



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

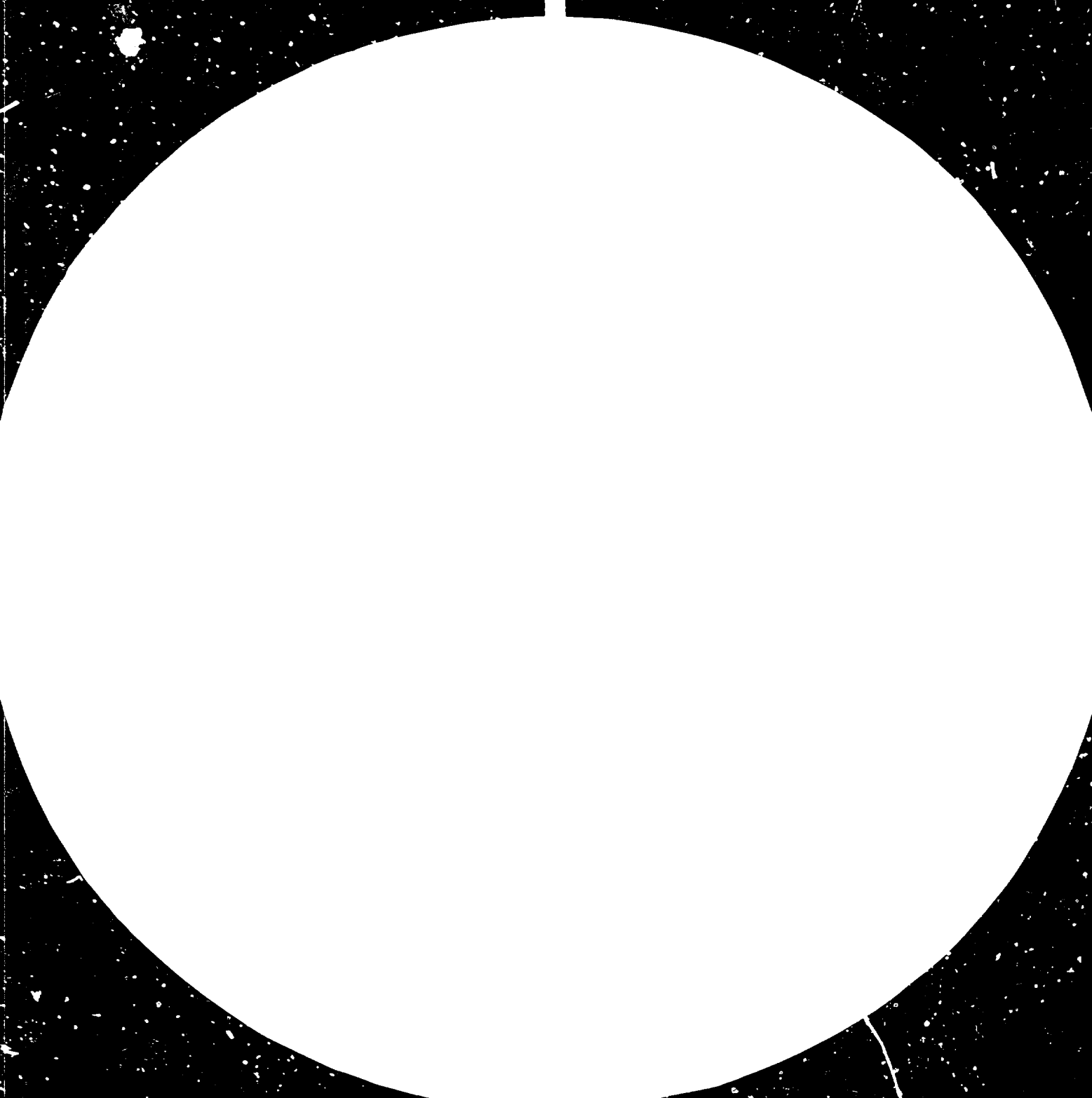
FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org





UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

MICROELECTRONICS MONITOR

12377

Issue Number 5

January 1983

Dear Reader,

The first issue of the Microelectronics Monitor in the year 1983 features a review of UNIDO's activities in the area of microelectronics going back to 1981 when a group of experts first met to discuss microelectronics and their implications for developing countries. The last event in 1982 was an expert group meeting preparatory to the International Forum on Technological Advances held in Moscow in December 1982. Microelectronics was one of the subjects discussed in depth in a working group.

The next landmark in this direction will, of course, be the International Forum on Technological Advances which UNIDO will organize in co-operation with the Government of the USSR in Tbilisi, Georgian Socialist Soviet Republic, from 10 to 15 April 1983. Representatives of developing countries and developed countries will meet, and with the assistance of high level experts look at implications of technological advances including microelectronics; genetic engineering and biotechnology; petrochemicals; renewable energy including biomass and photovoltaics; and new materials and technology.

May I take this opportunity to thank you for your continued support and interest and for contributions received from you and to wish you and your families a Happy New Year.

G.S. Gouri
Director
Division for Industrial Studies

Inside this issue:

News and events, page 2	Applications, page 42
Country reports, page 9	Robotics, page 44
New developments, page 21	Patents and standards, page 51
Market trends, page 24	Information Technology, page 52
Socio-economic implications, page 30	Recent publications, page 55
Software and training, page 35	Abbreviations and
CAD/CAM, page 40	glossary, page 58

Mention of any firms or licensed products does not imply endorsement by UNIDO.

Compiled by the Technology Programme of UNIDO

P.O. Box 300, A-1400 Vienna, Austria

NEWS AND EVENTS

International Forum on Technological Advances

The Forum will be organized by UNIDO in co-operation with the Government of the USSR and will take place in Tbilisi, USSR, 10-15 April 1983. It will review the potentials and implications of technological advances for developing countries in the context of five selected areas of technological advances including microelectronics; consider their implications in their interaction and their impact on industrial and other sectors; identify ways and means by which specific industrial and technological capabilities may be developed by developing countries; identify policy actions to be taken by governments as well as action by UNIDO; and making suggestions and recommendations for consideration by the next General Conference of UNIDO (UNIDO IV) to be held in 1984.

An expert group meeting was held preparatory to the above Forum in Moscow, from 29 November to 3 December 1982. International experts invited by UNIDO met with Soviet experts to discuss specific technological advances as well as policy considerations. Recommendations relating to the area of microelectronics included the following: regional centres should be set up in developing countries for development of microprocessor-based applications, equipment and systems; RandD centres based on similar lines could also be considered; within the framework of the United Nations a co-ordinating agency with a specific and technical secretariat with representatives of the participating countries could be set up. UNIDO was also requested to set up a task force of experts to examine the concept of a silicon foundry as an instrument for gaining access to the manufacture of chips for specialized needs; to co-operate with the International Standards Organization (ISO) to work towards standardization in this country; a meeting on setting up data banks and networking existing data banks in developing countries with the assistance of UNIDO was suggested; the Microelectronics Monitor was commended and it was recommended that UNIDO should seek to extend its scope and coverage.

UNIDO's Programme in Microelectronics seen in retrospect (1981-1982)

In June 1981 a meeting of experts was organized on the implications of technological advances in microelectronics for developing countries. The meeting emphasized the importance of actions at the national level relating to manufacture, industrial and other applications, software development and the formulation of a national microelectronics strategy. Actions at the international level were also recommended, including a continuous monitoring of the trends observed and of their impact on various sectors and the development of pilot projects and programmes dealing with applications and software. An expert group meeting for the ECLA region was held in June 1982 in Mexico, in co-operation with the Economic Commission for Latin America (ECLA), at which the socio-economic implications of microelectronic advances for Latin American countries were analysed and a Co-operative Latin American Programme of Action in the field of microelectronics was recommended.

Following the June 1981 meeting, in order to promote selective applications of microelectronics and software development in developing countries, an expert mission was organized to visit four developing countries. Apart from reviewing the national situations in the countries visited, the mission has recommended an approach to application of microelectronics including software and suggested models of microprocessor application centres and software houses.

Other activities in this field include: conduct of studies on selected aspects of country experiences; national-level workshop on microelectronics in Mexico; a pilot project for a rural development information system in the state of Karnataka in India; preparation of a paper identifying potentials and limitations of microprocessor application in Africa and suggesting a programme of action; issue of a quarterly "Microelectronics Monitor" etc.

Information technology as embraced by the term "informatics" and extending beyond data-bank systems and networks to industrial management tools and industrial processes is in a stage of dynamic growth, particularly through the use of microprocessors. UNIDO co-sponsored a conference on informatics and industrial development held in co-operation with the Irish National Board for Science and Technology and Trinity College, Dublin, in March 1981. The Conference highlighted the importance developing countries attach to information developments, which were of substantial consequences to current industrial development strategies.

This subject will be amplified at the future Intergovernmental Conference on Strategies and Policies for Information (SPIN). The Conference is being organized by the Intergovernmental Bureau for Informatics (IBI), following adoption in June 1981 of the Declaration of Mexico on Informatics, Development and Peace. UNIDO will co-operate with IBI in the preparation of this event, addressing itself to: the industrial applications of informatics; informatics as a sector of industry per se and hence of relevance to INTIE; and informatics as a feature of industrial technologies in any sector of industry; a factor which has to be taken into account in the proper selection of advanced technology.

The impact of microelectronics has also been looked at from the point of view of restructuring world industry. In this connection, two studies have been completed, viz. (i) the impact of microelectronics on the international economic setting: the case of computer-aided design (UNIDO/IS.297); and (ii) restructuring world industry in a period of crisis: an analysis of recent developments in the semiconductor industry (UNIDO/IS.285).

Several technical assistance projects are being implemented in this field such as for manufacture of integrated circuits, computer-aided design, etc.

A list of UNIDO documents prepared in relation to the above-mentioned activities can be found on page 55 under "Recent Publications".

