth generation of computers looks set to dodge the key issues raised by the Japanese by aiming for short timescales and limited software goals. A draft copy of the Alvey report, commissioned in haste in response to Japan's fifth generation project, is now circulating in Whitehall. The full Alvey proposals are due early in the autumn. The draft report recommends that the UK co-ordinate all its information technology research through a centralized directorate funded to the tune of £150 to £200 million by the Government and a similar sum from industry. But the proposals will be submitted to a government which has shown a marked reluctance to make money available for industrial projects, however deserving. Information Technology Minister Kenneth Baker will go only as far as saying that his Department's commitment has risen from £30 to £130 million, and there are indications that the level of funding will increase. John Alvey, the head of technology at British Telecom, was given the task in April of producing a report on the future UK information technology needs.

Although the report is widely seen as reaction to the ambitious Japanese goal of having a 10,000 million instruction per second self-programming computer in production by 1992, Alvey was given just five months to come up with a strategy for the UK, in the face of a Japanese effort which is already two years under way and which has a further two years of research input behind it. Alvey says that the report looks at a much wider spectrum of needs than the Japanese project. It also looks at a much shorter timescale, just five years compared to the three-phase ten-year plan from Japan. Alvey said he did not think the UK could generate the necessary collaborative effort without Government leverage, and that would not be effective without money. "No lever is quite as good as money," according to Alvey, who is recommending a figure for the next five years equal to the $US 450 million the Japanese intend to invest over the whole ten years of their fifth generation project. Conceding that it would be hard to catch up with the Japanese, Alvey said he thought the UK should collaborate with the Japanese eventually.

Professor Roger Needham, head of the computer department at Cambridge University and a member of the Alvey committee, made the same point and added that the only way to go into collaboration with the Japanese was from a position of strength. According to Alvey, one way to achieve this is to go for selectivity in UK projects. The only specific topic on which Alvey has so far elaborated is software, where the report appears headed for a low-key recommendation that the UK improve existing standards and make more readily available existing software tools. This appears as the key directional weakness in relation to the Japanese effort, which identifies all current software languages as stumbling blocks to progress in computing. (Computer Weekly, 12 August 1982.)

A London borough's effort to bring microelectronic awareness to local businesses is suffering - not so much from the apathy of the businesses it is trying to help, but from the negative response of the electronic companies that prompted it. The City Technology Centre was set up six months ago as a joint venture between the London Borough of Kackney and private industry, with support from the Departments of Industry and the Environment. Its aim is to help local businesses use microelectronics effectively and to attract new technology companies to establish in Kackney, close to the City. The sort of support the Centre is seeking is mainly companies to rent space in the showroom. The aim is that parts of the display area will be set aside for particular aspects of computer use - word processing, general microcomputers, computer-aided design - and follow a coherent plan. This will give a store of hardware allowing hands-on backup to the awareness seminars that will be running. (Computer Weekly, 16 September 1982.)

NEW DEVELOPMENTS

MOS chips '100 times faster by late 1980s'

Bell Labs' president Dr. Ian Ross said at the sixth International Conference on Computer Communication that the progress of the last decade, during which the number of components that could be put on a single chip had doubled every year, would continue. From this year's 60u,000 components giving 256 Kbit storage locations, we would go on to see 4 Mbit capacities in the late 1980s. By that time, MOS chips would be 100 times faster than today's and gallium arenide chips far faster. Since 40 per cent of chip manufacturers' costs lay in the silicon part, this kind of prgress was worth-while, he said. But it was not enough on its

own. Reliability and usability were essential so that systems became universaly acceptable and were put to widespread and productive use. The success of trains, cars and aeroplanes had depended on their man-machine interfaces, he said. "We need systems that people can use with ease and confidence." he added. "Only then will we be on the pathway to the information society." By 1990 chip components would be as compact as their equivalents in the human brain and by the end of the century a briefcase-sized computer would have capabilites equal to those of the brain, such as storing 20 million facts and dissipate 20 milliwatts. However, the brain operated through the interconnection of slow, small, but specialized processors. The computer industry had already learned to trade simplicity for speed. Maybe the way forward was through developing interprocessor communications. (Computer Weekly, 16 September 1982.)

Optoelectronic chip technology

A chip about 10X faster than those based on conventional silicon technology may be possible with an optoelectronic technology being developed at the University of Illinois. The chip would give off virtually no heat and offer potentially higher packing densities over current circuits. Although development may be 20 years away, the technology could revolutionize the way processors are built, by leading to the development of a processor driven by photons instead of the electric impulses used in silicon technology. Heat and Interference from closely packed circuits have posed a problem for developers of smaller and faster silicon-based devices. Since the optoelectronic chip can process both electric and optic forms of electromagnetic radiation, heat and interference can be drastically reduced. (Computerworld, 16 August 1982.)

Optical disc storage

A system which will store reference catalogues and manuals on easily accessible optical discs instead of printed documents was launched this week by UK-based conglomerate Combined Technologies. It has set up a subsidiary to supply a high-capacity document distribution system based on optical storage techniques combined with cheap materials. Called Mnemos, after the Greek goddess of memory, the new company hopes its system will become the basis of a new type of publishing in which projected images are mixed with the data to support software-driven search procedures. The Mnemodisc storage medium is a circular transparent flexible sheet of PVC 12 inches in diameter enclosed in a carboard sleeve similar to a magnetic floppy disc, it can hold up to 6,500 A4-size images reduced 88 times or 4 Mbytes of data, but typical mixes are expected to be from 6,300 images with 160 Kbytes of data to 5,000 images with 1 Mbyte of data. The images are back-projected on to the screen of the Mnemos System 6000 workstation, while the data is read by a CCD (charge-coupled device) array and fed to the workstation's Motorola 6809. This handles searches, prompts, interrupts and communications via the two serial ports under operator control from the keyboard. The hardware techniques were developed over the last three years by Patscentre of Cambridge, which will run the first studio where master discs will be prepared from customers' data, text and image input material. Each master disc can be used to press several thousand PVC copies.

The second studio is to be built late next year in the US, where the workstations are due to go into production in February. The software for the workstations and the studio was developed by Langton Information Systems in the UK and CSS in the US. The first markets Mnemos will aim at are those currently served by microfiche equipment, such as car manufacturers for distributing their parts catalogues to dealers and engineering catalogues to dealers and engineering companies for distributing standars data and procedure manuals.

The workstation could help people find their way around otherwise indigestible computer-produced listings, as well as being suited to the distribution of software for devices other than the workstation. In that case the documentation would be housed in the same package. The alphanumeric keyboard contains a 40-character strip display for prompts and status indications. It can also be used to display updated supplements to the information held on the disc, retrieved from alive database via the communications interfaces. One of the interfaces can also be used to drive a printer. Mnemos' first goal in designing its system was to provide indexing and other page handling facilities. The repertoire of commands available from the set of special function keys includes and interrupt command, for leaving one task temporarily to carry out another and then coming back to it, and a bookmark command for assembling a personal collection of pages. It also wanted the system to be capable of development in two directions, firstly, to make it more of a general purpose tool by adding to its range of processor based functions. And secondly by enhancing its display capabili-

ties. The latter desire is why it has used electron beam recording on to a glass master, a technique which is at the low end of its capability in the current device, rather than laser techniques which would be near the limit of their capability at this density. The result is a workstation designed to sell at $US 3,000, compared with (according to Mnemos) $US 20,000 for a computer-controlled microfiche reader or $US 15,000 for a high-resolution graphics display based on a CRT. (Computer World, 7 October 1982.)

Speech recognition chip for hands-off equipment

Matsushita Electric Industrial Company announced recently it has developed the first one-chip speech recognition LSI, designated MN-1263, together with a speech recognition circuit board. The new technology will allow machinery to listen to spoken commands, thus freeing the operator's hands for other uses. Other applications include use in equipment for the physically handicapped and in equipment that must operate in unlighted areas. The MN-1263 LSI integrates a spectrum analysis circuit and pattern matching circuit into one chip, giving the speech recognition unit the capacity to recognize a maximum of 64 words of a registered voice. The unit is less than half the size of conventional systems and the company says it can mass produce the LSI and circuit board at half the cost of conventional units. In addition, Matsushita claims its one-chip LSI has made the circuitry of speech recognition units much simpler, eliminating considerable alignment processes in production. The LSI and the speech recognition unit will be marketed at prices of $US 41.50 and $US 330.00, respectively, in Japan. Plans are being developed to market the new product abroad, on receipt of order basis. (Industrial World, July 1982.)

Pocket-sized Britannicas?

Handheld electronic "books" are no longer science fiction. Researchers at the University of Colorado are developing a device little bigger than a paperback book which can read, manipulate and index information stored in cartridges of microchips. Squeezing a book's worth of information into a "read-only memory" (ROM) chip demands linguistic as well as technical trickery. Convention dictates that the text be stored as it is read - word by word, letter by letter. A reference text like Encyclopaedia Britannica would need hundreds of times as much. Although Japanese chip-makers have one-megabit ROMs under development, the standard commercial versions can store only about 64,000 bits of information. Worse, these so-called 64k ROMs are not only bulky but cost $US 2 apiece. An electronic book based on them would be neither portable nor cheap. It would cost over $US 300 in ROMs alone. One way round the problem involves the way the language in a book is treated. The Colorado team believes that chip storage requirements can be slashed by treating whole words, rather than individual letters, as units of information. English texts tend to rely on a relatively small, but constantly repeated, vocabulary. Between 2,000 and 4,000 words account for 90 per cent of most texts. The Colorado team's clever dodge is to store these 2,000 or so words in a smallish memory chip called a dictionary ROM, with each word having its own binary number. The identifying numbers are then stored in a second ROM, which allows the user to look up the appropriate word in the dictionary ROM. Only 10 per cent or so of the text would need to be stored in a more conventional way. This word-and-number approach reduces the memory needed for any given text by over two thirds. When will the system be available? That depends on how fast bigger memory chips are developed. A former Colorado researcher, Mr. John Murray, now with Digital Equipment Corporation, reckons the system needs a four-megabit ROM to be commercially attractive. Such a device is probably five or six years away. (The Economist, 11 September 1982.)

Magic Wand

Texas Instruments Inc. has developed an educational tool that brings the teaching of reading into the electronics age. By combining two new technologies and building on its Speak & Spell learning aid, TI has produced what it calls the Magic Wand Speaking Reader. With it, preschool children can help teach themselves to read by sliding a handheld "wand" across a strip of bars printed under the words in special books.

The plastic wand, about the size of a fat pen, uses a tiny beam of infrared light to decipher vocal instruction contained in the bar-code strips. It operates much as checkout scanners in supermarket decode product identification data from the bar codes printed on grocery items, but TI's wand costs about a fourth as much as existing systems. Moreover, TI has figured out how to store on a single silicon chip most of the sounds of human speech, and it has developed a new process for stringing them together to produce natural-sounding talk. (Business Week, 7 June 1982.)

Langmuir-Blodgett films to the rescue

Organic chemists are joining the challenge of reducing the size of silicon chips thanks to a type of material called the Langmuir-Blodgett film. One of the main barriers to making smaller chips is finding suitable materials for photo-resists: the light sensitive films on the surface of chips that allow patterns to be transferred from a specially prepared "mask". Dr. Andre Barraud, of the Nuclear Studies Centre at Gif-sur-Yvette, France, thinks that Langmuir-Blodgett film technology could be the answer. The films are made by dipping a substrate into a liquid with a surface layer of an organic chemical just one molecule thick. Successive dippings allow scientists to build up very uniform coatings on the surface of the substrate, and to control very precisely the thickness and chemical arrangement of the coating formed in the process. Films can be made from a wide variety of organic molecules: scientists have made films that are sensitive to light, to certain chemical species, vibrations in solids and even to magnetism. Their properties also open up possibilities for the development of more efficient solar cells. Barraud told a meeting last week at Durham University that some LB films can be polymerised by exposing them to light and electron beams: the property required of photoresists. Other good properties are: they are extremely homogenous; sensitive to electrons; and resistant to the process used to etch the chips after they have been exposed to electrons.

Unfortunately, the films tested so fare have one big drawback. The electrons cause polymer chains, which are normally separate, linear molecules, to join up via new chemical bonds. This cross-linking process causes the material to swell up, limiting the resolution of the pattern that could be recorded on the chips.

Barraud has recently worked with a new polymer called omega tricosenoic acid, which merely turns into a polymer on exposure to electrons. He has demonstrated that this material can record lines just 50 nanometres wide. Engineers expect to be able to reduce features in the new "submicrometre technology" to between 100 and 500 nanometres. Current films can record features with a resolution of about 300 nanometres (0.3 micrometres).

But Barraud said other techniques in microlithography would have to change: in particular, a new type of electron gun, with a focal length of 100 micrometres to 1 millimetre would have to replace current devices which have a focal length of around 1 cm. The shorter the focal length of the electron gun, the smaller the size of the feature that can be etched accurately.

Another scientist at the meeting, Dr. S. Rickert of the Department of Macromolecular Science at Case Western Reserve University at Cleveland, Ohio, has resolved features as small as 5 nanometres in experiments on a range of vinyl and diacetylene-based monomers. Rickert said that LB techniques had allowed his team to make uniform films at thin as 3 nanometres. Conventional films of this type are about 800 nanometres thick.

Earlier this month, a British chemist called for more research on new polymers suitable for use as photoresists in the new submicron technology for silicon (and other) chips. Professor Tony Ledwith told the British Association's annual meeting in Liverpool that the Science and Engineering Research Council was about to launch a specially-promoted programme to stimulate research on electro-active polymers.

He complained that organic chemists in Britain, particularly in the academic world, had failed to get involved in this important area. Ledwith, who works in the Department of Chemistry at Liverpool University, is organizing a forum discussion to be held in January next year. (New Scientist, 30 September 1982.)

Microchip set to shrink yet again

Semiconductor manufacturers should be able to pack more electronic components into their chips without abandoning traditional production methods. That is the claim of a pair of companies that has produced a new kind of chemical used for making integrated circuits. The firms are the giant multinational Eastman Kodak and a small British company called Micro-Image Technology (MIT). Between them, the companies are manufacturing a chemical that, they say, makes it possible to make chips in which the distance between individual components is as small as 1 micrometre. That compared with the separation between the circuit elements in today's mass-produced semicondurtors of 2 to 4 micrometres.

Today's chips are made with techniques that rely almost exclusively on optical methods of generating the patterns that determine the positions of the components. Chemicals called photo-resists are vital to the process. Light shines onto the resists to produce patterns on a silicon wafer that corresponds to the places where electronic components are impregnated.

While conventional resist technology remains in service, pundits in the electronics industry have predicted that the optical techniques will become obsolescent in a few years. This is because the processes will no longer be able to achieve the resolutions required as semiconductor engineers try to cram more and more circuits onto a chip.

According to the pundits, the industry will soon have to turn to new techniques - using electron beams for instance - to obtain the higher resolution. The answer from Kodak and MIT, however, is to change the resists to those that can produce higher resolutions. As a result, semiconductor firms can produce chips with conventional equipment without turning to expensive new systems. The new chemical from the two companies is what is called a positive resist. After engineers have coated this onto the surface of a wafer, light shines onto it to change the chemical into a substance that can easily be dissolved. Positive resists are by no means new but the two companies claim that their substance produces better resolution. In general, positive resists are better than the conventional negative variety because the polymerisation that effects the latter produces a swelling, causing inaccuracies. (New Scientist, 16 September 1982.)

64K RAM manufacturers seeking better yield

Japanese semiconductor manufacturers are proceeding to full-scale mass production of 64K RAMs, and the opinion is spreading that, if the yield is to be increased further, some new measures for fully satisfactory results have to be adopted. All Japanese semiconductor manufacturers therefore are groping for such measures with a view to doubling their present 30 to 50 per cent 64K RAM yield to the same level as ordinary LSIs. The yield of 64K RAM has been steadily rising from not more than 10 per cent in 1980 to not less than 10 per cent in 1981 and 30-50 per cent in the spring of 1982. These percentages are not confirmed values. They are merely based on a conjecture because no company makes public the yield of a new product.

The improved yield is attributed to the adoption of not only new technology and new manufacturing technology but also new control technology. Typical new technologies for 64K RAM mass production are mask and silicon wafer flattening technology, defect reduction technology, high purity resist, reflective projection type exposure to light, sputtering and dry etching technology, etc. On the other hand, control technologies that have attracted attention are an analysis of all factors leading to an increased yield, and increased frequency of wafer cleaning, etc. The present yield of 30 to 50 per cent is not necessarily low as compared with the general yield of memory devices, but semiconductor manufacturers in Japan are trying to increase it further. The above percentage is considered satisfactory in the case of EPROM or others that are produced in relatively small quanitities and have a short product cycle. In the case of 64K RAMs, which are produced at the rate of 300,000 to over 500,000 units a month, however, the yield affects the cost of production seriously.

The opinion is now spreading, however, that the mass production yield of 64K RAMs cannot be substantially increased unless some new technologies and new control methods are adopted. Yield-increasing measures in the field of production technology have been considered and adopted, and the materials and manufacturing equipment have been reconsidered. It is therefore pointed out that an extension of conventional measures is not enough. Measures considered promising are: the method of processing with optimum values through full analysis of the parameters of each process, and the enforcement of thorough individual control of wafers. (AEU, July 1982.)

256K bit mask ROM

Mostek Japan has begun accepting orders for its 256K bit mask ROM (MK8003). The price for a 1000-unit order is ¥ 12,100 for the plastic package type and ¥ 13,700 for the ceramic package type.

Several other semiconductor manufacturers have already made public 256K mask ROMs and Mostek has entered the business with a general-purpose product relatively speedy in operation and contained in a 28-pin package.

Since its capacity is 256K bits, it can store 32KB on information. This storage capacity is sufficient for a basic compiler. Four units of this product are enough to produce a 16-by-16-dot Chinese-character generator covering about 3,000 Chinese characters and some 500 non-Chinese characters.

The main features of the product are: (1) a 32K x 8 bit composition, (2) pin interchangeability with RAM, ROM, and EPROM because of its 28-pin bytewide pinout, (3) access time of 250 nanoseconds and the same cycle time, (4) easy microcomputer bus control with chip-enable (CE) and output-enable (OE) signals, (5) perfectly static operation, and (6) halving of power consumption through automatic switchover to the power reduction mode (maximum power required: 250 mW). (AEU, September 1982.)

GaAs chips

Just as we've all got used to the silicon chip, scientists are moving on to a new marvel...the gallium arsenide chip. By 1990 gallium arsenide (GaAs) chip production is expected to reach $US 2 billion, fast catching up silicon. The great advantage of GaAs over silicon is its ability to transmit information exceedingly fast, and its light emitting qualities, which makes it suitable for optical fibres and lasers.

Gallium arsenide is a compound of two chemical elements, gallium and arsenic. It was first combined in laboratories in the early 1960s, when scientists realized that both elements had semi-conducting qualities. Gallium is a bluish-white metallic solid, making up about 0.0015 per cent of the earth's crust. It is usually extracted as a by-product of zinc or aluminium. Arsenic is produced as a by-product of copper, lead and other ores. It is toxic, and often regarded as a troublesome impurity, but its impurities are also necessary for semi-conducting.

When first comoined 20 years ago, scientists found GaAs very hard to handle, and not ideal in the very high temperatures needed in the fabrication process of chips. Nor did GaAs form the necessary insulating oxide to prevent power loss.

Silicon, another element which comes from silicon dioxide, was much more readily available. It comes from sand. Not surprisingly its availability and low price made it the ideal semi-conducting material for chips. But more recently GaAs' problems over the temperature and insulation have been solved. And though GaAs remains more expensive - at present about 100 times more than silicon, though this will fall dramatically as production increases - its advantages are becoming more obvious. "Its ability to send information more quickly makes it ideal for satellites, very intelligent computers and the office of the future, in other words all th up-and-coming technologies," says Dr. John Bass, director of Plessey's research laboratories at Caswell, Northampton. "Gallium aresenide has special talents which silicon lacks."

But GaAs will not replace silicon. It will simply be used for different products - but the growing importance of these products are forcing the world's leading electronics firms, from ATT and Hewlett-Packard in the US, to Siemens and Plessey in Europe, to speed up their research programmes.

The influential American research firm, Strategic Incorporated, believes that GaAs will be the best very large scale chip material by the end of the decade. It reckons that initially Governments will make most use of GaAs, notably for military needs and for storing information. But its business and consumer uses are also full of potential. GaAs is ideal for direct broadcasting by satellite (DBS), where very high frequencies are needed.

Not surprisingly, the Japanese and Americans are in the vanguard. Toshiba claims to have developed a prototype of a commercially viable gallium arsenide chip. Fujitsu hopes to be the first to have a mainframe computer running on GaAs chips by 1985. The so-called fifth generation computers, which can 'talk' to each other and take instructions in human written and spoken language, rather than a special computer language, will also be GaAs powered. The most amazing possibility is that computers will eventually be powered by light, produced by GaAs.

While the light-powered computer may remain in the labs for many years, gallium arsenide's light-emitting qualities are already in use in lasers and other optical devices. Gallium indium arsenates (part of the GaAs family) are now being used by Plessey in fibres optic cables. The gallium indium arsenate sends the light from light emitting diodes (LEDs). The light pulses take the information down the glass fibres, each as thin as a human hair. LEDs, pioneered by Plessey, are ideal for short-haul fibre optic cables. (Sunday Times, 7 November 1982.)

MARKET TRENDS

10 years of microprocessor

(The following article from AEU journal, in retrospective, describes the last ten years of development of microprocessors. Although most of the information will be known to our readers, it may be interesting to note the overview.)

In its latest Electronics Bulletin, the Kong Productivity Center noted that the microprocessor recently celebrated its 10th b . Designers and applications people unanimously agree that credit for creating the ble chip should go to Intel.

10 years ago, the companies that designe micros were mostly small, freewheeling organizations employing a great deal of ingenuity. Most of those early pioneers were either swallowed up by large companies (Zilog and MOS Technology) or are now very large companies (Intel, AMD, and National Semiconductor). Furthermore, leadership in design and production appears to be passing to the Japanese.

Today, there are 51 different-purpose microprocessors in production. Of these, 17 are four-bit devices, 14 are eight-bit devices, six are 16-bit devices, four are 32-bit devices with 16-bit I/O, four are bipolar, and five are microframe or special.

The microprocessor scene has changed a lot over the 10 years. First of all, suppliers are making micros easier to program. National and Zilog already have micros with software-in-silicon. They each provide single-chip computers that execute BASIC statements directly in an interpretive mode. Furthermore Intel is developing a micro with the capability to execute MP/M and another with a sophisticated on-board operating system. Also, there are rumors of a one-chip FORTH computer. There is no doubt that both National and Zilog have been successful with BASIC-processing ICs. Secondly, microcomputer ICs are getting more sophisticated, having floating-point capability, multiply/divide functions, enhanced interrupt handling and the like. Nevertheless, the most glamorous changes will occur in 16/32 bit micros. Already these devices are getting coprocessors to extend their capabilities into the minicomputer field, and recently Zilog has disclosed that it is working on a 32-bit micro.

Thanks to rapid innovations and economy of scale achieved through intensive research and mass production, we have witnessed an ever-widening application of microprocessors in areas which have not been contemplated or considered feasible previously. This explains the Hong Kong Productivity Center's decision in organizing an annual exhibition to insure that "we keep pace with the rapid technological changed in this influential technology." (AEU, October 1982.)

IBM to use 64K chip designed by Intel Corporation

Intel Corp. has signed a contract to provide International Business Machines Corp. with design and manufacturing process information on a key computer memory chip, the advanced 64K dynamic random-access memory.

The value of the contract was undisclosed, but analysts said it came as a coup for Intel, located in the San Francisco Bay community of Santa Clara. Intel entered the market for the advanced chip behind some of its big competitors after scrapping several early designs for the part.

The agreement gives IBM an option of manufacturing the Intel part for use in its equipment, Intel said in a statement. It was not disclosed which IBM data-processing equipment the part might be used in.

The chip is called the 64K because it can store about 64,000 bits of digital information. The chip is the latest generation of a family of electronic memory-devices that began with a chip, the 1K, that held a maximum of 1,0124 bits of digital information.

Intel went through six versions of its chip before arriving at what it considered a satisfactory design. Intel began shipping its chip in quantities only this year, months after the two larger semiconductor producers, Motorola Inc. and Texas Instruments Inc., produced theirs for sale to other companies. (Herald Tribune, 12 October 1982.)

US report predicts huge rise in portable sales

Revenues from the sale of portable computing devices will grow a massive 1,100 per cent by 1986, according to a report[1] from Californian consultants Creative Strategies International. Worldwide sales of these devices, which range from the programmable calculator supplied by Texas Instruments to the portable micro sold by Adam Osborne, were $US 426 million in 1981. CSI reckons that by 1986 this figure will have reached $US 5.3 billion, on the basis of shipments that year of 24.5 million units. Last year, the makers shipped just 2.2 million units, to bring the installed base to 10 million units. CSI says that future applications for the devices are limitless as capability increases and quality software becomes available.

Technologies which will influence the marketplace significantly will begin with ROM and RAM advances in CMOS. These will provide long memory retention with low power consumption. Advances in display technologies such as flat panel, CRT, LCD, gas plasmas, and electroluminescence will provide low-cost lightweight displays with hight resolution. Improvements in miniaturisation techniques applicable to mass storage devices such as floppy and Winchester discs and bubble memory, will help to increase the capability. Quality application software, developed primarily by end users and independent programming firms, will add value to products.

With the market predicted to grow by 200 per cent a year, CSI notes how easy it is to enter this area. According to the report, the marketplace, apart from the programmable calculator segment, is so new that unknown vendors with quality low-cost products can enter and gain a market share. CSI says many more suppliers including Japanese companies not yet in the market, major personal computer companies, and newly formed companies will soon enter the market, as the vast potential of portable computing devices is recognized.

CSI foresees the Japanese making major inroads into all segments of the protable computing device industry. This is partly because the Japanese have got their distribution channels well organized. The report notes that most major Japanese vendors have had great success sellin TVs, radios and other xonsumer electronic products, and the Japanese personal computer vendors plan to use the same channels. (Computer Weekly, 23 September 1982.)

'Japan will lead in world electronics'

The Japanese invasion of the worldwide electronics markets will take off during the Eighties and Japan will dominate in areas ranging from teletext and facsimile to process control. At the same time, Governments across the world will realize that a major social revolution is being detonated by electronics, and new work and leisure patterns will emerge. These conclusions are reached by Dr. Ian Mackintosh, chairman of the research firm Mackintosh Consultants, in the company's 1983 yearbook on the electronics market.[2] Mackintosh research shows the Eighties will see "phenomenal" growth in semi-custom integrated circuits, basic chips which equipment manufacturers customize to their own needs. The leading Japanese electronics companies are moving into the gate array part of the semi-custom chip business with great speed and determination, says Mackintosh. They will capture a big part of the world market and be well placed to take a leading role in the use of them. Mackintosh concludes from these facts that Japanese companies will make an "enormous effort" to capture world markets for most business and industrial equipment based on electronics. "They will systematically emulate their success in consumer electronics and semiconductor memory to the point where they will capture a majority of the world's free markets for many types of equipment," he says.