Computer licensing discussed at UNIDO meeting in India

The Seventh Meeting of Heads of Technology Transfer Registries held in New Delhi, India, 7-10 December 1982, a.o. had before it a paper on "Licensing Computer Software"; giving an overview of current patentability of computer software in USA, the EEC, Japan; describing channels for transfer of computer software and making suggestions as to developing country approach towards licensing of computer software (ID/WG.383/3). The meeting requested UNIDO to carry out further work preparing specific guidelines concerning payments in this type of transaction, including their evaluation and questions of liability and rights of use of the software.

ESCAP sponsors regional workshop on mini- and microcomputers

As mentioned in the previous issue, a regional workshop was held in Bangkok, 8-16 November 1982 to review the role of mini- and microcomputers as tools for economic and social development. Eight developing, three developed countries and UN agencies were represented. The ESCAP secretariat gave a presentation on the proposed project in Sri Lanka entitled "Pilot project for use of microcomputers to promote better use of information in rural areas" and country representatives gave accounts of the status of mini- and microcomputers in their respective countries with particular reference to applications in Government. The workshop adopted a report which will be published by ESCAP in due course.

Symposium on Microelectronics and Communication, New Delhi

The Government of India in cooperation with the Asia Electronics Union (AEU), Japan and UNIDO will sponsor a three day symposium on electronics for productivity which will be hosted by the Electronics Commission of the Government of India in New Delhi on 15-17 March 1983. Participation will be limited to the region. Discussions will centre around such topics as microelectronics for productivity; telecommunication technology; role of computer in developing countries; CAD/CAM, NC and robot; and a special panel will deal with technology transfer. More on this will be published in the next issue.

Brazilian Workshop on Microelectronics

The Fourth Brazilian Workshop on Microelectronics will be at Universidade Estadual de Campinas, Sao Paulo from 21 February to 4 March 1983. The purpose of the workshop is to continue the exchange of scientific and technological information promoted in the previous workshops, on the most recent advances and recent trends in microelectronics. At the same time the workshop aims at creating conditions that will facilitate co-operative programmes for research and development between Brazilian and international groups. The workshop is open to participants from universities, research laboratories and industry. Two plenary sessions will be held, one on the "new trends in microelectronics". Working groups will meet to discuss and carry out laboratory work on integrated circuit processes; gate arrays; instrumentation; biomedical applications; and power devices. UNIDO will contribute to the workshop by financing two consultants who will lecture at technical sessions relating to biomedical applications of IC's as well as applications of IC's for power devices.

Speculation on the barefoot chip

As a contribution to World Communications Year 1983 and the tenth birthday of Development Forum, the United Nations monthly newspaper on economic and social affairs, an Anniversary Colloquium will be hosted by the French Government in Paris, on 23-24 February 1983. The subject of the colloquium will be communication at the village level in the Third World in the light of the current and expected technological revolution - "A speculation on the barefoot microchip".

The colloquium is planned to fall into three half-day sections: (1) on technical and economic horizons for village level communications to the year 2000; (2) a review of lessons we have learned about village level communications and how to apply them; (3) a synthesis how to take further whatever may emerge from the discussions. Members of the panel will be high-level representatives of United Nations agencies such as UNU, ITU, UNESCO, UNICEF, FAO; of developing countries such as India, Mali, Tanzania as well as commercial companies such as Sony (Japan) and Philips (Netherlands). Further information can be obtained from Mr. E. Peter B. Stone, Editor-in-chief, Development Forum, Palais des Nations, CH-1211 Geneva 10, telephone 34 60 11.

Seminar to explore microcomputer technology applications in developing countries

The Board on Science and Technology for International Development (BOSTID), Office of International Affairs of the US National Academy of Sciences/National Research Council held a one-day seminar in November 1982 on the use of microcomputers in developing countries. The seminar was attended by 14 people experienced in the applications of microcomputers in such areas as agriculture, health, energy and education.

Specifically, the seminar was held to determine whether BOSTID might play a useful role in guiding the transfer of microcomputer technologies to developing countries. Funding was provided through the National Academy of Sciences' programme initiation funds. Rapid technological advances and declining cost of electronic components have focused attention on developments in information and communication technologies. In particular, use of the desk-top or microcomputer is increasing due to its ease of use, its diverse applications, and its ability to be linked with larger communication networks.

Participants noted that US federal agencies, the donor community, the private sector, and individual consultants have been active for some time in selectively applying this technology in a number of developing countries. Microcomputers currently are used in field administration of new projects, by donor agencies for general administration, as replacement for mainframe computers in existing installations in developing countries, and by consultants in conducting project-related scientific and engineering analysis.

Discussion also focused on technical and policy issues relating to the transfer of microcomputer technology. Specific topics included problems encountered in installation such as "dirty power" and the need for air conditioning; software development needs; training and education requirements; transborder data flow; and the potential social and economic impact of this technology.

In such a rapidly changing field, participants noted, it is often difficult for donor organizations to assess the need for and impact of microcomputers on development projects. It is equally difficult for officials in developing countries to evaluate the potentials and limitations of this technology. In view of the technical barriers and policy matters mentioned above, participants agreed that a need exists for a review and definition of the problems and issues associated with the adoption of microcomputer technology by developing countries. (BOSTID Developments, November 1982.)

Gulf computer exhibition at Dubai, UAE

A four day exhibition was organized in association with the Gulf Computer Conference at the Dubai Trade Centre from 12-16 December 1982. The exhibition was organized by the Trade Centre Management Co. in association with Middle East Computing and was supported by the Ministry of Finance and Industry of the United Arab Emirates. A total attendance of 4,300 was reported and more than 60 suppliers had made use of the opportunity to establish their presence in the region.

The Gulf Computer Conference itself, organized by Middle East Computing attracted 130 delegates, the majority of them holding senior technical and administrative posts throughout the region. Speakers emphasized the need for systems meeting the requirements of the Arab user.

The ability to display Arabic language character sets on the same VDU as Roman script is a significant advance for any manufacturer. Characters are displayed and printed from right to left, but this is a minor consideration compared with the contextual changes in character shape that must be taken into account: letters of the Arabic alphabet may change their shape depending on where they appear in a word.

The fundamental problems facing an entrant to the Arab marketplace were identified. While a manufacturer would ignore the conventions of ASCII coding on an "English" system at his peril, there has been no consistency in adopting the coding standards for Arabic, agreed at Rabat in April 1982, or the earlier SASO conventions from Saudi Arabia. Incompatibility between Arabic language peripherals from different suppliers will force an undue dependence on a single source. User documentation is the second major obstacle. To be effective, material supplied at the operator level must be translated by an Arabic speaker with a comprehensive knowledge of the computer industry. Given the absence of key terms from Arabic - there is no exact equivalent of "computer" for example, the translation requires considerable expertise if it is not to introduce more ambiguity than it removes. The introduction of computers to schools in the Middle East is increasing the urgency for good documentation: while graduate computer staff could afford the time to learn technical English, it is unreasonable to expect the same degree of proficiency from school children or the domestic user.

With the launch of the Arabsat communications satellite scheduled for 1984 manufacturers should be stimulated into the arabisation of computers and telecommunications equipment. Investment in this area will prove a critical factor in a product's acceptability. Member states of the Arab League are now tendering for the installation of earth stations in their respective countries to link directly into the system. This leaves little opportunity for suppliers who have not already done so, to develop systems from scratch. Dr. Ali Mashat, director general of the Arabsat organization, outlined the progress of the project. The United Arab Emirates is the first country to have announced tenders for its own communications station. The three trading centres of Dubai, Abu Dhabi and Sharjah between them provide a lucrative market for data communications equipment, with the sole exception of modems (the UAF PTT authority exercises a strict monopoly over these units). Now that problems in the supply of American made parts for the satellite have been resolved, spacecraft construction is on schedule. The system is designed to meet the telephone, TV and data communications requirements of a region stretching from Mauritania to Somalia through to 1990. Ali Mashat identified electronic mail, data base access and data file transfers as the most likely applications for the satellite. Installations of equipment for special applications would be organized on demand in each country. Several enquiries have already been received from organizations in the Gulf region and were being processed by the local telecommunications authorities. The first such system approved for installation is a network linking a data base at the Arab League headquarters in Tunis to each of the 22 member states.

The experience of Middle East countries with western computer supplies has been far from satisfactory, if the reaction of conference delegates is a fair indication. Staffed almost exclusively by expatriate personnel, many early projects fell behind schedule or were never fully implemented when the systems team returned home. To regain their credibility, suppliers will have to prove their commitment to the region both in terms of sales support and maintenance. (Electronics Weekly, 29 December 1982 and 5 January 1983.)

Calendar of Selected Events 1983

January

16-19 January, PTC '83, Honolulu: PTC is organized by the Pacific Telecommunications Council. This year's event will focus on communication infrastructures, the "technical, human, and institutional resources that contribute to economic and social development of the Pacific hemisphere." Contact PTC, 1110 University Ave., Suite 303, Honolulu, HI 96826.

February

1-5 February, Kuwait Info 83, Kuwait: In addition to last year's equipment demonstrations, the 1983 show will expand to a broader conference and seminar programme. For further information, contact Clapp & Poliak International, P.O. Box 70007, Washington, DC 20088, (301) 657-3090.

4-6 February, Caribbean Expo 83, Paradise Island, Bahamas: This computer and electronics expo will operate under the theme "Computers, The Door to Our Progress". Contact Ormand Vee Co., 1430 Miner Rd., Des Plaines, IL 60016, (312) 397-9572.

10-11 February, Conference on the Factory of the Future, Royal Aeronautical Society, London, Tel: 01-242 4045, State of the Art Ltd.

16-17 February, Offshore Computers Conference, Piccadilly Hotel, London, Tel: 01-734 4343, Offshore Conferences and Exhibitions Ltd.