Mackintosh disagrees with the view that Japan's advance will be hit by a lack of software expertise. And he sees no immediate shortage of programmers. It will be software quality, not quantity, which will be the problem worldwide, he says. Meanwhile Mackintosh sees the Eighties bringing the demise of companies specializing solely in integrated circuits. He points to the recent "tidal wave" of takeovers of chip manufacturers by equipment manufacturers. And only the very biggest companies will be able to stay in the high-volume

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1/ Portable Computing Devices: a report by Creative Strategies International. San Jose, California, $US 1,425.00.

2/ Mackintosh Yearbook of West European Electronics Data 1983. 210 pages, £150. Benn Electronics Publications, P.O. Box 28, Luton LU1 2NT.

silicon wafer manufacturing business, because of the price of the equipment and the cost of designing complex chips. Mackintosh says electronics will encroach on all areas of human activity, from manufacturing to shopping, law, medicine and leisure. Governments will "eventually" see that a major social revolution is under way. New work patterns will arise because of the "irresistable" productivity increases and laws and social customs will start the long process of adjustment to the eventual age of leisure. (Computer Weekly, 14 October 1982.)

Gate array franchises

Racal Microelectronic Systems Ltd. revealed plans to create an internationally-based organization to market the advanced microelectronics technology developed by the company in the United Kingdom. Two United States companies have signed franchises to use Racal's gate array technology to design and market complex custom silicon chips. They are California Micro Devices (CMD) of San Francisco and Torric of Phoenix, Arizona. In West Germany a subsidiary, Racal Mikro-Elektronik System GmbH (in foundation), has been formed in Munich to support similar activities. (Computer Weekly, 14 October 1982.)

TTI sets its sights on Third World

Transfer Technology International has been set up in the UK to act as a holding company to considerably broaden Alpha group activities in the computer market. Among its ambitions is to export computer know-how to the Third World and the former Governor General of Australia, Sir John Kerr, is to be chairman of TTI. His lifetime in diplomacy should be invaluable in the complex negotiations which precede such agreements.

The plan is that second-rank technology, such as, say, 8-bit computing might be put down in a Third World country and an industry could be built up around the technology. TTI will export this know-how through international joint ventures, consultancy agreements and licensing agreements. The schemes would be funded by the Government of the country and the manufacturer of the product. The primary object, is to ensure Third World countries keep on level terms with the rest of the world. (Electronics Weekly, 19 May 1982.)

SOCIO-ECONOMIC IMPLICATIONS

More jobs lost due to hi-technology

The number of new technology agreements between unions and employers is increasing, according to a survey* by the Labour Research Department. But the number of jobs lost as a result of the introduction of new technology is also going up. Less than one-third of the 225 agreements covered by the survey give guarantees of no job losses or redundancies. And in 42 of the 127 offices in the survey, which included top commercial and public sector employers, jobs were lost as a direct result of new technology. The survey also shows that in two-thirds of the cases studied, consultations between unions and management took place before new technology was introduced. The report suggests that workers are generally taking a positive attitude towards changes in the work environment - 83 per cent of those questioned did not feel that their jobs had been deskilled, and more than a half said the jobs had been enhanced. However, in most cases any improvement in pay or other work conditions was limited to those directly affected, principally the operators of new technology. Those who operated the new equipment gained higher earnings in one-third of the cases. But in only eight cases did new technology agreements lead to shorter working hours. Most of the job losses took place in companies where there was a large clerical operation. The majority of new technology agreements have been signed with white collar workers. (Computer Weekly, 14 October 1982.)

Innovate or liquidate, warns UK Minister of Industry

The Department of Industry has streamlined its various support schemes under the collective title, Support for Innovation.

Before the launch of the MAP scheme, a survey in 1977 showed that only "five per cent of UK manufacturing companies were aware of the importance of microelectronics and using it."

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* Survey of New Technology - Bargaining Report No. 22. Labour Research Department, 78 Blackfriars Road, London SE1 8HF. £6 (£2 to trade unions and educational bodies).

A similar survey last year showed that the number was about 50 per cent and, whilst this by no means represents a victory, and is not wholly due to the DoI's efforts, it does show that the DoI, through the media, is starting to get its message across. But there is still a long way to go and the Minister confessed that he is "still speaking at meetings up and down the country where companies are not aware of the one-third grants available to them". Part of the problem lies in the complexity of the various support schemes for this has tended to blur the availability of what is on offer. Rather than talk about robotics, CADCAM, flexible manufacturing and the like, all of which mean very little to the layman, the DoI should be pushing the simple and appealing fact that one-third grants are available for innovate projects. Hence the launch last week of the Support for Innovation scheme which embraces all the diverse technologies.

The Minister described it "as a way of helping industry find its way through the maze of support schemes." The total spent on these schemes for 1982/83 is expected to be £140 million and for 1985/86 £195 million is anticipated. (Electronics Weekly, 8 September 1982.)

What's in a name?

In the first of a series of articles, Les King, founder of recruitment consultancy Les King Associates, looks at how job functions and job titles are changing with advances in technology.

"The embryonic DP industry recognised few job functions apart from that of the programmer, a rather sterotyped individual whose essential job qualifications included a 'beatnik' beard and scruffy pullover combined with an active passion for chess, bridge and the Daily Telegraph crossword. During the last decade, however, the rapid maturity of the industry has opened up a new range of (genuine) job functions while the traditional roles of operator, programmer, analyst and DPM have undergone radical reassessment. Technically, projects are more ambitious, with international communications networks, integrated real time databases and electronic mail replacing traditional, tabulator-type, invoicing, payroll and sales ledger applications. Even the humble micro offers immense computing power with online programme editing, real time processing and a communications capability as standard. The other main area of change has been in the development of what many people are pleased to call "user friendly" systems. Increasingly, computer users are expecting software that actually works and are becoming less inclined to accept highly-technical excuses when it fails to do so. Similarly today's more sophisticated user demands software which reduces his workload (rather than increasing it) while being easy to use without specialized technical training.

Naturally, these developments have had a considerable impact on organization and career structure, the precise implications depending, to a large extent, on the size and complexity of the individual DP installation. Clearly, there are now a considerable number of career possibilities outside the basic programmer-analyst-DPM structure and I will be writing about these, in some detail, over the next few weeks. Although the series in primarily intended to give young people some indication of the available opportunities within our industry, I hope that experienced managers may also find some useful ideas applicable to their own organizations." (To be continued. Computer Weekly, 2 September 1982.)

Computers keep French firms healthy

Small and medium-sized firms which use computer technology are the healthiest in the French economy with expanding employment, profit growth and encouaging exports, according to an investigation by the business daily Les Echos.

France now has 75,000 firms with 132,000 machines installed and a staff of 210,000. For last year 59 per cent reported growth, 26 per cent stagnation, 10 per cent a temporary backslide and only five per cent a real decline in activity. While unemployment is expected to rise from two million to 2.2 million by the end of this year, 25 per cent reported an increase in personnel and 53 per cent said they were exporting over eight per cent of turnover. French firms equipped with computers operate on average 10 times more office equipment (telephones, photocopiers and typewriters) than those which make no use of data processing technology. They also have 20 times as many executive staff. Very small companies which handle about 5,000 invoices a year are equipped with a microcomputer operated until now by a single specialist. Very big firms with a high invoice volume (70,000 a year) operate an average of nine computers, including one mainframe and one medium-size system and have a data processing staff of 25. Medium-size systems become increasingly important in a French firm

until the threshold of 200 employees is reached. Beyond this level, microcomputers regain importance. Data processing staff in French firms, except for input operators and trainees, totals 210,000 including 24,000 project managers, 74,000 analysts and programmers, and 110,000 operators. Paris and its green belt account for 41 per cent of staff but only one third of computer sites, because of the high concentration of mainframes in and around the capital. A microcomputer or small system keeps two specialists active, compared with 10 for a medium-size system and about 50 for a mainframe.

Les Echos reports that 75,000 sites are now equipped with 94,000 machines and 38,000 microcomputers which are installed outside data processing departments. Some 70 per cent are very small systems and under 25 per cent are medium-sized. (Computer Weekly, 14 October 1982.)

Personal computers can change our lives

Personal computers could affect our everyday lives as much as the invention of moveable type in the fifteenth century. They will change the way we work and play - but there is a big educational job to be done first. This is the message from Dr. Louis Robinson, who will give a special lecture sponsored by Computer Weekly as part of the British Computer Society's Silver Jubilee celebrations. Robinson is director of university relations for IBM in the US. "As easy-to-use personal computers and terminals evolve and become cheaper they open up the possibility of information literacy to the whole world and this can change the quality of life," says Robinson. "As one example people will start using big, publicly available databanks not only in business but to help them in their hobbies." The big problem will be education: "People need to understand how to expoit computing across different disciplines. We also need greater understanding of how to apply it to society - and to protect society against the misuse of computing." Robinson's lecture on the challenges of evolving technology in the next 25 years will be held at the Royal Society, 6 Carlton House Terrace, London W1, on March 2 next year. (Computer Weekly, 2 September 1982.)

A recent report in Der Spiegel (Nr. 37/1982) looking at the implications of microelectronics for employees in the FRG gives a rather pessimistic outlook as regards the human and employment aspect. Accoding to official government forecasts, 300,000 jobs will be eliminated until 1984 and 3.5 million will be completely changed. In the long run, every second employee will be affected by electronic rationalization. In the last few years, the number of jobs in the production process was reduced by 1.5 million while at the same time the volume of production increased by 50 per cent. The report cites examples quoting the case of a savings bank where the number of customer accounts had increased since 1967 from 300,000 to 1.25 million. The number of employees, however, only increased from 500 to 600. The additional workload which would have necessitated the creation of several hundreds of jobs was taken over by a computer. A town planning company increased its turnover by 125 per cent over a period of five years after having installed a computer, but the number of employees increased only by 2 per cent. Investigations carried out in the metal industry revealed that in only 2 out of 15 branches of the industry, the advantages and disadvantages of implications of microelectronics seemed to balance each other. According to the report, trade unions are increasingly concerned about decreasing demand for skilled workers which is being replaced by semi-skilled personnel working with computers. One example is the printing industry where typesetting is replaced by photo-typesetting and compositors have to compete with young datatypists who can work much faster at the computer keyboard. A trade union agreement however reserves the right to control the computer for the next eight years exclusively to compositors who are trade union members. The Institut für Arbeit und Technik carried out a survey locking into complaints of workers and employees working with computers: it revealed anxiety to loose one's job and the feeling of being electronically watched and controlled by the employer; especially the older representatives of the workforce expressed feelings of frustration (isolation and no visible result of one' labour) as well as physical exhaustion.

APPLICATIONS

Farmyard computer

The computer industry is taking a lively interest in French agriculture, and sooner or later every farm in France will be affected by computerisation. The question Government officials and agricultural-industry experts are now asking themselves is: how can this formidable tool for growth be mastered?

Is the computer going to become a barnyard fixture, installed somewhere between the manure pile and the beet field? For some years now, but lately much more intensely, phrases like data processing, computer graphics, microchips, and software have been creeping into the vocabularies of French farmers and their wives, many of whom now attend computer-programming courses. A number of initiatives have been taken by an industry which knows there's a market out there in the countryside. Proof is to hand in such phenomena as the successful seminar organized in late June by the on-the-job training centre of CENA, the Centre d'Enseignement Superieur des Affaires (or centre for advanced business education) at Jouy-en-Josas around the theme "data processing and agriculture."

Additional testimony is provided by the Ministry of Agriculture's expressed desire to bring some order to the rustic rush on hard- and software. The significance of the notion that computer control confers power escapes nobody, and farmers are going to have to learn how to master what is turning out to be a new tool for growth. But lack of co-ordination could bring setbacks even for the most innovative, setbacks which could threaten the entire domain of agricultural data processing. This is why the ministry is planning to set up a pilot committee to dispel the anarchy which currently reigns in the farm-computer field by testing software offered for sale to farmers. (Reprint from an article in Le Monde in The Guardian, 29 August 1982.)

Putting cows on computers

Few markets are more vertical than agriculture and horticulture, with farmers and growers more reluctant to accept automation than the average small business. Agricultural colleges throughout the country are gradually introducing computer courses as the first step in educating tomorrow's farmers, and three has been considerable competition to install systems in the colleges.

Shuttleworth Agricultural College, near Biggleswade in Bedfordshire, has recently installed a British-made Triton 4A microcomputer from Trivector Commerce, to aid the teaching of business management, train students in the use of computers in farming, run the college farm, and assist in college administration. Software has come from several sources. Reading University has provided the Daisy dairy-management programme, and Comput-a-Crop of Louth, Lincs has installed its Fram financial and arable management system. And the Triton 4A has its own general business software, including the Auto-Clerk and Auto-Index filing and retrieval programmes, Auto-Writer word processing and B-Stam CP/M communication programme. Triton's operating system is BOS, developed by CAP subsidiary MPSL. Daisy has recently been rewritten in Microcobol, and gives detailed information on health, fertility, milk yield, feed planning, costings and margins from the individual cow level up to management statistics on the whole herd. (Computer Weekly, 7 October 1982.)

Sheep line up for the kindest cut

Engineers in Australia are nearing their target of devising a fully automated mechanism for shearing sheep. They have invented a special frame into which a sheep must be herded. Inside, a set of steel "fingers" picks up the animal while clamps secure each foot and a rubber arm restrains the head. If all goes to plan, the animal should be completely still and ready for a quick trim with mechanically-operated shears. The job of devising this last mechanism is, however, still beyond the engineers at Melbourne University, who are working on a project sponsored by the Australian Wool Corporation. Further research will concentrate on producing a "robot" shearer that operates without nicking, or worse still decapitating, the animal.

The wool corporation has embarked on the project because of the high cost of shearing sheep by hand. Australia has 134 million sheep, roughly 10 for every human inhabitant. Even the most skilled shearer can cope with only 200 animals per eight-hour day, for which he receives 87 cents (roughly 50p) per trimmed animal. Besides the cost of sheep shearing, farmers are also worried that the skill is dying out as fewer young people enter their country's oldest industry. According to the wool corporation, sheep-shearing robots would be owned by contractors and leased out to farmers for short periods. Two automatic shearing units would cut 500 animals per day and require just two technicians. The researchers on the project say that, ultimately, a robot may be kinder to sheep than a human shearer. The mechanism could incorporate sensors that adjust cutting edges to the contours of the animal's body and so avoid cuts and other injuries. (New Scientist, 2 September 1982.)

Industrial process control

An industrial process controller that can gather information close to the sensor in the hostile environment of a plant has been developed by Control Logic Industrial Systems of Inconix (Natick, Mass., USA). It is part of a new product class that designers call a primary automation controller. Physically, it is a small, microcomputer-based unit that accommodates 32 digital- and 16 analog-input data points with 14-bit analog-to-digital accuracy. Each unit has its own Intel 8051 microcomputer, power supply, and automatic start and diagnostic functions for stand-alone operation. It responds to alarm conditions and reports them without the need for a host computer to poll the system. By moving the "intelligence" closer to the process-control point in an industrial plant, wiring costs can be cut by up to $US 30/ft. The controller, called Cinch Pac, sells for $US 1,500 - $US 5,000 in the U.S. A network permits conversation with over a hundred other Cinch Pacs, or a total of 6,000 data points and 1,000 control outputs. It also can communicate with another vendor's network. Deliveries will begin this summer. (Industrial world, July 1982.)

Ambulance scheduling system

A system to streamline ambulance scheduling has been developed by UCL (System), a company formed within UCL Nortern to specialize in applications software. Using UCL's system, requests for ambulances are input direct to Ultimate minicomputer system, and scheduling can be left until the last minute. An automatic preplanning system produces a list with 50 per cent fit of patients to hospitals and ambulance routes.

Each ambulance depot is given a printer, and dials up for the day's schedule of drivers, passengers, times and destinations in the morning. The controller can then adjust the routes to cater for emergency calls by radio control during the day.

The ambulance system, which costs £50,000 including both hardware and software, has been installed in three districts so far. (Computer Weekly, 16 September 1982.)

Micros for medics

Up to £2.5 million is to be made available for the development and purchase of computer systems for general medical practitioners and Family Practitioner Committees. The Department of Industry, under arrangements agreed with the Health Ministers for England, Wales, Scotland and Northern Ireland, and the medical profession, will finance the major part of the purchase and installation costs, and the maintenance costs for three years, of 150 microcomputers for selected general medical practices throughout the United Kingdom; finance the computerization of patient registration in two Family Practitioner Committees; and help finance the purchase of 20 microcomputers for cervical cytology recall, and the development of a cervical cytology recall module. (Electronics Weekly, 30 June 1982.)

Medical electronics

Two areas that are now receiving closest attention are cardiology and blood cell separation. In both of these, IBM technology is able to offer cost effective solutions at a time when Europe's, and in particular Britain's health services are under severe strain because of shortages in both cash and staff.

IBM's 2997 blood cell separator can be used in the treatment of leukaemia and bone marrow transplants. It separates a patient's blood into red cells, white cells, and plasma, so that it is then possible to replace the diseased component and return the patient's blood. Moreover, any component can be exchanged for a pooled component or component substitute, which is then returned to the patient. The components are physically separated by centrifugal action on the basis of density difference. The actural process rapid, and the procedure is simple. The actual separation takes place inside a simple disposable plastic collar, which nevertheless cost $US 1 million to develop. To date, IBM has chalked up sales totalling tens of millions of dollars for the machine, which sells for £20,000. The launch of IBM's ECG acquisition and analysis system represents a major advance in ECG technology. The computerized machine can analyse a patient's cardiogram, and is capable of detecting the commonest forms of heart abnormalities. A report is given on the bottom of the cardiogram readout. IBM has developed a technique whereby successive report can be fed into a Series 1 mainframe computer, and a report on a patient's trends can then be obtained. The 5880 machine can hold the records of 70 patients on diskette, and the complete system sells for £13,500. In recent tests conducted in the US, the machines was proved to be 99.8 per cent statistically correct. (Electronics Weekly, 13 October 1982.)

Computer enhanced oil exploration in Latin America

Using space age technology to reach five miles into the earth, and oftentimes in the sea under 1,500 feet of water, oil exploration today is as risky and as costly as ever. The search for oil and gas and getting it out draws on the combined know-how of geologists, geophysicists, engineers and economists. Because of the high risks and large amount of capital required, the conventional capital market may be reluctant to finance preliminary phases of exploration, particularly in the underdeveloped world. At the Inter-American Development Bank (IDB), economists are working on a computer model designed to help reduce this risk by selecting the most economically attractive exploration strategy. Their effort responds to a need for a practical method to appraise projects which primarily produce information, as is the case with seismic studies. Like other projects financed by the IDB, the economic worth of the investment must be valued in terms of its benefits to the economy as a whole. The Bank's interest stems from the fact that oil importing nations in Latin America are already spending about 3 per cent of their GNP and 25 per cent of their export earnings on oil imports. If current trends continue, these imports could account for as much as 6 to 7 per cent of these countries' GNP, a prospect that points to the need for a dramatic increase in oil exploration and development projects.

During 1980-81, the Bank financed exploration projects in Bolivia, Brazil, Colombia, Jamaica and Peru with loans totalling nearly $US 83 million. (Source unknown.)

Autodiagnosing System

Significant progress has been made in an effort to make diagnostic systems more efficient and cost effective. Battelle has developed a top-down procedure which, for a given product or process, determines optimally cost-effective sets of sensors and test-nodes (sites for sensor placement) for the identification of a prespecified set of failures. The procedure allowsthe systematic evaluation of sensor attributes and failure characteristics, both of which are inputs to computer-aided design software that ultimately identifies the diagnostic sensor/test-node set. The computer-aided design software has been designed and implemented at Battelle, and various aspects of the overall procedure have already been successfully employed in the design of diagnostic subsystems. These techniques have also been used to identify areas for sensor development and to validate existing diagnostic subsystems. Scientists from Battelle's Intelligent Device and Microcomputer Systems Group are extending the theoretical base for autodiagnosing systems, along with refining the design procedure and its associated software. Benefits of this procedure can include improvement of a product's quality control, its control system, and its maintenance expense. The result will be reduced lifecycle costs, allowing the product to be more competitive in the marketplace.

Memory cards

Moemory card technology is progressing at an incredible rate. A memory card is a creditcard-like package with a larger amount of memory (typically semiconductor or optical) embedded within it. Many current memory cards contain an entire microcomputer system as well. In both the United States and Europe, systems are in the final design stages of pilot implementations in the electronic funds transfer (EFT) area. The United States Government is also interested in using memory card for use in electronic food stamp benefit systems, identification systems, and manufacturing and diagnostic applications. (Excerpted from Applications and Technology Center, October 1982, by Battelle, Columbus, Ohio 43201, USA.)

Computer keep tabs on the shop floor

IBM is channelling more of its resources in Britain to installing computers in factories rather than in their traditional domain of office blocks. Last week, the company opened a new centre in Warwick that will sell computerized tools for the shop-floor to the manufacturing world.

The new hardware for factories is based around two types of application. In the first, designers draw pictures of new products not on paper but with "light pens" on a computer terminal. By pressing buttons or writing with their pens in a set way, the designers can call up information about their new creations from a data base to the screen. In the second application, office staff can obtain - with similar terminals - data about orders for

products, the volume of goods in stock and so on. The information is channelled to other office workers via a network, and so helps more efficient planning. For instance, if it runs out of parts for an essential product a firm will realise sooner than if the information were either communicated verbally or on paper. IBM's engineers say that, for most customers involved with manufacturing, the computerized applications begin and end with the design room and the office. The two systems are sometimes linked so that an accountant can tell an overenthusiastic designer that his creation looks like being too expensive. Gradually, however, the more enterprising firms are linking their design and office terminals with the factory floor. They can do this in one of two ways. In the best trodden route, data from the design terminals are transferred to paper tape, which then operates a computerized machine tool. The tools that make a complicated part obtain the huge amount of information they need much more quickly than if a worker eleaborately translates the information on a conventional engineering drawing-to-computer code. IBM says that only 25 per cent of its customers program their machines with data straight from the computerized design terminals; the rest are thinking about doing it. In another way of linking computers to the factory floor - one that a firm will probably adopt in parallel with the more traditional method - machinery workers report regularly to a computer terminal. They feed into this details of what work they are doing, and whether anything is going wrong. The terminal itself has previously given the worker the instructions for a particular job. These come on a piece of card which the machine spews out; some of the instructions comprise text that the worker reads, and the rest is in magnetic code for the tool. The shop-floor terminals, which cost about £3,000 each, are linked to a foreman's office so supervisors can keep track of exactly what is happening. The terminals may seem a luxury at a time of economic gloom but, according to IBM, they remove the need for time-and-motion men to scurry around shop floors checking on machines and their operators. (New Scientist, 23 September 1982.)

Lloyds looks to new technology

Lloyds of London, currently rebuilding its giant insurance complex in the heart of the City, is in the process of a full-scale investigation into how the new market can best take advantage of the new technologies on offer. The rebuilding of the Lloyds' building presents a golden opportunity for a total modernization of the vast insurance-based network. Commendably Lloyds is taking this opportunity to show the City how it is tackling the problem in the hope that other City-based institutions will learn how they can best modernize. Last week, Information Technology Minister, Kenneth Baker opened an exhibition of possible solutions to Lloyds' modernisation. Lloyds is still at the drawing-board stage and it has invited various firms to exhibit systems which could contribute to a modernized network.

Insurance is the largest single contributor to the City's invisible earnings and therefore a vital part of the economy. The Corporation of Lloyds was one of the first institutions to use computers for business purposes and its Central Accounting System, whereby money from brokers and syndicates is paid into a central system and automatically redistributed, has greatly speeded up transactions. Last week's exhibition did not offer any definitive answers to how this could be done but looked at the equipment currently on offer and likely future developments. Since Lloyds is planning for the future it is important that it anticipates likely trends in new systems, otherwise systems could be outdated before they are installed.

To oversee the introduction of new systems, Lloyds formed a System and Communications Policy Board. The Board commissioned a report from US consutants, Nolan, Norton and Company, which concluded: "Despite the high level of expenditure on systems development in recent years, this had nevertheless only managed to keep pace with maintaining existing systems. No significant new services were being developed for the long term". The Board has already started introducing new computer hardware, redesigned software, and is experimenting with data communications systems. There is also a pilot scheme linking an underwriting agent's office directly to the data on the Membership system - this avoids duplication of records between the Corporation and agents. (Excerpted from Electronic Weekly, 22 September 1982.)

Microelectronics in water quality management

The essential influence of microelectronic developments on water quality management is that they have created the potential for operational decision-making by satisfying the prior requirement for rapid communication and exchange of data and information across the river basin. This influence is perhaps more radical than the other obvious impact of microelectronics in superseding earlier analog control devices, and it will serve as the point of departure for this section.

It is helpful to begin by considering the basic elements of a control system as shown in simplified form in Figure 2. The components of the control function are threefold: (i) the processing of data and information, which can be used for, (ii) comparison of the actual performance of the system with the desired performance, which comparison can in turn be used for, (iii) determination of the required regulatory actions if performance is not as desired. The success of control depends upon the capacity to acquire pertinent and reliable data (the capacity to "observe") and upon the capacity to implement regulatory actions (the capacity to "act"), which are respectively indicated in Figure 2 as input and output of the control function. Nevertheless, applications of microelectronics that service these latter two activities, such as those associated with on-line sensors and automatic control of pumps, blowers, and scrapers, will not be discussed here. Equally so, more sophisticated developments, such as microprocessors programmed for the compensation of instrument calibration drift or for self-tuning, closed-loop control will not be discussed. Rather, the central theme of this section will be concerned with potential applications of microelectronics that are likely to encourage active man-machine interaction in operational water quality management. In other words, these are applications for which it is assumed that a human element will be retained in the control function of Figure 2. This is significantly different, therefore, from the more conventional designs of control system in which elimination of the human element from the control loop is a customary objective.

Four organizing principles, which are concerned with both the needs of management in terms of operating data and the possibilities for expoiting cheap, flexible, small-scale computing facilities, will guide the discussion of the potential applications to be illustrated. These principles can be summarily stated as follows:

(a) All the variables of possible interest to water quality management cannot be measured by on-line sensors; hence, those that can be measured should, above all, be measured reliably.

(b) What the manager may wish to know for operational decision-making is not necessarily the same as what can be measured, and there exists unexplored potential for deriving more useful information from currently available monitoring networks.

(c) If only a few variables can be measured reliably, these variables should be responsive to as broad a range as possible of operating disturbances and pollution events affecting water quality.

(d) Any on-line models and statistical estimation/forecasting algorithms should be "robust" and "compact" for implementation on small-scale computing devices.

These are general principles relevant to all the components of Figure 1 (next page).