16-19 February, Data and Telecommunications Japan 83, Tokyo, Tel: 0483 38085, Carners Exposition Group.

21-22 February, Conference on Automated Manufacturing - Adopt or Decline? London, Tel: 01-621 1355, FT Conferences.

21-23 February, OAC 83, Philadelphia: Theme for the fourth annual Office Automation Conference is "Explorations in Office Automation". For information, contact AFIPS, 1815 N. Lynn St. Arlington, VA 22209, (703) 558-3624.

22-25 February, Info 83, Office Automation and Technology Conference and Exhibition, Barbican Centre, London, Tel: 01-647 1001, BED Exhibitions Ltd.

22-26 February, BIAS Microelectronica 83 - 18th International Automation, Instrumentation and Microelectronics Exhibition and Conference, Milan, Tel: 010 39 2 796 096, Exhibition Secretariat.

23-25 February, ISSCC, New York City: The 30th annual International Solid-State Circuits Conference is touted as a "global forum", covering topics that include the design, performance, fabrication, testing, and application of solid-state circuits, devices, and systems. Contact Lewis Winner, 301 Almeria, Coral Gables, FL 33134, (305) 446-8193.

23-25 February, SECURICOM 83, Cannes, France: Also known as the Worldwide Congress on Computer Security and Protection, the goal on the congress is to support the exchange of information on technological, economic, and social aspects of computer protection, data security, and privacy. Contact Peter Hazelzet, SEDEP, 8, Rue De la Michodiere, 75002 Paris, France, Tel: 073-94-66 or 742-41-00.

25-27 February, Computer Expo 83, Orlando, Florida: Featuring mini- and micro-computers, the expo will focus on the needs of end users in small business, real estate, education, and entertainment; professional and home use will also be covered. Contact Tom Blayney, P.O. Box 1185, Longwood, FL 32750, (305) 339-1731.

March

7-9 March, Seminar on Advanced Data Communications, Mount Royal Hotel, London, Tel: 01-486 0334, Carolyn Budd.

8-10 March, Automatic Testing and Test and Measurement Exhibition, Wiesbaden, Tel: 02802 5226, Network.

8-10 March, Semicon Europe 83, Zurich, Tel: 01-353 8807, SEMI.

14-17 March, CAMP 83 - Exhibition and Conference on CAD/CAM and Computer Graphics, Berlin, Tel: 010 49 30 381.

16-17 March, Laboratory 83, Edinburgh, Tel: 0799 22612, Theresa Austin.

21-25 March, Inspex 83, International Measurement and Inspection Technology Exhibition, NEC, Birmingham, Tel: 01-643 8040.

21-25 March, Networks 83 - International Network Planning Symposium, University of Sussex, Brighton, Tel: 01-240 1871, IEE.

22-23 March, Office Automation Conference and Exposition, Zurich-Regensdorf, Switzerland: The show will concentrate on OA solutions developed in the US that are applicable to the European office environment. Contact the Foreign Commercial Service, American Embassy, P.O. Box 1065, CH-3001 Bern, Switzerland, 031/437011, Telex: 32128.

28-31 March, National Design Engineering Show and ASME Conference, Chicago, Tel: 01-747 3131, Clapp and Poriak.

29 March - 1 April, Future Office, Milan, Italy: This exhibit will feature US equipment and will be held in conjunction with an OA conference. Contact Carol Ross, U.S.I.M.C., Via Gattamelata 5, Milan, Italy, Tel: 39-2-469-6451, Telex: 330208.

April

10-13 April, Comunicaciones Expo 83, Miami Beach - Exhibition devoted to Latin American communications. Tel: 0101 617 329 8090, Latcom Inc, Martha Hammerquist.

11-13 April, International Conference and Exhibition on Engineering Software, Imperial College, London. Tel: 042129 3223, Dr. R.A. Adey for conference information.

13-20 April, Hannover Fair 83, Hannover, West Germany. Last year's show had over 600,000 visitors from 118 countries; of course, "the world's largest industrial fair" expects another record-breaking crowd this year. Contact the Hannover Fair's Information Center at P.O. Box 338, Whitehouse, NJ 08888, (800) 526-5978.

18-21 April, 13th International Symposium on Industrial Robots/ROBOTS 7, Chicago: "Robotics: The Emerging Challenge" is the theme for this combination conference and expo, co-sponsored by Robotics International of the Society of Manufacturing Engineers and the Robot Institute of America. Contact Pat Van Doren, SME Technical Activities, One SME Dr., P.O. Box 930, Dearborn, MI 48128, (313) 271-1500.

18-20 April, Circuit Technology 83, Kensington Exhibition Centre, London. Tel: 0892 39664, Slaughter, Steadman & Co.

19-21 April, The All Electronics/ECIF Show, Barbican Centre, London. Tel: 0799 22612, Evan Steadman Group.

19-21 April, NE 83 - Numerical Control Exhibition and Conference, Wembley Conference Centre. Tel: 01-579 9411, Numerical Engineering Society.

25-28 April, National Material Handling Show, Chicago. This year's theme is "The Automated Factory". The show is sponsored by the Material Handling Institute, Inc. For additional information, contact the show organizers at 1326 Freeport Rd., Pittsburgh, PA 15238, (412) 782-1624.

May

2-5 May, Test and Measurement World Expo, San Jose. Tel: 0101 617 254 1445, Meg Bowen.

10-12 May, Northcon/83 High-Technology Electronics Exhibition and Convention, Portland, Oregon. Tel: 01-486 1951, ECI.

11-15 May, Computa 83, World Trade Centre, Singapore. The Third International Exhibition on Computer and Information Processing Technology. Tel: 021 705 6707, ITF.

17-20 May, Automan - Automatic Manufacturing Conference and Exhibition, NEC Birmingham. Tel: 01-747 3131, Clapp and Foliak.

21-25 May, International Electronics Technology Exhibition, Milan. Write to Intel, Via Luciano Manara 1, 20122 Milan.

24-26 May, Printed Circuits and Microelectronics Exposition, Boston. Tel: 0483 38085, Cahners Exposition Group.

June

7-10 June, International Computer Technology Exhibition, Hongkong. Tel: 021 705 6707, Industrial and Trade Fairs Ltd.

8-10 June, IFCOM - International Telecommunications Conference and Exhibition, Cologne. Tel: 01-730 4645, ITFA.

14-16 June, Comcon/83 High-Technology Electronics Exhibition and Convention, Detroit. Tel: 01-486 1951, ECI.

16-19 June, Computer Fair, Earls Court, London. Tel: 01-643 8040, IPC Exhibitions.

27 June - 1 July, Laser/Opto Elektronik Exhibition, Munich. Tel: 01-486 1951, ECI.

July

4-8 July, International Conference on Software Engineering for Telecommunications, Lund, Sweden. Tel: 01-240 1871, IEE.

6-8 July, Reliability 83, Metropole Hotel, NEC Birmingham. Tel: 01-584 9026, Institute of Quality Assurance.

September

4-10 September, Leipzig Trade Fair. Tel: 01-493 3111, Leipzig Trade Fair Agency.

6-8 September, Semiconductor International Exhibition and Conference, Bingley Hall, Birmingham. Tel: 0483 38085, Cahners Exposition Group.

13-15 September, Weigtech 83 - International Industrial and Process Weighing and Force Measurement Exhibition and Conference, Wembley Conference Centre. Tel: 01-686 5741, Specialist Exhibitions Ltd.

13-15 September, Midcon/83 High-Technology Electronics Exhibition and Convention, Rosemont, Illinois. Tel: 01-486 1951, ECI.

14-16 September, Euromicro 83, - Ninth Symposium and Exhibition on Microprocessing and Microprogramming, Madrid. Tel: 0892 44027, R.C. Marriott.

19-23 September, IFIP 83, Paris - World Computer Congress. Tel: 010 33 1 261 5242.

21-30 September, Sicob, Paris. Tel: 01-439 3964, French Trade Shows.

October

4-7 October, Design Engineering Show, NEC, Birmingham. Tel: 01-747 3131, Clapp and Poliak Ltd.

12-14 October, Drives, Motors, Controls Exhibition, Harrogate Exhibition Centre. Tel: 0799 22612, Evan Steadman Services.

12-14 October, Laboratory 83 Exhibition and Analyticon Conference, Barbican Centre, London. Tel: 01-437 0678, SIMA.

12-15 October, IE 83 - International Industrial Electronics and Electrical Technology Show, Vienna. Tel: 01-891 2606, Glabe International Group.

18-20 October, Computer Graphics Conference and Exhibition, Wembley Conference Centre. Tel: 09274 28211.

November

1-4 November, ELKOM - Professional Electronics Fair, Helsinki. Tel: 01-486 1951, ECI.

14-17 November, The Advanced Technology and Automation Exhibition, Belle Vue, Manchester. Tel: 01-739 8973, Mal Hyams.

14-18 November, Paris Components Show. Tel: 01-439 3964, French Trade Exhibitions.

15-17 November, Test 83 - Measuring and Test Instrument Exhibition and Conference, Wembley Conference Centre. Tel: 0822 4671, Trident International Exhibitions Ltd.

December

13-15 December, Automatic Testing Equipment Exhibition, Metropole Convention Centre, Brighton. Tel: 02802 5226, Network.

(Source: Datamation, December 1982; Electronics Weekly, 29 December 1982 and 5 January 1983)

The following information has been excerpted from the sources indicated.

COUNTRY REPORTS

Brazil

Brazilian banking conglomerate Investimentu Itau wants to buy wafer processing and chip assembly technology. Antonio Oliveira, general manager for design at Itaotec, a member of the Itau group: "The idea is to establish a semiconductor plant for digital integrated circuits (ics) in Brazil. We have submitted a plan to the Government as part of the government sponsored project to develop microelectronics in Brazil. We already have assembly plants of a number of multinationals here, but this will be the first Brazilian semiconductor company. I believe the market for ics in Brazil will grow". According to Oliveira the total budget for the project stands at about \$180 million but he said that spending will be relative to the type of technology purchased. (Computing, 8 July 1982.)