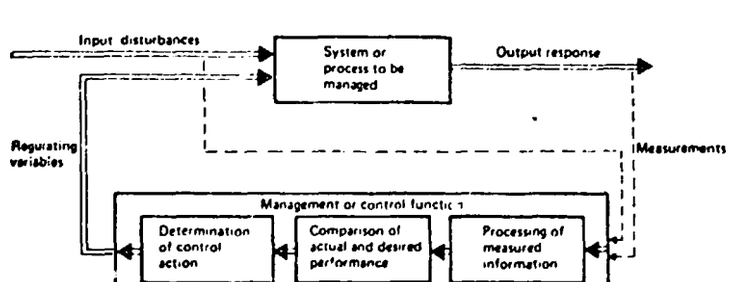


Figure 2 The basic, but much simplified, management/control system

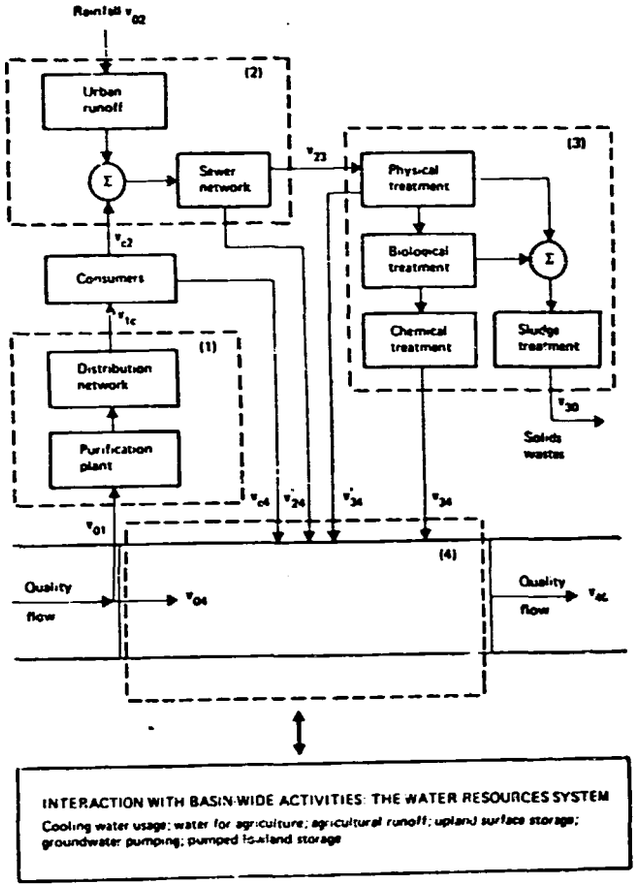


Figure 1 The water quality system (an abstracted component of the water resources system) comprising: (1) potable water abstraction, purification, and supply; (2) the sewer network; (3) wastewater treatment; and (4) the receiving reach of river

(Excerpted from "Systems Engineering and Microelectronics in Water Quality Management" by M.B. Beck, IASA, A-2361 Laxenburg, Austria, publication No. RR-82-2, March 1982.)

Making roads safer for cyclists

Cambridge cyclists have won high technology help with the first separately signalled cycle lane in Britain. The cycling crowds can now cross the junction of Brooklands Avenue with Hills Road, safe from cars trying to turn left across their path - and it has all been made possible by microprocessors. A Mitrac controller from Philips runs the signals, keeping the left-turn motorists away from the go-ahead cyclists. The microprocessor-controlled system means that timings between the various phases and the order of these phases can be changed automatically, using information from vehicle and cycle detectors embedded in the road surface. (Computer Weekly, 2 September 1982.)

Controlling electric machinery

Control of power by semiconductors began in the early 1960s with the advent of the thyristor. The amount of power that can be controlled has risen from a few kilowatts 20 years ago to several Megawatts now.

Power electronics relates to thyristor circuitry and, more recently, to that of other silicon power semiconductors, for example bipolar transistors, power MOSFETs, Vertical-channel JFETs, field-controlled thyristors (FCTs), static induction transistors, gate turn-off (GTO) thyristors and the newer Gallium Arsenide devices.

Control of electric machinery is one of the major applications of power electronics. The power electronics interface between the supply and the electric machine was the main concern of this project. The frontier in power electronics now lies in high-frequency switching applications like variable-speed ac motor drive systems. (Technology Ireland, September 1982.)

Smart stoves save energy

Microprocessor-controlled electric 'smart stove' rangetops could save energy, according to A. Myklebust, D.C. Haring and H. Eslami of University of Arkansas, who are concentrating on controlling cooking heat by measuring the temperature of the heating coil. Computerized feedback control is used widely in conventional and microwave ovens. Since range-top coils heat up faster than they cool, an effective controller would leave the coil on only long enough to bring the liquid in the pot to a boil (if desired) and turn it on again as needed to keep the liquid at a boil; this would necessitate the controller knowing what is being cooked. The controller could save energy by correcting poor cooking habits such as improper choice of cooking time and coil setting. (Technology Update, 25 September 1982.)

SOFTWARE

UN backing for software plan

India and nine other countries have bought together 35 software experts to develop and research software designs for specific applications such as railways, electric power and meteorology with funds provided jointly by the United Nations Financing System for Science and Technology (UNFSST) and the United Nations Development Programme (UNDP). Because of the rising costs of software packages for specific applications, few developing countries can afford to import them or adapt them to their requirements. The need for indigneous developments of software is, therefore, of importance. Countries so far participating in the project incude Colombia, Indonesia, Kenya, Nigeria, Sudan, Tanzania, Turkey, Venezuela and Yugoslavia. In India, the software professionals are working at the Computer Maintenance Corporation in Hyderabad under a project called "Technological Development and Training Programme for Computer-based Systems", which will run til the end of 1984. Its aim is to design software specifically tailored to national management of electric power distribution and railway wagon traffic. Two computer professinals from each of the nine countries are participating in the project. Once the software package has been developed some 200 computer specialists, including 100 from India will receive intensive training in these programmes. (Electronics Weekly, 29 September 1982.)

EEC software link

Co-operation between ICL, France's CII-Honeywell Bull, and a German company to work on software development was called for by UK Information Technology Minister Kenneth Baker. The Minister, who was addressing the Club of French Computer Peripherals Manufacturers, said in Paris last week that the Common Market must be used as a framework for developing information technology and promoting exports of Western European products. The club is linked with UKITO, the United Kingdom Information Technology group, which with similar pressure groups in other European countries forms the European Independent Informatics Industries. Baker stressed that for the Common Market, which represents 30 per cent of the world market for information technology, the removal of trade barriers was vital.

"We in Britain attach the very highest importance to developing the new technologies. But we see immense problems, perhaps even the squandering of a unique historical opportunity if we do not act together as a community. "We should let industry get on with the job. And we must recognize the importance of training at every level. In developing Community strategy we must not lose sight of the importance of European co-operation outside the framework - particularly in telecommunications and space." The Minister said the European Social Fund had a major role to play in training young people to acquire skills needed for the new information technologies. (Computer Weekly, 7 October 1982.)

Computer giants back independent software

When a company decides to move to a new type of computer it normally has to buy a new set of software with the machine. But now two computer giants in the US have given a new boost to the concept of "machine-independent software" - programmes that can run on many different machines with little or no alteration. At a meeting in London last month, both IBM and DEC confirmed that they would offer a feature called the UCSD p-System on certain computers. The two companies join the ranks of other such as Apple, Texas Instruments and Philips that already have the p-System. The big advantage to the computer user is that any software he may buy or develop will not be rendered useless if he has to move over to a different machine. (New Scientist, 21 October 1982.)

Computers learn Chinese

Far eastern inventors are working overtime to overcome one of their region's last great obstacles: the complicated system of Chinese characters. British patent application 2 089 730, from Chu Bong Foo of Taiwan, is the latest idea for a computer system capable of processing and displaying Chinese text.

Chinese characters are so complex in shape that each one takes up a large space in a computer's memory. So a memory capable of storing the tens of thousands of characters necessary for descriptive writing in Chinese script, is normally very expensive. Chu Bong Foo says he has spent 10 years on "laborious studies", to find a way of coding Chinese characters with English alphabet signs. In this way he stores 0.6 million coded characters in just 64 bytes of memory, so an English language domestic computer can process Chinese text.

The crux of the invention is that each Chinese character is decomposed into two parts, the "initial" part, which is its upper or left part, and the "stem" which is the rest of the shape. The decomposed words are then allocated identifying combinations of English alphabet letters. The letter codes are then stored in a computer memory for recall and display on the screen in response to English language instructions typed into a conventional keyboard. (New Scientist, 16 September 1982.)

Programming language announced by Inmos

Inmos, Britain's publicly-backed semiconductor firm, has moved into software. It has announced a new programming language designed for its long-awaited transputers. The language will have concurrency and simplicity as its keystones, says an Inmos spokesman. It is inteded to be generally applicable and run on a wide range of equipment. Its development has drawn heavily on the work of Tony Hoare, professor at Oxford University, on communicating sequential processes. Hoare has been a consultant to Inmos since its early days. Transputers, first mentioned by Iann Barron back in 1977, are Inmos' vision of the future for microprocessor devices. They will include numbers of processing elements on one chip, along with large amounts of memory. A language supporting a high degree of current operation will take advantage of the efficient interprocessor communication by allowing different processes to be assigned to different processors on the chip.

Inmos will be releasing evaluation packages for the language - which it coyly keeps anonymous for the moment - later this year. It hopes this will encourage general acceptance and so boost the potential of the transputers when they appear in 1984. (Computer Weekly, 2 September 1982.)

Programming of the future seminars

Cobol programmers can learn how they will be coding in a few years' time at four seminars on the new Cobol 80 being organized by the National Computing Centre. The seminars will be held in November in London, Birmingham and Manchester and will discuss the impact of the version of Cobol likely to be standard by the mid-1980s. The seminars will examine how Cobol standards are reached. At present, the US Codasyl Committee is responsible for discussing and recommending new Cobol versions. These are written into its Journal of Development, and passed on to the American National Standards Institute (ANSI) which has responsibility for laying down the new standard. This process takes several years and has been criticized by people who think it would be quicker if ANSI were responsible both for developing and defining a new standard.

As a result of the long lag between initial conception and execution of new Cobol features, the version of Cobol now being discussed is known as Cobol 80X. ANSI has also been criticized for failing to maintain adequate compatability between successive standards. These controversies, along with the detailed features of Cobol 80, will be discussed at the NCC seminars. There are three main differences between the existing ANSI 74 Cobol, and the new Cobol 80. One is that Cobol 80 offers a block structure with new statement delimeters to enable better structured programmes to be written. Cobol 80 also has an EVALUATE verb similar to, but more powerful than, the CASE statement of Pascal. This allows actions to be taken according to the value of a variable. In effect, a decision table can be built, with the value of a variable determining what path the programme is to take. The third main new feature of Cobol 80 is inter-programme communication, which allows one programme to be a subprogramme of another. (Computer Weekly, 14 October 1982.)

Micros in UK primary schools

Sinclair last week topped the Government's £9 million scheme to put micros in all 27,000 UK primary schools with a £15 million bonus offer of the company's own. The company is to give a ZX printer, a copy of the Logo educational computing Language, and 10 discount vouchers for future purchase with each of its Spectrum micros bought with the Department of Industry's 50 per cent subsidy for schools' pruchases of their first micro. "It is our way of making the point as dramatically as we can," says Clive Sinclair, boss of Sinclair Research. "One computer per school is a great help, but it is only a start. The ideal is one per child." The vouchers may be used to get a £45 discount on the normal price of £175 for a 48K Spectrum, or to get a free printer worth £60 with a full-price Spectrum. The Spectrum Logo language, which will come free in the package offered by Sinclair for the Department of Industry scheme, joins two other micro versions available for the Apple II and Texas Instruments' TI99/4A.

The combination of computer and Logo gives a model of the natural environment of the real world, says Nigel Searle, head of Sinclair's computer division, and means children do not have to adapt their way of thinking to fit in with the computer. The Logo package, which will sell for below £25, says Searle, will be joined by a Spectrum version of Prolog and further packages in Sinclair's range of educational software. The DoI Micros in Primaries scheme starts next month and runs until the end of 1984. Money from schools to buy packages based on the Sinclair ZX Spectrum, Acorn's BBC Model B and Research Machines' 480Z will be matched pound for pound. Sinclair hopes his scheme will induce schools to plump for the Spectrum. (Computer Weekly, 23 September 1982.)

CAD redraws the architect's job

With the sophisticated and easy-to-use CAD systems just now hitting the market, a growing number of architects are able to design buildings as much as 10 times faster than they could draw them manually. The computer has also enabled these pioneers to cut their design fees by 10 per cent to 60 per cent and increase their profit margins at the same time. Computer-aided design is not just making architecture a more profitable business; it is also starting to restructure the entire building industry. First to feel the impact of CAD are the beginning architects - traditionally the drones of the design office. Architects and design school professors report that graduates with computer training are now drawing salaries 10 per cent to 50 per cent higher than their classmates. Computer drafting is also freeing these young designers from the painstaking task of drawing by hand such repetitive items as railing details and restaurant partitions during their years of apprenticeship.

More important, CAD is moving architectural firms into entirely new businesses. For instance, Los Angeles architect Maxwell D. Jadlli now works for energy companies, producing drawings of oil fields from geological data that he runs through the computer. And thanks to its CAD system, the giant engineering and architectural firm of Gibbs & Hill has gone from mereley choosing building sites to full-fledged urban planning. "We realized that the system had great applications outside architecture and engineering," says John A. Tesoro, the company's manager of technical information systems. The Gibbs & Hill CAD systme uses drawings and numerical data to construct complex, multicolored, three-dimensional maps that show the optimal locations for roadways, buildings, and plants. Recently, Gibbs & Hill advised the Government of Nigeria where to place four new steel-related facilities based on computerized models that even accounted for political factors. The increased productivity on the design side is also improving efficiency at the construction site. Some architects

claim that CAD can trim one-third or more from design and construction time, making it possible to erect buildings that otherwise would be too expensive. This is because high interest rates and climbing real estate values can quickly change the economics of a building when construction is delayed. At current interest rates, for example, a one-week delay on a $US 100 million project can cost as much as $US 300,000.

Several computerized "service bureau" companies have emerged in the past three years that operate like quick copy centers: Architects send these bureaus their sketches to be computer-drafted or go to the bureau to use its machines. One Los Angeles bureau has the capacity to service 50 competing architectural firms in its shop. Some industry watchers point to this trend as a sure sign that a consolidation is on the way in the architecture business. The large integrated-design firms with enough capital to buy CAD systems, they believe, will dominate the field.