China

China's effort to develop its electronics industry is paying off - in dollars. According to statistics released by the Policy Research Section of the Chinese Electronics Industry Ministry, although China still lags 10 to 15 years behind those in advanced countries, the country has netted \$US 100 million last year, by exporting electronics items. Currently, about 1.3 million Chinese workers are engaged in the country's 2,800 electronics enterprises and among the items they produce are telecommunication appliances, radios, colour and black-and-white TVs, recorders, measuring equipment, computers and electronic components.

Its computer industry which came into being in 1958 has more than 70 factories now which annually produce about 400 large, medium and small computers and about 4,000 microcomputers using integrated circuits plus radar for sea and air navigation, early warning, tracking and for the control and guidance of missiles and satellites as well as for range finding and meteorological observation. The industry's annual production now exceeds seven billion electron tubes, transistor devices, integrated circuits and electronic components for domestic use. Instruments needed for production and research within the electronics industry are also for the most part, designed and made domestically. In the case of TVs and radio sets, its production last year amounted to 40,000,000 radios, 5,120,000 TV sets and 1,520,000 recorders. In the first half of this year, the production of TV sets had climbed to 2,820,000 sets, up 45 per cent over the same period last year. China, which began the production of colour TV in 1980 based on Japanese technology, currently has two production lines. (Electronics Weekly, 3 November 1982.)

EEC/OECD

A call for collaboration in high technology at a European Community rather than a national level was made by Gaston Thorn, president of the EEC, recently where he spoke at the publication of a report on the impact of British membership of the EEC over the last 10 years. "The present recession is not a temporary downturn in our economies. Let there be no mistake about it. We are in a period of fundamental transition. We cannot base our collective future - as we have in past - on the success of our heavy industries. There is a desperate need to develop new industries in the service and high technology sectors. This is best done at Community level rather than country by country."

The attitude of the EEC is that the new industries are important for the future and the problem is how best to exploit them. It has a £260 million market and should be able to emulate Japan and the US. The Esprit programme (European Strategic Programme of Research in Information) to develop an infrastructure semiconductor chip manufacture is seen as an important watershed in European collaboration towards challenging Japanese and American dominance. Asked specifically about the plans the EEC has to support the European microchip and computer industry, bearing in mind outside competition, Thorn replied, "We are falling behind not because we are not able, but because investment is needed". He then hinted at current developments: "The way ahead is through collaborative research. The approval of the Council of Ministers is needed and 10 proposals are currently on the table. We hope to get an agreement to start next week in Copenhagen at the European Council. We can't be too ambitious at the beginning, and we must first put our proposals on the table." There was no further elaboration about the nature of the ten proposals or of the nature of the agreement. An announcement is likely in the next few days. (Computer Weekly, 2 December 1982.)

The Organisation for Economic Co-operation and Development (OECD), which groups the West's 24 leading industrial countries, has called on its member governments to set their telecommunications manufacturers a series of guidelines which will emphasise commercially viable projects. In its report "Telecommunications Policies for Change", published at OECD's Paris headquarters, the organisation also warned traditional manufacturers that they will have to face stronger competition from the data-processing and other related industries. OECD said the telecom equipment business is being transformed by the soaring cost of R&D in basic systems and by the entry into the market of a new wave of equipment makers as new services and products proliferate. The report quoted the example of ITT's expenditure of over \$US 30 million in the early 1960s to develop its electro-mechanical Pentacenta switching system which had a commercial lifetime of two decades. In the late 1970s the American multinational found itself spending almost \$US 500 million to develop its 1240 switching system at a time when the lifespan of new technologies is growing shorter and shorter. Other companies are now spending \$US 600 million on similar ventures. UTEQ added: "At the same time, the number of manufacturers able to offer advanced, fully digital switching systems is growing and increasing the competition for the few major contracts that will be on offer. With computer manufacturers possibly entering the market, on the strength of their experience in private branch exchanges and small-scale switching equipment, the established manufacturers may face even stronger competition." OECD advised governments to provide the R&D support needed by their telecommunications industry but to avoid measures that distort or hinder competition.

The organisation listed these guidelines for governments in reconciling R&D policy with broader policy targets in telecommunications:

- Competition must be the rule in publicly supported projects, with at least two firms taking part in the development process.
- Projects must involve commercially viable technologies. Projects which do not meet this rule must be terminated.
- Development projects must complement or extend work being carried out in other countries. They must not duplicate foreign efforts. Joint efforts between firms in different countries should be made in order to optimise the use of scarce resources and share know-how.
- The results of publicly funded development research must be made available as widely as possible and with a minimum of strings attached.

OECD welcomed efforts by national telecommunications authorities to introduce more competition on their own home markets. It said this example paved the way for liberalising international trade in telecom products and was already showing results in sales of a wider and more sophisticated range of terminal equipment. But the organization criticised governments which give export credits to domestic manufacturers while closing their own borders to competition from abroad. OECD pointed out that this 'beggar-my-neighbour' policy fails to produce any real net return on investment. The OECD report quoted the example of the world's 16 major switching systems. Developed at a total R&D cost of \$US 6 billion, these are competing for world sales of \$US 12 billion. But under \$US 3 billion of this amount is open to international competition. The Paris-based body warned that the growth of the telecommunications equipment industry will not necessarily create an increase in its labour force because technical progress tends to substitute capital for labour and telecoms is becoming increasingly capital-intensive. (Electronics Weekly, 5 January 1982.)

France

President Mitterrand's government (which has still to finalize its IT plans after more than 18 months' deliberation) will, so it says, build on French strengths and remedy the weaknesses. The principal weapon will be money. Under the electronics plan, government and industry (including foreign firms in France like IBM) should spend £12,000 million over the next five years.

Just where the cash will be spent is not yet clear, though presumably much will finance R&D, an development of new products and sales strategies. A government spokesman pointed out that France's state programmes to develop telecommunications and nuclear energy consumed similar amounts of money during the 1970s - and largely succeeded. Jean-Claude Hirel, the head of the government's electronics division, cites the lack of spending as one reason why

the previous electronics plans went wrong. Hirel says the new strategy will be better because companies will be told much more clearly what to do. Also, the government will place great store on encouraging firms to be competitive. "It's not good having a protected market," insists Hirel. "There won't be any promises of state purchases."

One of the biggest handicaps faced by France's planners is the scepticism of private enterprise. Companies do not much care for the interventionist policies of Mitterrand's government, including its decision to nationalize all the large IT companies. For the planners' part, they know that they must come up with good results to make up for the inadequacies of the previous strategies. But so far, the government has not dared to predict when good results may come. (New Scientist, 9 December 1982.)

Who does what across the gamut of information technology in France	
Activity	Companies
General-purpose computers	Cii-Honeywell Bull
Minicomputers	Cii-Hu (to include Sems)
Small business computers	Cii-HB (including R2E); Thomson-Brandt; Goupil; Matra; Creusot-Loire*; Logabax*; Symag*
Office automation	Cii-HB (including activities of Thomson CSF and Alcatel); Matra Sagem*
Computer terminals, discs, printers etc	Rhone-Poulenc; IER*, plus most of the computer manufacturers
Public telecommunications systems, for switching etc	Alcatel; Thomson CSF; CGCT
Private telecommunications equipment	Alcatel; Jeumont Schneider*; Thomson CSF
Broadcasting	Thomson CSF
Complex systems/military equipment	Thomson; Matra; Sagem; Sa*; Dassault; Aerospatiale
Satellite technology	Thomson CSF; Aerospatiale; Matra
Optical fibres	Fibres Optiques Industrie (owned by St Gobain, Thomson, Corning); CGE
Integrated circuits	Thomson CSF; Matra
Videotape recorders	Thomson-Brandt (distributes equipment made by V.C. of Japan but may manufacture with Grundig and Philips)

The list shows the extent to which France's information technology industries are nationalized. An asterisk denotes those companies which are not under the financial control of the French government.

(New Scientist, 9 December 1982.)

Thomson-CSF is about to extend its role in France's electronic components industry by taking over Eurotechnique, the manufacturer in which National Semiconductor holds a 49 per cent stake with French conglomerate Saint Gobain exercising 51 per cent control. The Thomson takeover marks the first step in a Government plan to rationalize output of components which is at present shared by Eurotechnique, EFCIS and Matra-Harris. Thomson is already a partner with Motorola and the French Atomic Energy Authority in EFCIS. The new move, for which the blessing of the French Government has been required, is being challenged by private industry in France as a restriction on the choice available to customers in buying components.

For Thomson's takeover of National Semiconductor's share in Eurotechnique, the French taxpayer will have to pay between Fr 100 million (£8 million) and Fr 200 million (£16 million). In order to pursue production of American-designed components Thomson will also have to buy licences and pay royalties from National Semiconductor.

French Minister for Industry and Research, Jean-Pierre Chevenement, seems to have been impressed by arguments that since state-controlled Cii-Honeywell Bull is to receive the most remunerative part of the market for French computers, Thomson should be compensated with a dominating role in components. National Semiconductor made a series of tempting offers to the French authorities before being told that its partnership in Eurotechnique will soon be a matter of history. The American firm offered to make Eurotechnique's plant in Southern France the only factory responsible for research and production within National Semiconductor of EEPROMs and EPROMs. National Semiconductor offered to sell these French-made components or its worldwide marketing network as well as selling Eurotechnique's microprocessors through

its own European sales outlets. While National Semiconductor would naturally have been able to rationalise research and development tasks within its own organisation and increase turnover thanks to an enlarged catalogue of products, Thomson would have had much to gain. Thomson was offered the opportunity to sell those integrated bipolar circuits which National Semiconductor does not manufacture through the American firm's sales network. The same arrangement would have applied to Thomson's discrete semiconductors. The advantages of the Thomson takeover of Eurotechnique will be further limited by the likelihood that the new French owner is likely to abandon plans to manufacture memories. (Electronic Weekly, 24 November 1982.)