Yet with the price of CAD systems dropping to less than $US 100,000, it seems equally likely that CAD will give the small design firms the ability to compete with the giants, especially with those that still employ inefficient platoon of draftsmen. One New York City architect who already proves this point is Samuel A. Haffey. He has added five people to his 10-person shop since buying a $US 100,000 CAD system a year ago, but he claims that he would have needed an additional 8 to 10 employees to do manually all of the large jobs that he has won in the past year. And, he notes, "I am breaking even if the computer replaces only two people." (Business Week, 15 March 1982.)

Industry bites off more CADCAM than it can chew

Smooth-talking salesmen are taking British companies for a ride on computer-aided design, according to experts at the Government's Computer-Aided Design Centre (CADcentre) in Cambridge. Brian Gott, head of the centre's consultancy division, says that nearly every manufacturing company could benefit by computerising its drawing office, but many are confused by the variety of equipment on the market, and end up buying systems that are too complex. Gott hopes that his organization can help to raise awareness of how computers can help designers through its "practical Experience Centre" which gives industrialists first-hand experience of what computers can do. The Department of Industry foots the bill for introductory sessions and will subsidize further consultancy work. CADcentre launched the practical experience scheme in May this year, and 105 visitors from 36 organizations have so far visited it. Dennis Payne, the centre's manager, described the response as "very promising, but we have plenty of space for more visitors."

CADcentre, established 12 years ago, itself probably leads the world in designing systems for computerising drawing offices and linking them with machine shops. But Gott points out that the consultancy division is a separate organization, and quite often has to tell people that CAD/CAM is not the solution to their problems. "A company that is not organized for CAD/CAM will not benefit from it," Gott said, "and people are being sold systems that are far too sophisticated." One example is the vogue for three-dimensional modelling, which required vast computer memories. Gott says this is often unnecessary. One of CADcentre's newest products, the Project Engineering and Graphics System (PEGS) could make life a lot easier for the people who have to design process plants for the chemical and oil industries. It enables a designer to find the best layout for the different processes in a chemical plant, and for the myriad of pipes and conveyors that connect them. It will memorize the direction of flow in the pipes, and even warn the designer if he is connecting two output pipes together. (New Scientist, 28 October 1982.)

Guarding against computer crime

If computer crime rises in the UK as it has in the US, most installations will probably be caught napping. With the question of data privacy and protection still under sporadic discussion, methods of security have not yet had their airing and there appears to be little sense of urgency within the industry. Most systems are protected by a hierarchy of passwords which are more than adequate for guarding them against all but the most determined end user, but to someone with a little DP skill they are rarely totally watertight. According to a recent report by Frost & Sulivan, the market for secure information systems in the commercial sector will quadruple by 1986 in the US and be worth about $US 100 million. The market for military applications is also predicted to triple by 1986, to $US 20 million. Data encryption products are specifically mentioned in the report as being proof against most types of computer misuse, particularly when integrated to be transparent to the user. The US Data Encryption Standard (DES) algorithm is found to be "sufficient for almost all commercial applications." (Computer Weekly, 7 October 1982.)

Even codebreaking is becoming computerized

Cryptography, long a black art monopolized by spies and codebreakers, is about to become a normal part of business life. Computers are the rason. Computer data, stored and transmitted electronically, cannot be guarded by simple physical precautions. Today's crooks can tap into a computer system using a remote terminal, then alter, damage or read unprotected data stored in it as easily as if someone had left the safe door open. Now one standard cryptography scheme is about to spread rapidly through America's financial system; small businesses relying on micro-computers can buy, for a few hundred dollars, crytographic devices that will protect their files. (The Economist, 16 October 1982.)

LEGISLATION

US Bill to strengthen legal protection of software

An attempt to provide further legal protection for software producers is to be made in America. Legislation to amend the Federal Copyright Law has been introduced by Congressman Robert Kastenmeier, who is chairman of the House Sub-committee on Courts, Civil Liberties and the Administration of Justice. The Bill is supported by the Association of Data Processing Service Organisations (Adapso), roughly the equivalent of Britain's CSA.

Software is theoretically already protected by US copyright legislation, but the existing provisions are, in the opinion of many commentators, unclear, which means that anybody wishing to take action risks an expensive lawsuit with nothing to show at the end. The Kastenmeier Bill contains four important provisions designed to improve the position. First, it will incorporate the World Intellectual Property Organization (WIPO) definition of computer software into the copyright law. This is slightly wider than that incorporated in te existing Act, in that it concentrates on protecting the idea rather than the form in which it is expresssed. Secondly, it provides that the use of copyright mark on unpublished software does not constitute publication of the material. Thirdly, it established a procedure for the secure deposit of computer software within the Copyright Office. Finally, it specifies that copyrighting does not disqualify a programme from protection as a trade secret. The significance of this is explained by one of the UK's leading authorities on software protection, Alastair Kelman. "Under US law a literary work, including software programmes, cannot be a trade secret as well as a copyrighted document. This Bill will change that and will also give you an extra leg on which you can sue - that is for stealing a trade secret as well as violating copyright." Kelman added, "The deposit provision is what the whole thing's really all about. It will mean you can't just walk in to the Copyright Office and have a look at somebody else's copyrighted programme." Jerome Dreyer, president of Adapso, commented, "The law cannot, in and of itself, stop the proliferation of software piracy, but it will make proof of this type of theft easier. Therefore, software developers of all types will have the opportunity to gain restitution from those that steal their work. In the long run this legislation should reduce the number of thefts."

In the UK, action to give legal protection to software developers is far less advanced. The Government introduced a Green Paper on copyright, covering software, last summer, but no further action has yet been taken. (Computer Weekly, 2 September 1982.)

Apple protects patents

Apple Computer of California has taken legal action against four Hong Kong companies which have allegedly been infringing its patents, copyrights and/or trademarks.

Court orders have been issued restraining Lux Electrical and Maxland Electronic, both of Hong Kong, from infringing British letters of patent and rights. Charges are pending against two other small Hong Kong companies.

An Apple spokesman explained that suing for compensatory or punitive damages in Hong Kong is difficult "and not like it is in the US." In addition, most of the companies involved are small operators.

Apple's intent in seeking restraining orders but not monetary damages is simply to demonstrate that it is serious about stopping the pirating lest bigger pirates move in, the spokesman explained. (Computer Weekly, 2 September 1982.)

Firms link to put a stop to software piracy

More effective prosecution of software pirates could result if a new consortium of software houses gets off the ground. Trevor Brownen, chairman of Torquay-based Crystal Research, approached some of his rivals last week with an idea for a consortium specifically designed to provide an effective agency for the prosecution of software pirates. The basis of the software protection consortium is to provide the resources to take offending companies and individuals through the courts, rather than the out-of-court settlement that has up to now been the usual course of action. The idea is to make examples of copyright offenders as a deterrent to others. Brownen says that the latest estimates put the cost of piracy in the US at more than $US 2 billion, and that four out of five copies of all software are illegal. VisiCalc has 250,000 authorized users, but an additional 625,000 illegal copies.

Simon Elsom, a law student at the University of Aston in Birmingham who is working on software piracy as part of his PhD, says that the current laws on copyright are adequate, but the lack of precedents concerning software thefts is making interpretation of the law difficult.

INFORMATION TECHNOLOGY

SPIN II

The Intergovernmental Bureau for Informatics decided to postpone SPIN II from 1983 to September 1984 to allow UNESCO to include the conference in its budgeting cycle. The venue continues to be Havana. (See MM No. 1 for earlier reports on the conference.)

Embassy enters information age

Britain's Embassy in Paris has joined the information revolution and installed an ICL System 25 to put French buyers in touch with English companies. It is the first UK embassy to do so. The computer will contain records of 10,000 British companies and 30,000 of their senior executives in order to meet requests for information from French firms interested in placing orders in Britain. At present these requests - in which computer purchases top the list - mean lengthy searches of manual files and often depend on the memory of the commercial officer involved. With the System 25 the search will be cut to real time from an average of at least one hour. Three women employees of the Embassy are transferring the manual files from the trade registry to the computer, which is scheduled to be fully operational by the end of the year. If the system and its software, which are believed to have cost about £65,000 to purchase and install, are a success, it will be duplicated in UK embassies all over the world.

Britain already has information systems operating in five capitals and business centres abroad but these are basically word processors. In Paris the programmes have been written for a custom-built system. The Foreign Office, which has masterminded the venture, will have the choice of buying extra terminals or microcomputers. Plans are ready to link the Embassy's System 25 with the commercial departments of Britain's consulates in Lille, Bordeaux, Lyons and Marseilles. Each of these offices could then consult the Paris records as well as being accessed from the Embassy over France's Transpac data packet switching network. The System 25's next appearance is likely to be in Bonn which will be linked with Britain's commercial offices in Frankfurt and Düsseldorf. The American State Department helped the Foreign Office with its own experience in setting up computerized systems in US embassies throughout the world. The Americans have spent an estimated $US 57 million on these efforts, compared with a British investment of a fraction of this sum. The Foreign Office has plans to extend the use of the system 25 in Paris to incorporate visa and other consular records. But this project involves security measures to ensure that unauthorized persons cannot access confidential data. (Computer Weekly, 30 September 1982.)

ESPRIT aims for 30 per cent IT market share

Common Market countries only supply 40 per cent of their own information technology requirements, and supply a miserly 10 per cent of the world's requirements for IT products. This is the bleak background to the community's ESPRIT scheme of which details have now been announced.

Despite economic recession, the world requirement for IT products has continued to grow at 10 per cent a year. But EEC countries have shown an increasing tendency to rely on importing such products: "Community industry", says an EEC report, "is losing the race to create a solid technology base." The report estimates the world IT market as being worth £55 billion a year with £16.5 billion being accounted for by sales to EEC countries. "In recent years", the report concludes, "foreign competition has made inroads in the manufacture of microelectronic components, in mainframe computers, smaller computers, in consumer electronics such as TV components, video and audio equipment, and in telecommunications."

Companies in the EEC which make IT products must either, says the report, "increasingly rely on imported basic technology, with the consequent risks of vulnerability to embargo, or they must opt out of the race to be in the forefront of high technology and fall back on lower technology products." ESPRIT is the Community's response to this bleak projection. The acronym stands for European Strategic Research Programme in Information Technology. The general aim is to channel more money into IT R&D and avoid duplication of effort among member countries. The specific aim is to gain a 30 per cent share of world IT markets. The report reckons that "three years ago about half the products on the market today did not even exist, and this headlong upsurge of innovation and invention appears unlikely to slacken. "An encouaging indication that the community might be willing to put its money where its mouth is, comes in the statement that "ESPRIT should command sufficient resources to compete successfully with R&D resources in the USA and Japan. The figure has still to be worked out, but is expected to be large."

Areas of particular attention which the report recommends are advanced microelectronics, advanced information processing, software technology, office automation and computer-integrated flexible manufacturing.

The scheme will not only come up against the appalling problem of inter-company rivalry, but also will hit the conservative instincts of European Governments. Although not locking up their entire efforts in high technology in their defence programme, like the Russians do, nonetheless European Governments have shown nothing like the same sort of commitment to the democratisation of technology as exists in the US and Japan. (Electronics Weekly, 11 August 1982.)

Test bed for IT

Milton Keynes (UK) has formed an information technology group to spread the application of IT throughout the new town and identify "legislative impediments to its work." The new town has employed consultants, Butler Cox, to identify new IT applications both on a consumer and industrial front. In many respects Milton Keynes is being used as a test bed for technologies which other towns have been extremely cautious in introducing. Each house in Milton Keynes is on a cable network, a clever move by the architects when they planned the town 10 years ago, since cable is only now beginning to come into its own, with the cost of actually laying the cable being the most prohibitive expense. Milton Keynes is also taking advantage of remote meter-reading using microcomputers with the backing of the Department of Industry and Thorn EMI. Viewdata, one of those many British inventions which have so far failed on the marketing side, is being positively expoited in Milton Keynes using the Prestel gateway system and teletext. Milton Keynes has also been first in expoiting solar energy. The IT systems being experimented with by consultants Butler Cox could be available in ordinary households in the next five to 10 years. The town is also developing training resources with the creation of an IT training centre providing apprencice training in electronics. Milton Keynes is working closely with British Telecom which is using the town as a test centre for many of its experimental systems. BT is providing its services free due to the experimental nature of the project. (Computer Weekly, 9 September 1982.)

IT projects run into legal snags

Legal snags could be holding up information technology projects as legislation fails to keep pace with progress. That is the view of the Milton Keynes Development Corporation and the consultancy Losys, which are looking into possible legal implications of information technology systems.

The problem range from issues such as data protection to building regulations which restrict the use of some types of cable, and lack of clarity over whether direct debits can be made from accounts held on bank computers.

"In many cases the law has not kept up and no-one is sure if something's legal or not," said Eosys consultant Nigel Hinton, who is co-ordinating the project. "They can take the risk and go ahead or try to analyse the finer points of the law. But one problem is that terms like word processor, facsimile and even telex don't seem to have entered the legal vocabulary.

"As a result, some good information technology products could be hit by existing legislation - or lack of it." The gradual growth of the Prestel public viewdata service and cable television provides an example of laws lagging behind technology. Hinton pointed out that if someone boutht a product through an advertisement and reponse frame on Prestel and the advertisement was subsequently deleted, the customer would have nothing to use as proof of misleading claims by the supplier in the event of dispute. Hinton said an insurance company was planning to do electronic direct debiting of premiums from its customers' bank accounts to its own computer files. It had held back because the law was not clear. Lack of clarity was also affecting the use of communications to read gas and electricity meters remotely. And building regulations restricted the use of flat cables which could be cheap alternatives to expensive underfloor ducts.

NEC and Q1 Europe link to develop local net

Japanese microcomputer maker NEC has joined the rush towards local networking. Its European arm has developed a system in conjunction with Southampton-based Q1 Europe to link its PC-8000 personal micro into a hard disc based network of up to 64 machines.