German Democratic Republic/Finland

GDR is building a fully automated picture tube factory in Finland in co-operation with Toshiba. Due to the well-known Japanese reluctance to export their robotology, the GDR authorities are now negotiating with Finnish Rosenlew Automation, which specialize in picture tube robots. The GDR tube factory is expected to become number one in the Comecon area. Finns also claim that GDR herself is strongly and systematically developing her own robot production in order to become the main supplier of them in the whole Soviet bloc. (Electronics Weekly, 20 October 1982.)

India

The Soviet Union and India have signed an agreement for co-operation in computer technology and electronics, according to the Associated Press. The signing of the agreement came after five days of talks in mid-October between the Soviet Union's Deputy Radio Industry Minister N.V. Gorshkov, and India's Deputy Electronics Minister, M.S. Sanjeevi Rao. No details are available on the agreement, but it marks a turn by the Indian Government to the U.S.S.R. for help in boosting an indigenous computer industry. India kicked IBM out of the country some four years ago after the U.S. company refused to share ownership of its Indian subsidiary with the Indian Government. The country's computer industry is fledgling, overseas say, but is the focus of increasing interest by government. India is known to be encouraging foreigners to take advantage of its great number of college graduates who can deliver programming services and is understood to be eager to develop manufacturing capabilities. (Datamation, December 1982.)

India's first electronic typewriter - Network 208 - has been manufactured by Indian Communication Network Private Ltd, New Delhi, an associate company of the state-owned Hindustan Computer Ltd. Network 208 is based on sophisticated microprocessor computer technology. The microprocessor gives the typewriter 'intelligent' and 'memory' features which enable it to remember whole documents at a time and to type them out automatically a the press of a button. A small display reads out the memory and permits editing and modification of drafts on the typewriter itself prior to final print-out. The typewriter uses a daisy-wheel printer in place of conventional typebars or golfballs, reducing the sound level by over 40 per cent. (Computer Weekly, 15/22 December 1982.)

The Electronics Corporation of Tamil Nadu (ELCOT) Madras, one of the 13 State Government Corporations licensed to manufacture digital watches each with an annual capacity of 200,000, will be the first to market a product at the end of this month. C. Ramachandran, chairman of ELCOT, said an arrangement for technology transfer with Hitachi of Japan had recently been concluded. Initially, an eight-year agreement had been entered into with the State-owned Semi-Conductor complex at Chandigarh. According to a spokesman of the Semi-Conductor complex, modules containing large-scale integrated circuits would be imported from Japan and after assembling them and other components, also to be imported, the devices would be despatched to ELCOT. ELCOT would be producing about 20,000 watches by March next year, 50,000 in 1984 with a target of 200,000 by 1985. (Computer Weekly, 15/22 December 1982.)

Indonesia

Siemens AG of West Germany and Indonesia's P.T. Diangraha Elekrika have signed a \$US 170 million package of contracts with State-owned telecommunication companies to build Indonesia's first digital telephone system. Nine other international telecommunication companies including L.M. Ericsson of Sweden and CIT of France competed for the contract.

The contracts, the first stage of Indonesia's massive programme to convert the country's dial telephone system to push-button technology, involves replacing 823,000 dial telephones now in operation throughout the archipelago with push-button telephones and making 1.3 million such telephones operative by 1988. The largest of the contracts is to build a \$US 108.3 million facility to manufacture push-button telephones. (Electronics Weekly, 10 November 1982.)

Ireland

The Irish State agency, the Institute for Industrial Research and Standards, has published the first Irish Electronics and Electrical Directory.

It lists 337 companies of which 304 are manufacturers, 31 service companies, and claims that 25,189 are now employed in the electronic/electrical industry and that while electronics employs six per cent of the country's manufacturing workforce, it produces 21 per cent of the manufactured exports. (Electronics Weekly, 17 November 1982.)

Iceland

In May 1982 the Icelandic Electronics Industry Association (IEIA) was founded by the electronics manufacturers in Iceland which are all members of the newly formed Organization of Electrical and Electronics Companies in Iceland (SREI). The IEIA was founded with the objective of analysing the status of the electronics industry in Iceland today; analysing the status of support firms; making an analysis of the potential for Icelandic electronics products; working to achieve technological transfers in areas where such transfers are considered necessary; and working on the formation of conditions which are necessary to enable an electronics industry to develop and prosper in Iceland. Financing for the organization will be provided by the founding companies; grants will be requested from Icelandic and Nordic industry funds for development purposes. A "Five Year Plan" was envisaged to have been ready by November 1982. Projects that were considered natural for the funds to sponsor included:

- Technical transfer of production technology;
- Establishment of a R and D Centre;
- Purchase of equipment that would benefit the industry as a whole such as multi-purpose microcomputer development systems; equipment for printed circuit board production; computer-aided testing equipment for completed printed circuit boards; computer system/programme for technological text processing and computer graphics; and computer system/programme for the processing of printed circuit boards.

Malaysia

Mostek Teknologi Sdn Bhd, a wholly owned subsidiary of Mostek of the United States, is to open its second off-shore semiconductor assembly plant in Malaysia this month following the approval of the firm's application to set up a second assembly plant by the Malaysian Industrial Development Authority.

The new plant is being set up in the Pengkalan Chepa Industrial Estate in Kelantan State in the north of Peninsular Malaysia. The facility is the first off-shore electronics assembly plant to be established in Kelantan and is understood to require an investment estimated at about M\$ 38 million (\$US 19 million).

The setting up of the Mostek plant is expected to create jobs for about 1,200 people. "Test" advertisements run to recruit staff for the facility have generated interest among Kelantanese working in electronic assembly factories in Singapore, Kuala Lumpur and Penang, and it is believed that some of these workers will return to their state, now local job opportunities have arisen. Mostek established its first off-shore semiconductor assembly plant in Malaysia nine years ago in Penang's Bayan Lepas free trade zone.^{1/} Production started there in July 1973 on the company's two-acre site with testing facilities being brought into a new facility over the past two years. According to Mostek's managing director Chuck Hamrick, the company is expanding its operations in Malaysia due to a need to integrate

^{1/} See also article on Malaysia: "Automation the key to the future" on page 12 in Microelectronics Monitor no. 4.

production processes more fully. By testing locally the company can supply its customers directly from Malaysia and therefore increase its competitiveness. It is understood that semiconductors produced in the new plant will be sent to Mostek's Penang facility for testing before being exported, rather than setting up costly testing facilities at both plants.

Few details have been released so far on proposed production at the Kelantan assembly plant. Reports in the Malaysian business press indicate the ICs worth about \$US 3 million are expected to be produced during the first year with the value of production rising to at least \$US 20 million by the third year of operations. Devices to be assembled include the 64K RAMs though the company has not yet disclosed a complete product list.

Mostek's decision to locate its second Malaysian off-shore facility in Kelantan has been hailed as a major breakthrough in the Malaysian government's industries dispersal programme by Minister for Trade and Industry, Tengku Ahmad Rithauddeen. The programme had sought, without success until now, to attract other electronics assembly plants to Kelantan. (Electronics Weekly, 1 December 1982.)

Mexico

Hewlett-Packard has built a computer plant in Guadalajara. H-P won approval for a wholly owned subsidiary, unusual for US computermakers in Mexico, by agreeing to supply to the Mexican market computers produced in Mexico. By 1983, the plant should employ 100 Mexicans, eventually reaching a total of 500. H-P plans to pay for imported components by exporting some of its finished product. (San Jose Mercury, 10 May 1982 and 1 November 1982.)

Pakistan

Itac, a Silicon Valley-based offshore assembly contractor, is opening a video-game assembly plant in Rawalpindi, Pakistan. Already operating in a temporary facility there, Itac plans to employ 600 people in a 25,000 sq. ft. facility and as many more in another factory to be opened within the next two years.

Though Pakistan has a plentiful supply of cheap labour and an adequate supply of skilled professionals, it has no major electronics plants other than government-run telephone factories. Itac decided to pioneer Pakistan's industrial environment after being approached by a non-profit Pakistani foundation, the Fauji Foundation, which is a partner in the operation. (Peninsula Times Tribune, 29 September 1982.)

Puerto Rico

Employment in Puerto Rico's electrical and electronics industry has continued to grow despite the recession. In October 1979, the industry employed 17,300. A year later the total reached 18,000. In 1981 employment rose to 19,200. In the two-year span, growth was spread over several segments of the industry, but the employment actually fell in SIC 367 (components, including semiconductors) and electrical industrial apparatus (SIC 362). (Puerto Rico Business Review, July-August 1982 and November 1981.)

SIC Code	1979 Employment	1981 Employment
361	5,176	6,518
362-3	1,301	870
364	2,454	3,034
365	750	1,213
366	2,386	2,879
367	3,997	3,344
369	1,269	1,337

Philippines

The Philippines, already a booming site for offshore electronics assembly, is taking steps to encourage more investment. The government has eased taxing provisions and eliminated a requirement that large firms grow grains to feed their employees. In addition, the government has announced its intention to organize a massive, industry-wide training programme.

In 1981, semiconductors outpaced coconut products and sugar to become the country's leading export for the first time. Chip exports reached \$US 632.2 million. Semiconductor companies employed about 40,000 people. The eleven US chips firms currently assembling in the Philippines are Advanced Micro Devices, American Microsystems, Delton/Sprague, Fairchild (Schlumberger), Intel, Motorola, National Semiconductor, Raytheon, Signetics (Philips), Texas Instruments, and Zilog. Signetics is presently the only foreign-owned plant with a recognized union.