NEC claims the network is faster and more versatile than other networks designed for microcomputer use because of Q1's established intelligent local area network and Winchester disc controller used in conjunction with Q1's operating system. (Computer Weekly, 23 September 1982.)

Two in three will depend on computers

Europe is firmly in the rear in the development of information technology - despite the fact that 60 per cent of the workforce will be employed in some way with computers by 1985. That was the view expressed last week in Berlin by top Eurocrat Dr. Jean-Marie Cadiou, a director of the European Commission's Internal Marketing and Industrial Affairs directorate. He was making one of the keynote speeches to the International Congress for Data Processing and Information Technology (IKD82). Cadiou saw the challenge to Europe as being from both Japan and the US, and his theme was addressed to "the challenge of new information technologies for Europe." Cadiou emphasized the impact of IT on the rest of the economy, claiming that one-third of jobs in Europe depended on "effective use of IT and a further third on medium use of IT". By 1985, Cadiou calculated, 60 per cent of the workforce in Europe would be employed in some way with computers. Immense opportunities could be derived from the expansion of information technology, but in answer to his own question, "Who is making use of the new technology?" Cadiou had depressing answers for Western Europe in general, and he quoted from the recent McKinsey Study for the EEC. That study showed Japan in the lead in exports, followed by the US, with Europe lagging behind. Figures relating to components production versus components consumption showed that Europe does not produce enough for its own consumption.

Cadiou had a dismal picture of the IT industry in Europe. His statistics showed an industry with a fragmented market and stifled by the chauvinistic national championship of each nation's own IT companies. Cadiou quoted comparable development times: 15 months in Europe, 8-9 months in Japan - a scale of one to two, probably across a range of products. He He lack of inventiveness in, for example, the UK or Germany, but wherever one saw a development or product invented in Europe it could be seen that the current market leader was either a Japanese or US company. (Computer Weekly, 2 September 1982.)

ROBOTICS

Robotics through 1990:

The sale of robotics during the 1980s promises to be a highly competitive battle among budding producers from major industrialized countries that, in the process, will greatly alter the comparative advantages of today's industries. Those countries that are willing to adapt their national policies to this new technology and deal intelligently with possible opposition and obstacles will gain in efficiency. Those that do not may find themselves hopelessly behind, not just in productivity but also in the technological breakthroughs that

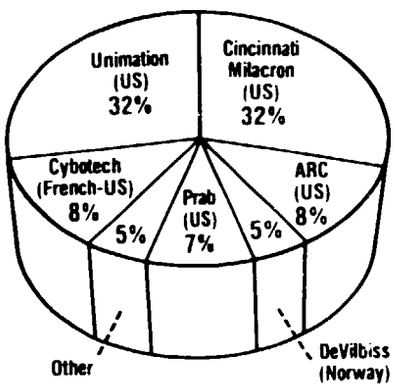
more advanced stages of robotics will lead to. The lineup of the likely company leaders and the hot market areas are just two of many of the developments explored in a recent in-depth look by Creative Strategies International (CSI) at robotics to 1990 and the impact the new technology will have.

According to the study, the robotics market will grow from about $US 1 billion in sales in 1981 to an over $US 10 billion yearly market at the end of the decade. The number of robots in use will expand from some 110,000 today to the 1.25 million range in 1990. Much of the growth will be in more sophisticated robotics, i.e. of technology that is only now emerging from research laboratories and will be proving out after mid-decade. While a majority of the robots in use are nonprogrammable mechanical transfer devices, the CSI study has pinpointed stages of development over the next three to five years that will bring rapid increases in multi-programme, mobile units. More importantly, the latter half of the decade will see the introduction of aural, tactile and visual sensing machines that will move industry steadily toward the totally automated factory. (Business International, 8 October 1982.)

Robotics Market Shares at a Glance

US Robot Market

(Market share of 1981 sales of approx $250 million)



Source: Creative Strategies International

Top 10 Potential Markets* for Robots

(number of units in use)

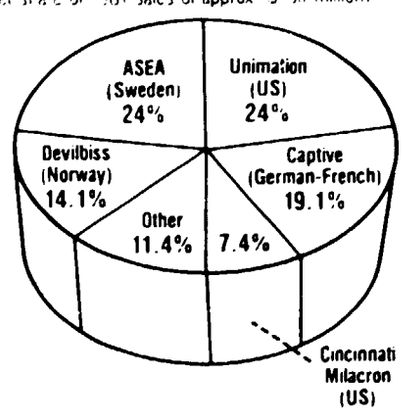
Country	1981	1985	1990
US	12 743	82 164	330 987
Japan	11 571	61 377	156 338
Germany	10 563	47 824	[illegible]
France	10 205	44 606	[illegible]
UK	8 895	35 853	[illegible]
Italy	8 335	32 323	[illegible]
Canada	7 355	27 350	[illegible]
Mexico	4 130	14 780	32 016
Netherlands	4 348	15 189	31 670
Australia	4 325	14 834	30 193
Other	27,151	91 985	189 704
Total	**109,621**	**468,285**	**1,220,922**

[illegible]

Source: [illegible]

European Robot Market

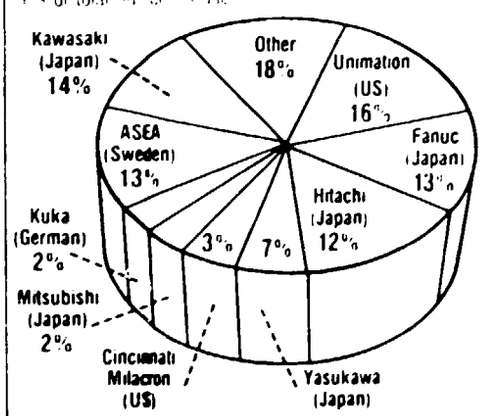
(Market share of 1981 sales of approx $130 million)



Source: [illegible]

World Robot Manufacturers by Firm, 1981

[illegible] of total number in use



[illegible]

Source: [illegible]

Future robots

The present first generation of industrial robot has been generally welcomed by both workers and management in all the industrialized countries. A robot after all is simply replacing a man who has been forced to work like a robot.

Future generations of industrial robots are liable to provoke a differemnt, less welcoming response. First generation robots either grip a tool or workpiece. But they move the tool or part in a blind, unfeeling world. Indeed the robot will paint or weld in mid-air if the part is unavailable or incorrectly positioned. Today's robots depend on the workpiece being in the precisely correct position. They also depend on exact orientation of the workpiece. Because of this lack of sense, first generation robots are of limited use in inspection work, assembly tasks or even in some common materials-handling applications.

Future generations of robot will have increasing levels of sophistication of sensing ability. These 'generation 2, 2.5 and 3' robots will be able to 'see' parts and 'feel' the differences between different workpieces. They will also be able to 'hear' commands and to change operating programmes using their own intelligence. Robots with vision have been feasible for some time. Various researchers in the field of artificial intelligence have demonstrated the concept. There are, indeed, already a few, limited commercial applications. Laser sensing can also be used in the same fashion as video devices. In addition, tactile sensors are being developed which tell the robot controller that the workpiece is either in position or is missing. It is also possible to link robot hands to proximity sensors. One such device uses fibre optics to position the hand precisely over workpieces which are presented in varying locations. These developments and many more (including voice commands) are well advanced in the laboratories of universities and leading makers of robotic devices. The problem is to adapt them to the complicated environment of the shop floor. A typical forecast within the engineering industry is that robots with simple video and tactile sensors will be in fairly common supply by the late 1980s.

Assembly robot

The major goal of engineers developing these next generations is the assembly robot. Assembly represents a huge technical challenge. It also constitutes a major cost in manufacturing industry since a very large proportion of manual workers are employed in assembly. The assembly shop might represent the most significant arena for socio-technical conflict in the early 1990s. If the technology of fitting closely toleranced parts to each other can be achieved by robot in a reliable, flexible fashion, the implications for employment are immense. The jobs that would be lost to the robot need skills with which humans are well equipped - manual dexterity and intelligence. (Excerpted from an article by Prof. T. Husband, Imperial College of Science and Technology, published in Futures, August 1982.)

Laser eyes for industrial robots

Computers may be able to learn about a world that for them is new - that of complex shapes - thanks to a development in laser engineering.

At the French Government's INRIA near Paris, engineers are developing a laser range-finder which translates information about the shape of objects into data that a computer can store. The result could be useful in areas as diverse as industrial robots and filmmaking.

One application of the range-finder is in industry. A robot with data about shapes can work very accurately. For instance, it could move its 'arm' along a contour of a piece of metal to weld two componenets together. (New Scientist, 7 October 1982.)

Home robot

The first manufactured intelligent robot for the home experimenter has been launched by RB Robot Corporation. Designated the RB5X, the robot learns from its experience. With its own microprocessor, memory, programmes and tactile sensors, the RB5X detects and responds to objects in its path. Once a successful random response is achieved, the RB5X remembers its action and repeats the correct response when confronted again with the same situation.

These same principles are intended to be applied with other sensors and with more complex programmes by the home experimenter using the RB5X as a starter system. Designed for technically-oriented consumers (engineers, scientists, computer programmers, educators, hobbyists, etc.) the features of the RB5X support experimentation in the field of robotics. Users may increase the "experience" and capability of the robot by installing additional mechanical functions and additional sensors. (Electronics Weekly, 6 October 1982.)

Robots in industry

Widder (Naugatuck, Conn) has developed a 3-axis oxyfuel pipecutting robot for field and in-plant operations. The computer-controlled Versiflame-O_2 can cut straight, angle, and saddle configurations while maintaining an ideal bevel for subsequent welding. The operator inputs data regarding the type of cut, dimension of the pipe and the desired degree of bevel. The robot then advises the operator to ignite the torch, preheat, and activate the start button. Advantages include portability of the 35 lb (16 kg) unit and the ability to change the attack angle while cutting an angle or saddle. (Robotics T, June 1982.)

Mobot (San Diego, Calif) is introducing a new line of verhead bridge robots for spot welding automobile bodies. The Mobot robot comes in one or several traveling carriages that support 2+ wlding heads and are mounted over the welding line on 2 parallel steel beams. Welding heads can achieve any desired orientation with up to 6 independent axes of motion; welding heads provide 3 rotary axes of motion; and the carriage provides 3 linear axes of motion that consist of parallel, crosswise to the welding line, and vertical. Each motion axis is a standard Vectron motion module. (Robotics T, June 1982.)

Mobot (San Diego, Calif) has developed a material handling robot to work in a high vacuum with an electron beam welder. The robot works inside a vacuum chamber loading parts from a stack to the welding fixture, yielding a 10X increase in the quantity of parts/cycle and increasing productivity by a factor of 6. Human operators had been required for the work while a vacuum was alternately produced and released to allow human entry into the chamber. (Robotics T, June 1982.)

Rockwell Intnl's Graphic Systems Div (Rockford, Ill) has incorporated a robot system to handle a centerless grinder. The application developed with input from several groups of people to consider engineering, installation and personnel training. The firm adapted a Cincinnati Milacron Twin Grip centerless grinder with a 20-in (508-mm) wide grinding wheel that tools steel printing press rollers with fewer passes, at a faster feedrate, and reduced setup time. Rockwell's first step was to form a task force to learn about industrial robots and interfacing considerations, i.e., matching the device to the job. To help visualize applications, a scale model of the centerless grinder and different types of material handling methods were made for use with a plastic model HT^3 robot provided by Milacron. Consulting an outside engineering frim, Robot Systems Inc (Atlanta, Ga), was done to guarantee the success of the first robot in the Graphic Systems Div. (Robotics T, June 1982.)

Fiat is using 37 wire-guided Robocarriers to improve productivity in building engines at its Mirafiori plant (Turin, Italy). These battery-powered carriers travel at 4 km/hr around an 8-km network of buried magnetic tracks connecting the work stations with parts and buffer stores. Trolleys normally carry 2 engines, and are identified by a magnetically-coded card indicating their particular build specifications, and hence the routing round the floor. Since adopting the trolleys, Fiat has halved the test-bed rejection rate to 7.5 per cent, cut build time/unit by 1/4 to 1.5 hr, reduced the floor workforce 20 per cent, halved absenteeism to 7 per cent, and increased flexibility in dealing with 100 different variants of the basic SOHC engine it builds. (Technology Update, 10 July 1982, Auto Engineer, June 1982.)

Robots at Ford (UK) plant

The UK's robot population has more than doubled with the installation of over 150 robots by Ford for the production of its Sierra car, launched this week. But the UK still lags behind many other developed countries in the robot stakes: Japan and the US share about 5,000 of the world's 8,000 machines and the rest are installed around Europe. BL's Metro plant has about 40 robots. Ford has spent £500 million no manufacturing for its replacement for the Cortina. Half has gone on automating the other Sierra production centre, in Gent,

Belgium. In the UK the Dagenham plant in Essex now has 120 robots from US, German and Italian manufacturers, mainly for welding body sections together. The plant also has an automated conveyor system which brings body sections together from their separate welding lines for final assembly. Another 20 robots have been installed at Ford's Swansea plant to produce rear axle assemblies, while others are helping build gearboxes at Halewood. Ford says robots produce far stronger and more accurate welding than manual methods. The output is not significantly greater - the company is building up to 950 cars a day by March - but the quality is much better. The number of manual welds has been cut from over 3,500 on the Cortina to just 503. (Computer Weekly, 23 September 1982.)

UK electrical giant switches on to foreign robots

GEC is about to buy robots from abroad, probably from companies in Japan or the US, as part of its scheme to become a major force in automated engineering equipment. Engineers at GEC Electrical Project group in Rugby hope to conclude licensing deals with the foreign robot firms within the next couple of months. Among the companies to which GEC has talked are Hitachi and Yaskawa Electric of Japan.

At the same time, researchers from the electrical-engineering giant are working on three novel products to automate factories. The researchers are devising a "modular" robot that can be built up from components Lego-style. With this technique, engineers can build a robot for many different applications from a limited number of parts; thus the robots should be cheap, at around £5,000.