Synertek (Honeywell) and Analog Devices have both announced plans for Philippines facilities as well. Raytheon recently took over Philippine-owned Carter Semiconductor (originally a British affiliate) following a month-long strike there. Raytheon had accounted for more than 90 per cent of Carter's work.

Of the eight non-captive assemblers in the Philippines, locally controlled Stanford Microsystems and Dynetics account for 75 per cent of the contract assembly capacity. Stanford, the largest contract assembler, employs 6,000 workers at its "super plant" at Pasig (metropolitan Manila).

In addition to the chip-makers, computer builder Data General produces printed circuit board and other assemblies in the Philippines and Times assembles watches. (Philippine Update; Semiconductor International, August 1982; Asian Wall Street Journal, 26 July 1982.) (The above four new items have been quoted from the Pacific Studies Centre's Global Electronic Information Newsletter; 222 B View Street, Mountain View, Ca. 94041, USA.)

South East Asia

A recent survey conducted by UNIDO and the Asian Institute of Technology has revealed that computer programmers, already in short supply in the five member Association of South East Asian Nations (ASEAN), are not being efficiently used. Nearly 70 per cent of the ASEAN companies, the survey indicates, have developed their own programmes instead of using standard package.

This in itself, according to the survey, is not a waste of resources, but when 80 per cent of the programmes are used for accounting, payroll and inventory control - for which there are many packages - the question of proper use arises. The survey places the blame partly on vendors. The survey reveals that 41 per cent of the companies surveyed complained of lack of vendor support, both in hardware and software as well as in the application of software. It also noted that except for IBM, most of the other computer manufacturers supplied their computer through agents and that they were more interested in selling hardware. Some companies have also complained that vendors themselves were not familiar with their own packages. Most of the computer owners were also not satisfied about the number of demonstrations vendors provided. The situation, they claimed, prevented them from using standard software packages. The survey also said that there were many who were not aware of what packages had to offer. Although the companies are satisfied with their present system, they found it difficult to broaden their use of the computer. The shortage of qualified computer people was another complaint.

The survey also showed that as many as 80 per cent of the firms surveyed have small (minis and micros) computers rather than mainframes and that in ASEAN, 20 per cent of the computers are installed in the manufacturing sector, a figure on par with the developed countries of the West. But while Western factories are using computers increasingly in designing and making new products (CAD and CAM), ASEAN factories showed very slow movement in this direction. (Electronics Weekly, 8 December 1982.)

Spain

Spain's electronics industry is seeking Japanese partners to assist in the creation of a national manufacturing concern to compete with the emerging European grouping of Philips, Thomson-Brandt and Grundig. Sr. Jaime Llopis, chairman of Compania de Electrónica y Comunicaciones (Cesa), said that Spanish groups were in contact with Sharp, Hitachi, Toshiba and Mitsubishi. He hoped that a blueprint for an electronics venture would be presented to the Spanish Industry Ministry by March. Three other Spanish electronic companies, Elbe, Vieta and Telerasa, are associated with Cesa in the venture.

Thomson, the French state-owned electrical concern, has signed a letter of intent with Grundig to take a 75.5 per cent stake in the West German company. Philips, the Dutch electrical group, holds the remaining 24.5 per cent in Grundig. Thomson and Philips recently agreed in principle on co-operation. The guiding principle behind the plan is to stop the European companies from acquiring control of more than the estimated 65 per cent of the Spanish market they already have. Sr. Llopis said the Spanish groups were seeking a lasting partnership with Japan to develop applied technology in the video field. A Spanish holding would offer participation in an underdeveloped market and "a springboard to Europe", Sr. Llopis said. The move underlines an aggressive stand by the electronics sector in Spain, spearheaded by Ces, a company which became the national electronics leader as a result of its association in the 1970s with the Hughes Aircraft Company to develop Spain's early-warning system. The company has since launched a wholly Spanish-manufactured personal computer, the Maste-32.

Sr. Llopis said Spanish manufacturers would press the Government to follow what he termed "the politics of Mitterrand" and the French commitment to high technology. Electronic demand in Spain is less than a third that of West Germany, he said, and the sector represented 1.5 per cent of gross national product of against 3 per cent in developed countries. The Cesa chairman also called on the Government to set down guidelines on royalties, establish a code of conduct for multinationals in Spain and overhaul anti-trust legislation. (Financial Times, 17 November 1982.)

Sweden

A Swedish Commission for Informatics Policy was formed by Cabinet Decision as a parliamentary commission in March 1980. Originally attached to the Ministry of the Budget, it now reports to the Ministry of Public Administration.

It has the responsibilities of co-ordinating policy efforts within the government on informatics issues, following the development of informatics, promoting the development of knowledge in this field and suggesting measures for guaranteeing a positive development of informatics utilization in society under democratic guidance and control.

The chairman of the Commission is Mr. Sven Moberg, Director General of the Swedish Agency for Administrative Development. The members of the Commission include six members of parliament, drawn from the five parties represented in parliament and representatives for the main employer and union confederations in the labour market as well as for central, regional and local government. There are also a number of experts attached to the Commission representing a.o. relevant government ministries and agencies.

The terms of reference of the Commission are as follows: The Commission should follow the investigations in progress and initiate other investigations and measures needed to follow the development of automatic data processing (ADP) and electronics nationally and internationally. On this basis the Commission should propose principles and guidelines for the development and use of ADP in the Community as a whole. It should also consider in what form other measures should be taken by the Government to safeguard a positive development of computer utilization in society.

The Commission should, in its considerations and suggestions, pay a great attention to the increased use of ADP, telecommunication and electronics in different fields, e.g. industry, trade, public administration, research, health services, education and communication, as well as its effects on efficiency, the economy, employment, working environment, personal privacy, secrecy, security, vulnerability, the promotion of influence, the development of competence and the promotion of equality between the sexes. The Commission should pay special attention to public functions of importance in peace as well as in times of emergency and war, for example, to functions vital to the national supply situation.

The Commission is also to survey and evaluate the effects of major ADP investments made in public administration.

The Commission should also pay great attention to questions of education, in a broad sense, in computer technology and to research into its future use and consequences, in order to increase the national readiness for action.

The effects and possibilities of development of ADP are at present being studied from a number of different angles simultaneously. Different committees are in many cases dealing with fields that impinge on or overlap one another. The work being done by one committee may

in some respects be of direct importance for that being done by others. In view of this the Commission should endeavour to ensure that co-operation between the present committees is facilitated and that their proposals can be co-ordinated. This will create the conditions necessary for a more coherent data policy.

In order to fulfil its tasks, the Commission should keep in close contact with those authorities, committees and organizations, etc. that are working on questions relevant to the Commission's assignment.

The Commission should be the body to which important ADP-questions are referred.

In view of the rapid development in the computer and electronics field, it is desirable that the Commission-work be conducted so that results and proposed measures can be submitted in the fairly near future. This could, for example, be done through interim reports or proposals for action on different questions.

The Commission should deliver a report to the Government each year by 31 August at the latest giving an account of the work done in the preceding fiscal year.

Thailand

Five foreign semiconductor companies now employ about 7,700 workers in Thailand. National Semiconductor, which opened in October 1973, has 1,500 workers on its payroll. In 1981 National produced 68 per cent of Thailand's integrated circuit output. Eighty per cent of its product - in 1980 - were finished ships. Data General, a leading manufacturer of small computers, produces chips for its own consumption. It employs 500 assembly workers in Thailand. The finished product, representing 3.7 per cent of Thailand's chips production in 1981, is shipped to Hong Kong for inspection.

Signetics, based in Silicon Valley but gradually being integrated into its parent firm, Philips, started operations in Thailand in 1980. It employs 1,600 and produces 27.8 per cent of Thailand's chips. Sixty-five per cent of its circuits were finished goods in 1980.

Synertek, the merchant semiconductor subsidiary of Honeywell, also opened a Thai facility in 1980. Presently, it employs 300 Thai workers, but it has plans to expand. In 1981, reportedly, its product only represented 0.5 per cent of Thailand's integrated circuit production. Sidtha International, which was awarded promotional privileges in 1979, plans to employ 809. It will supply circuits to an affiliate in India which will manufacture video recorders. Sidtha is 85 per cent - owned by the World Government of the Age of Enlightenment Trust (headquartered in Switzerland), 10 per cent Thai-owned, and 5 per cent - owned by Indian interests. Thai integrated circuit exports, which grew rapidly during the late 1970's, have leveled off with the current recession:

	Quantity (million units)	Value (million Baht)
1977	171.1	1,144.1
1978	254.7	2,157.9
1979	314.1	2,903.1
1980	618.8	6,156.8
1981	592.5	6,144.8

Because chips are assembled from imported materials and components, those exports exaggerate the foreign exchange earnings generated by the industry. The Thai Finance Ministry has released a study showing that 63.03 per cent of chip export earnings pay for associated imports. Of the remaining 36.97 per cent, 1.67 per cent goes for local raw materials and 35.30 per cent for local value added:

<u>Raw Materials</u>	1.67
Chemicals and Gases	0.79
Packaging	0.07
Electricity	0.81
<u>Value Added</u>	<u>35.30</u>
Depreciation	2.01
Wages	17.65
Profits	15.64

It is interesting to note that profits are counted as earnings of foreign exchange, and that they almost equal wages. (Bangkok Bank Monthly Review, June 1982.) (Quoted from SPC's Global Electronics Information Newsletter.)

United Kingdom

The Government seems prepared to put another £15 million of equity funding into Immos, Britain's publicly backed semi-conductor firm, by the end of January so long as agreement with the Immos management can be reached on a valuation of the company's shareholding. When Immos was set up, 27.5 per cent of its ordinary shares were allocated for purchase by 'key employees'. Included among these were three founders: Dick Petritz, Paul Schroeder and Iann Barron. Schroeder, since leaving the company, has relinquished his stake. Barron was reputed to have put up £15,000 for his holding. Clearly it is in the interests of the key employees to have a valuation put on their shares. It would allow them a potentially profitable "out".

The British Technology Group (BTG) confirms that it is having discussions with Immos. It is thought that the £15 million is needed to get the UK plant at Newport into production. The BTG investment becomes necessary as a result of Immos apparently having failed to attract private investment. To that end it has been seeking the services of a public relations consultancy to burnish the Immos image in the City. (Electronics Weekly, 17 November 1982.)

With £49 million committed and a further £13.5 million under consideration in the Micro-electronics Applications Project (MAP), the government has nearly spent the £55 million allocated to the scheme in 1978, and last week a £30 million, three-year extension to the scheme was announced.

The MAP scheme was one of the few ideas of the previous government which the present government has been prepared to back. Although £55 million spent in four years is a relatively small sum and 30 per cent of UK industry still chooses to go its own way without microelectronics, this is a significant improvement on the five per cent level of awareness in 1979. IT Minister Kenneth Baker noted that "traditional industries are now showing a greater awareness of where they should be moving". He said companies are now aware that "if they don't use microelectronics they won't be in business."

Announcing the extension of the MAP scheme, the Department of Industry took the opportunity to present one of the success stories of the scheme. Lawrence Lux's company, Lux Traffic Controls, makes microprocessor-based portable traffic signals. Its earlier products were more conventional, but the new microprocessor-based system has greatly increased versatility since it can be easily reprogrammed for different traffic conditions. The key question here is, of course, did the grant make it all possible? Baker was visibly delighted when Mr. Lux confirmed this and noted that the capital expenditure would have been formidable if the company had been on its own.

The DoI has begun a programme of events linked to the extension of the MAP scheme in which other institutions and interested associations are involved. The first of these was announced last week. Williams and Glyn's Bank has joined with the DoI to launch a competition for 16- to 19-year olds to find the best innovation using microelectronics. It is open to young people in full-time employment or on government training schemes and entries must be approved by employers or the training college involved. The winner receives £1,000 and there will be other prizes for winners in each of 10 regions. Applicants must identify a use for microelectronics in their place of work and produce a written report on how microelectronics could overcome a specific problem.

Other events on the programme to support MAP include the launch of a Scottish Information Centre by Inmap, an advanced technology and automation exhibition at Manchester and the launch of an East Midlands Regional MAP initiative. On the publicity side an interim report on MAP will be produced which is aimed at "financial decision makers," there will be phone-ins on local radio and a new national advertising campaign.

About £50 million has so far been committed under MAP with £12 million going on awareness and training, £6 million on consultancy and £31 million on project development. Another £13.5 million has recently been approved or is under consideration taking the total over the original £55 million allocation. So far 160,000 people have attended awareness events, 30,000 training places have been created and over 2,000 consultancies have been completed.

Baker acknowledges that "work still needs to be done on the awareness side" and this is why the DoI has gone in for a series of regional promotions till the end of the year. Underlining the change of attitude in the City, he said: "I do not really believe there is an absence of money for new technology, there has been a sea change." He pointed to the number of City institutions becoming interested in innovative companies, though he admitted: "They often have to be guided," and "they tend to pool their money to spread the risk."

The Science and Engineering Research Council (SERC) has awarded Edinburgh University £2.5 million to support work in electronic circuits. The cash will finance equipment and research that should make possible manufacture of chips in which individual components are no more than 1 micrometre apart. The comparable figure in integrated circuits manufactured today is around 3 micrometres. By the end of the 1980s, the innovations should make possible memory devices that contain 1 million components, compared with 100,000 or so today. The grant to Edinburgh University forms part of a £7.5 million scheme to support chipmaking work. Other universities benefitting are Sheffield, Surrey and Southampton. (New Scientist, 4 November 1982.)

And what may be the most advanced piece of chip-making equipment in Europe is to be delivered to Edinburgh University in February. The university's micro-fabrication facility - an offshoot of the electrical engineering department - is to get an Eaton wafer stepper at a cost of about £600,000 on a grant from the Science and Engineering Research Council. This means that Edinburgh will be able to supply chips to other British universities which are working in the same research field. The optimetrix 8010 wafer stepper, made by Eaton Semiconductor Equipment Operations in the US, will give the university the most advanced optical techniques available for integrated circuit production. Dimensions as small as one micron per circuit can be printed. "The apparatus is in the forefront of technology," said a SERC spokesman. (Computer Weekly, 16/23 December 1982.)

Two information centres were opened in Edinburgh this week to encourage closer links between Scotland's "Silicon Glen" - the central lowlands area supporting microelectronic-based industries - and other sectors of industry and commerce. They were set up at the Edinburgh headquarters of Inmap (Integrated Micro Applications), the company established by Heriot Watt and Edinburgh Universities to encourage technology transfer. The funding is from the DoI's MAP awareness scheme. The first is a microtechnology centre which provides an information service and exhibition covering all aspects of microelectronics in the production environment. The exhibition contains static exhibits and also working demonstrations of a wide range of microelectronic hardware and systems. The other centre, the Waverley micro-systems centre, is one of 15 planned for Britain, and is the first to be opened in Scotland. It provides a source of impartial advice and guidance to prospective business users of microcomputers in Edinburgh and East Scotland. (Electronics Weekly, 2 December 1982.)

The Scottish DP industry will soon have a shortage of trained Scots if the "Silicon Glen" boom continues at its present rate. A report, published by the Manpower Services Commission, concludes that the current levels of computer training are probably inadequate to meet future demand and recommends that employers and the various training bodies have a rethink about their training programmes. It also draws attention to the changing structure of the Scottish computer industry, with a diminishing need for applications programmers, but an increased demand for certain specialist skills, particularly in systems programming and design. But unemployment among Scottish computer personnel between 1979 and 98 has tripled.

The report is based on a survey of 373 out of the estimated 440 Scottish computer installations of a sufficient size to employ specialist staff, as well as a survey of 36 computer users. Its aim was to assess whether there is a shortage of computer skills in Scotland, to forecast the trend in demand to 1985, and to examine the implications of these findings for future training both by industry and the MSC. The industry is growing and should increase by 10 per cent this year. It is estimated that about 3,500 people were employed in computing (programmer upwards) in Scotland in 1981. Half of the computer installations surveyed reported serious shortages of systems programmers and one third has shortages of systems analysts, designers and analyst/programmers. (Computer Weekly, 16/23 December 1982.)

USA

A group of 13 microchip manufacturers in the US has awarded more than \$US 3 million to eight universities for research into the next generation of semiconductor technology. The group, a non-profit organisation called the Semiconductor Research Corporation, hopes that these and future awards will help boost the international competitiveness of the country's microelectronics industry.

Cornell University will receive nearly \$US 1 million for research focussing on properties of integrated circuits. This will become important when circuits become small enough to be measured in atomic spacings. The University of California at Berkeley and Carnegie-Mellon University will together receive \$US 1.75 million for research in computer-aided design of integrated circuits; the two institutions will co-ordinate efforts to develop new design tools for very large-scale integrated (VLSI) circuits.

The corporation was formed early this year by semi-conductor executives who were concerned about the US losing its lead in electronics. Britain, France and Japan have already established government research programmes. As an alternative to the government-supported initiatives of these nations, the US chipmakers decided to set up a co-operative research effort, which they would pay for, and carry out the work mainly in university research labs. While much of the sponsored research may be of direct use to member companies, the programme also has an underlying goal of improving the quality of university research. "We hope that by raising the level of university research, the grants will help universities to attract students and retain faculty in fields, supported by the research," says Larry Sumney, executive director. Before joining the corporation, Sumney headed the Department of Defense's research on very high-speed integrated circuits (VHSIC). The Semiconductor Research Corporation has a budget of \$US 6 million in 1982, but hopes to have annual budgets of \$US 11 million in 1983 and \$US 15-20 million in 1984. It plans to find three more university research centres in 1983.

Ralph Landau, a millionaire chemist/entrepreneur, has given Stanford University \$US 1 million to study the sources of technological innovations and their impact on America. The gift will provide \$US 250,000 a year for a "technological innovation programme" at Stanford's Center for Economic Policy Research. The centre plans to use the money to study how new technology affects the economy. Stanford's Paul David said: "We know remarkably little about the sources of invention, or about the appropriate goals of national technology policies." (New Scientist, 6 January 1983.)

West Indies

The Development Corporation located at Kingstown, St. Vincent and the Grenadines, West Indies (P.O. Box 841) informed UNIDO of certain fiscal and non-fiscal incentives which the Government of St. Vincent offers in an effort to attract more electronics firms to establish labour intensive assembly operations in the country. Among these incentives are: 15-year tax holiday with freedom to repatriate profits; duty-free exemption for imports of machinery, equipment, raw materials and components; availability of standard factory building for long term lease or rent on concessionary terms; abundant supply of young, literate, English speaking work force; basic labour rates of US cents 60 for men and US cents 50 for women per hour; regular air and sea links to North America and Europe; minimum of bureaucratic procedures; and excellent living environment.

Zimbabwe

Zimbabwe, like all developing countries, cannot rely on overseas computer systems but must have its own skilled people who can design and program systems for the country's special needs, say two British computer experts. The two - Ian Shearer and Roger Tagg - said recently in Harare that Zimbabwe could go further and assemble some of its own hardware from imported components. Both men are independent computer consultants and Shearer is secretary of the developing countries' specialist group of the British Computer Society. The group was set up to help study the needs of developing countries and help pass on the required information. Bibliographies have been prepared of information on four topics: banking and finance, transport, water-resources management, and agriculture and forestry. The group has also prepared a volume of case studies of successful use of computers in development schemes throughout the Third World. The BCS had taken a leading role in setting up the UK Council for Computing Development, a body that received government funds. The council believed computing could help developing countries plan their development in better way and direct, in the best way, the human and other resources of the country.