The second product is an automated truck that will trundle around factories, to load machine tools, for example. The truck will follow instructions lodged in a computer in a control room that tell the vehicle what to do when it gets to a particular part of the factory floor and which route to take. (New Scientist, 7 October 1982.)

Spotwelding robot

A new spotwelding robot system which is compact and flexible has been developed by ASEA, the Swedish-based manufacturer of electrical equipment, industrial electronics systems, etc.

Comprising a robot, control equipment, welding monitor, welding gun, mast unit, cables and hoses, it is said to withstand severe environmental conditions and heavy duty, while meeting the needs for good handling capacity, long reach and comprehensive programming facilities.

With nearly 50 per cent greater reach than its predecessor, the new robot system meets the demands for accessibility imposed by most modern automobile bodies, ASEA says. Long, loosely hanging cables and hoses have been eliminated through the integration of water, air and current supplies inside the robot.

The integrated power supply system - built into the robot arm - permits copper conductors and contact units always to retain their characteristics, in contrast to the gradual change experienced with flexible cables.

The new robot is normally supplied with five servo-driven axes - robot rotation, radial arm movement, vertical arm movement, wrist twisting and wrist bending - but it can also be equipped for the control of up to four external axes, synchronized with the robot axes. With five axes it has a handling capacity of 90 kg.

The robot is programmed by means of a "dialogue" with the control system via a portable programming unit. The control system poses questions on an alphanumerical display and the operator replies by pressing push-buttons for the answer chosen.

A joystick on the programming unit is used to move the robot manually from one position to another during programming. This results in considerably faster programming compared with earlier systems, ASEA says. (Electronics Weekly, 11 August 1982.)

Industrial robots breaking new ground

Discussing prospects for the use of industrial robots in the GUDOK newspaper Corresponding Member of the USSR Academy of Sciences Professor I. Makarov notes that his country has now over 200 robot models, most of which are already in commercial production. Their chief use is in labour operating under extreme conditions.

Meanwhile still more versatile and improved models are being developed. To illustrate this fact, Moscow University specialists have come up with a three-armed robot for operations under extreme conditions such as underwater, or in gaseous environments, etc. Another model is a versatile robot with a self-contained system supported by various telemetric radars and visual systems, which are essentially its brain, sight and sense organs.

Work is now being carried out on three specialized plants for the commercial production of programmable automatic robots, due for completion in 1983 - 1984.

A major problem now, the article points out, is to develop a highly efficient though inexpensively produced robot capable of processing vast data fed to it by its technical sensors drives and control systems. With the assistance of specialists in other fields, such as biologists, physiologists and chemical engineers, the task could be simplified.

They were instrumental in helping the electronics industry start manufacturing microprocessors, which are basically cheap miniature computer devices, which could easily be assembled into compact but high-capacity manipulators. Moreover, such microprocessors could be placed in a robot's arm, which could act not unlike its brain, the article concludes. (Moscow News Information, No. 62, 1982.)

Governments looking at robotics: Australia

In a report on new technology a task force of the Australian Labor Party (ALP) has warned that the development of robotics cannot be ignored.

"If Australian industry is robotized this will lead to rapid restructuring, massive unemployment and enormous discontent, but it may enable a restructured industry to survive for decades more," the report said. "If Australian indsutry is not robotized it will retain high levels of employment for a time but may then crash, leaving behind no industry at all." Described by the task force as "controversial", the report examines the issues of technological change, job replacement, the work ethic and education, and recommends a continuous public information campaign to "demystify" science and technology and raise community awareness. It also stresses the need for Australia to reduce foreign control of its technology and to encourage intensive development grants.

The report admits that introducing technology into the work-place can reduce employment in specific areas. While these may be dirty, noisy, monotonous jobs, the displaced workers may not find new and agreeable employment. Work appears to be economically, socially and psychologically necessary for most people and unemployment dreaded as humiliating and intolerable, the report says. "We should abandon the masochistic doctrine of work for work's sake. There is nothing life-enhancing in performing boring and exhausting work year after year." The report suggests voluntary alternatives to unemployment such as non-compulsory early retirement and re-current education, coupled with a guaranteed income and universal superannuation scheme.

Technological innovations, particularly in robotics, will become more prevalent in manufacturing and service industries, and Australians will have to revise their attitudes toward work to accept the changes, says the report. Recognizing the role that Government plays in developing and controlling technology, the report proposes that a committee be established to increase Parliamentarians' understanding of technology, and puts forward proposals for Government action such as:

- Collaboration with industry on R&D, specially in "socially constructive areas";

- Requiring foreign-owned corporations in Australia to invest appropriate sums in R&D and transfer technology to Australian control;

- Assisting small businesses in high and intermediate technology by setting up an investment fund to provide risk capital;

- Adopting the principle of the Swedish Joint Regulation on Working Life Act under which employers must tell and negotiate with workers before introducing technological innovations in the workplace;

- Support for employers and unions entering into technological agreements.

(Electronics Weekly, 11 August 1982.)

The Australian Government's Department of Industry and Commerce is patenting (British patent application 2 086 614) a system that enables a parachutist to control the descent of unmanned parachutes alongside.

In addition to his own control lines, the parachutist has a pair of electrical controls, each like the cylindrical plunger valves of a trumpet. The cylinders contain variable resistors which change value as the parachutist presses down on their plungers. The resistors control a radio transmitter which sends out signals to the slave parachutes. When received by the slave, these signals drive winches to reel the parachute control lines in and out.

The parachutist jumps and pulls his rip cord while the slave parachutes open automatically. He then pulls on his own control lines, while working the radio transmitter controls with his thumbs to keep all the parachutes together. (New Scientist, 22 July 1982.)

Japan

A planned Japanese Government study of the effect of robots on employment could ruffle the complacency of bureaucrats, indsutry leaders, and even labor union officials who insist that Japan is immune to the threateded factory takeover by steel-collar workers. In April, under heavy pressure from the nation's four biggest labor unions, the Labor Ministry will undertake a two-year study of robots. But Japanese unions fear that the automation threat may outrun the Government's leisurely pace in examining the problem.

The Labor Ministry argues that robots will revolutionize industry without disrupting employment. "Until now, we've heard no complaints," says Makoto Ogata, manager of policy and planning in the Labor Ministry's Secretariat. "On the contrary, both management and workers are welcoming industrial robots. They boost productivity for management, and they do a lot of dirty and dangerous jobs, such as spot welding, which workers hate." Ogata, however, concedes that in the past two months the ministry has heard increasingly from labor unions that are worried about the robot invasion. (Business Week, 29 March 1982.)

Ireland

The impact of robotics on Irish industry so far has been almost nil, despite some isolated installations. And according to a National Board for Science and Technology (NBST) report. MicroElectronics - the implications for Ireland, the scope for adopting microelectronics in the Irish engineering industry (it is in some form of engineering that most robots are currently-used) is relatively limited, in the short term at least.

"Small machine shops are dependent upon their adaptability and engineering skill, and many will continue to provide the same level of service without adooting sophisticated machinery," it says. (Technology Ireland, June 1982.)

Robotics seminar

The appraisal, installation, maintenance and safety of Getting Robots and Automation Systems to Work will be examined during a one-day seminar being held on November 1, 1982 by the Manufacturing Industries Division of the Institution of Mechanical Engineers' at its London headquarters.

Co-sponsored by the Institution of Electrical Engineers, the Institution of Production Engineers, the Machine Tool Industry Research Association and the Zinc Alloy Die Casters Association, the seminar will deal with the practical problems of getting Robotic and Automation Systems through the financial justification and installation stages. Speakers have practical experience of their areas. Latest trends in maintenance and safety guarding, including the use of light beams, will be covered.

Robotic and automation systems are of great interest as the UK manufacturing industry seeks to meet and beat international competition in the world market place. Between the realisation of the opportunity for installing such a system and its successful commissioning lies much work by engineers and managers.

The Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London SW1H 9JJ, Tel: 01 227 7899. (Electronics Weekly, 6 October 1982.)

RECENT PUBLICATIONS

The report of the expert group meeting to review the implications of microelectronics for countries in the ECLA region held in Mexico City on 7-11 June 1982 (see page 2 in issue No. 3) has been published in English and Spanish and is available from UNIDO under symbol No. ID/WG.372/17.

For a report on the UNIDO mission to Egypt, India and Thailand (see issue No. 3, page 3) please refer to the report of UNIDO consultant J.M. Oliphant, document number UNIDO/IS.351.

Information Resource Management - Opportunities and Strategies for the 1980s (William Synott and William Gruber; John Wiley & Sons, 356 pp. £18.50)

Information is of vital importance to the everyday activites of virtually all organizations. Techniques to aid the management of information resources will therefore be of value to small and large enterprises. This book describes 68 tested and recommended strategies to aid the IM task. They should appeal to all those managers likely to encounter the increasingly complex information management problems of the next decade. The 68 strategies form the foundations upon which the whole book is based. From these stem the 13 chapters that make up the book. These, in turn, are organized into three parts: the new management, management integration and information resource management. Part One introduces the strategies and suggests how the book might most effectively be used. It then discusses the future role of the DP manager as, during the 1980s, data procesing evolves into information management. The substance of Part Two is essentially integration. Here, the authors discuss techniques for increasing the influence of the IM function within an organization, how to establish effective user relations and methods for closing the communication gap with top management. The third part of the book is by far the largest. It contains chapters on human resource management, hardware and software, telecommunications, office autiomation, project management/selection, and techniques for managing distributed processing resources. These chapters account for over 30 of the 68 management strategies. (Reviewed in Computer Weekly, 2 September 1982.)

"The office of the future" (Predicasts, 1101 Cedar Ave. Cleveland, Ohio 44106, $US 995)

Office staff productivity is set to take off as investment in office automation more than triples to $US 18,800 million by the mid-Nineties. And spending on equipment for managers in particular will grow at 60 per cent a year as the focal point for improving office productivity shifts from the secretary to the executive. These predictions are made in an office automation report by the US market research firm Predicasts. The report points out that office staff have always ben the poor relations as far as capital investment is concerned. Over the last decade a capital investment of $US 40,000 in an agricultural worker has brought a 200 per cent boost to productivity. In manufacturing every $US 30,000 spent per worker has seen a doubling in productivity. By contrast only $US 2,500 has been invested per office worker - and productivity has increased by just 5 per cent. Predicasts says changing social and labour factors make the office an ideal candidate for automation. Staff shortages are appearing at lower levels as more women aspire to managerial and technical jobs, and labour costs generally are rising, while equipment costs are falling. The report says text generation equipment, mainly word processors, will represent two-thirds of the market by 1995 and reproduction equipment - copiers and duplicators - will account for a fifth. This will be a marked contrast from the last 10 years, when reproduction equipment led the market with a 50 per cent share. The importance of communications in the automated office is reflected in that the teleconferencing equipment sales are expected to grow at 30 per cent a year and electronic mail terminals sales will increase by more than seven times. The only area to suffer as office automation catches on is that of microfilm. Sales will increase at 12 per cent a year initially but will drop off in the Nineties as magnetic media performance continues to improve. (Reviewed in Computer Weekly, 2 September 1982.)

Fifth Generation Computer Systems (Editor T. Moto-Oka, North Holland (Oxford), £20.00)

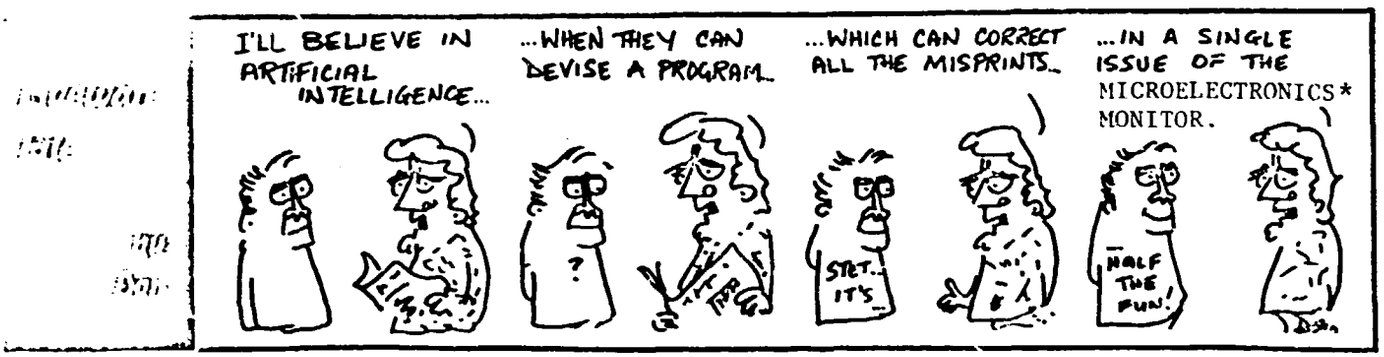
This work, contains all the relevant papers to date on the Japanese Fifth Generation Project.

The Japanese see the project as the only route to national survival for a country without natural resources other than ingenuity.

The Japanese see the Fifth Generation as a silicon-based VLSI engineered era of super-computers, accessed by everyone via handheld devices which will enable users to communicate with the system in common English or Japanese.

The central machines, which will contain up to 1,000 processors each, will operate on non-von Neumann architecture and rely to a great extent on inferential logic working at 10,000 million instructions per second (mips).

The project is clearly laid out in the papers, and the timescale is regularly referred to. The Japanese expect to have their first inferential logic machine which will be based on a very much enhanced version of Prolog (an advanced high level language used in artificial intelligence), within three years. They expect to have developed the main elements of the man-machine interface four years later, and the first Fifth Generation systems will be in production three years after that, in 1991/2. (Reviewed in Computer Weekly, 19 August 1982.)



By courtesy of Computer Weekly, 2 September 1982

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