Both Shearer and Tagg said it was important for Zimbabwe and other developing countries to develop their own computing strategies, especially in the public sector. It has to be decided what computers would or should do and what sort of systems - including what mix of large and small computers - should be installed. This would be preferable to just adding systems ad hoc. It was in this area that local experts were so valuable. "It is very difficult at times," said Shearer. "Even the training offered overseas may not be the most suitable. It is something that must grow up in a society, but skills are needed now. Zimbabwe is fairly fortunate in having a lot of people who have studied outside and returned and these people can help design the training needed locally. And you also need people who can design hardware and software or can adapt what is available on the world market", he said. Zimbabwe could also, fairly soon, assemble its own hardware, especially in the micro-computer field. Companies already existed in developed countries which just bought components and software packages and made up their own systems and some developing countries could and should do the same. Both men, who attended the three-day Datacom 82 conference organized by the Computer Society of Zimbabwe, are specialists in Database, an information-pooling system. Database helped eliminate inconsistencies, gave greater flexibility of collecting and validating data at source and for making corporate data available on demand to the user.

Tagg said there were dangers of creating 1984-type societies, where all the files of information on one person could be brought together. The best way of avoiding this was to ensure that there were independent controls over various separated files and information stores and early - warning alarm systems to prevent someone assembling a complete dossier on a particular person. The chairman of Datacom, Wally Green, said 144 delegates had attended - "a very pleasing number". They came from commerce, industry, local and central government, banks, building societies, pension funds, the university and private groups. Because of the high attendance there would be a profit and the money would be used to help the society with its training programmes. (Electronics Weekly, 10 November 1982.)

NEW DEVELOPMENTS

The micro micros

The handheld computer is here. Its arrival was inevitable, the result of two long-converging trends. Ever since the first ENIAC was put into production, manufacturers have been making computers smaller, cheaper, and more powerful than their predecessors. And ever since the days when the four-function Bowmar Brain signaled the beginning of the end for the slide rule, more and more powerful capabilities have been appearing in each generation of handheld calculators. It had to happen at some point that these two marvels - the computer and the calculator - would merge.

Handheld computers are the first truly portable computers; these new machines fit in your hand, run on batteries, and offer impressive computer functionality, usually for less than \$US 1,000. Of course, these handheld computers don't offer quite the same functionality and capabilities as desktop computers or larger machines. They can support only one user at a time, their memories are quite limited, and the typical one-line display can be infuriating. And when peripherals like printers, larger screens, or off-line storage are added, these machines can quickly lose their portability.

Nonetheless, users who want to stay in the vanguard of new technology in tiny computers will have to be satisfied with the handheld variety. There are not even that many of these around; indeed, only a handful qualify as fully functional handheld computers. That is, they are approximately the size of a handheld programmable calculator, weighing under two pounds, and can be held in one hand while being operated with the other; they must contain at least a 4-bit microprocessor and be programmable in BASIC or some other high-level language; and they must be compatible with some kind of peripheral devices for hardcopy output and for off-line storage.

... There are four leading candidates for the title of handheld computer. At the top end is the Sharp PC-1230, a machine that fulfills the criteria for a handheld computer. Slightly more powerful is the Radio Shack TRS-80 PC-1 and the U.S. in 1980. (The Sharp PC-1230 is more powerful, and more expensive, than the Panasonic RL-1000 or the Quark II, a breed of computer - the nanocomputer - which can cost as much as some desktop computers.

At the low end there is the Casio FX-702p, a machine that fulfills the criteria for a handheld computer but is labeled "programmable calculator" and PC-1500, which are identical to the first handheld computer introduced in the U.S. in Japan a year earlier.) Still more powerful is the Sharp PC-1230, marketed in this country as the most powerful and versatile of this new breed of computer - the nanocomputer - is the Hewlett-Packard HP-75c, which can

There's no question that there is a market and that is poised to take off in the next few years. Because the computers have been on the market for only two years, the installed base is still low. A Yankee Group study recently tabbed the current market at some 162,000 units sold this year, or about \$US 52 million in sales.

Great expectations are held for this infant market. Studies by Future Computing in Dallas and Creative Strategies International in San Jose have predicted that close to half a million units would be sold in 1982 and over a million in 1983. Sales can be expected to reach 5 million units in 1986, with revenues of \$US 754 million, according to the CSI study. Future Computing predicted that sales would not reach 5 million until 1987, but even that represents enormous growth.... (Datamation, December 1982.)

4Mbit RAM

Nippon Electric Co (NEC) has announced the development of basic technology that would enable it to commercialize 4-M bit random access memory (RAM) chips, 400 times more integrated than the current 64K DRAM, and able to store almost 500,000 alphanumeric letters.

The super memory will have 10-12 million transistor elements integrated on a several millimetre-square chip. The NEC achievement will have a big impact on other key semiconductor makers in the world which have developed prototypes of 256K RAMs and started R&D of 1M RAMs.... The development will be revealed at the International Electron Devices meeting to be held in San Francisco.

The basic technologies developed are: (1) a thin die fusion layer formation technology using silicide film in the implantation-through-metal (ITM) process; (2) an ultra-thin silicon dioxide film formation technology, and (3) the selective epitaxial silicon single-crystal growth technology to create a 0.5 micron wide and a two-microns deep transistor element separation area. A combination of these three basic technologies has made it possible to produce a circuit line of less than 0.5 microns in width compared to 1.5-3 microns for 64K RAMs. The NEC technique has thus reached the submicron processing target. The line width of circuit patterns has been thinned down year by year, but the narrowing of the line width - namely higher integration - has given rise to many problems to be solved, such as the inability to control the flow of electric current, insufficient insulation between transistor elements and incomplete switching. NEC has solved these problems, it claims, by means of the three basic technologies. (Electronics Weekly, 1 December 1982.)

A future for CMOS

Intel expects that it will be shipping more CMOS parts than NMOS parts, both by value and by volume, in 1985. It is now taking bookings for its first two CMOS parts - the 80C49 and 80C51 microcontrollers. The 1985 projection is significant. Making the 1985 projection was Intel's microcontroller marketing manager, Joe Baranowski. "We think there's a revolution going on", said Baranowski. "Some think we're here late. Our perception is that you're never late as long as you come in with the right technology." Baranowski predicted that Intel would be bringing out its leading-edge memory products - 64K DRAMs and SRAMs - in CMOS by the middle of 1983 "at the latest." The revolution is evidenced, said Baranowski, by the shrinking cost differential between NMOS and CMOS. Next year he expects that it will cost twice as much to use CMOS as NMOS. In 1984 it will cost 40 per cent more to use CMOS. In 1985 it will cost the same.

Intel is proud of the fact that, instead of setting up its CMOS process from scratch like all other semiconductor companies, it has managed to modify its existing HMOS process. Instead of a p-well in an n-type substrate, Intel's process places an n-well in a p-type substrate. Consequently, the substrate material is the same for CMOS as for HMOS. The similarity has resulted in a minimal time for getting into production. Like HMOS 2, channel lengths for the CMOS process are 2 microns and minimum gate delays are 350 picoseconds. (Electronics Weekly, 20 October 1982.)

4Mbit bubble memory

Intel has kept its promise, made two years ago, to have a four megabit bubble memory ready by 1982. The company already has a one megabit device on the market. The non-volatile part, 7114, which measures 1.46 cm by 1.35 cm, is smaller in size than the one megabit 7110 device. It has been produced using X-ray lithography and will sell for \$US 150 for the complete chip set by 1986. The four megabit memory has double the data rate and double

the access time of the one megabit device at 200/400K bit/sec and 80msec compared with 100k bit/sec and 40msec respectively. The maximum power dissipation is reduced also, from 6uw down to 1.8 uw. The company's product marketing manager for non-volatile memories, Dave Shrightley, in an interview: "We launched our 1Mbit bubble memory three years ago, after setting up a subsidiary, Intel Magnetics, in October 1977 just to specialize in these devices. Since that time, we have never wavered in our commitment to bubble memories."

Apart from Motorola, several major semiconductor manufacturers have dropped out of the technology, including National Semiconductor, TI, and Rockwell - all pulling out last year. While floppy discs look like establishing themselves as the input/output memories for computer programs, bubble memories will take on the role of working memories in the future generation of computers. (Electronics Weekly, 10 November 1982.)

The biological computer

A five-year project in the new area of "biobionics" - the science of self-organising life phenomena - started last month in Japan. The Japanese government takes the subject seriously enough to grant it 1.8 billion yen (£3.5 million). The goal of the project is to develop motors powered by biochemistry, and even a "biochemical computer". At the core of the project is some hard-headed research work that its director, Professor Hiroshi Shimizu, has carried out at Tokyo University on the biochemical synthesis of life phenomena. Five years ago, after studying the movement of cytoplasm in plant cells and the molecular mechanism of muscle contraction, Shimizu synthesised a molecular motor. It was powered by muscle proteins and the energy carrying chemical adenosine triphosphate (better known as ATP). It consisted of a propeller coated with the muscle protein actin, which rotated when a solution of ATP and another protein myosin, spontaneously streamed past it. Shimizu sees important applications for this process - but he stresses that it is only a starting point for the project. Shimizu is most interested in pursuing an idea for reconstituting elements of the nervous system into a sensor, possibly to make a "feeling robot". This would be one step along the road to a "bio-computer".

Shimizu and government officials were vague about the details of this research, "as it has yet to be patented". But it seems to involve storing in nerve membranes the "ones" and "zeros" that constitute the information normally found in computer memories. The data would be coded as electrical signals that register either "on" or "off". Shimizu, who was trained as a physicist, is looking for a physiologist and a computer researcher to take the idea further.



"I suppose that's life! Someone invented the ultimate in micro-chips. I am the first generation micro-chip". So I am out.

MARKET TRENDS

Dim prospects for US semiconductor industry

This summer it looked as though the two-year slump in the world's semiconductor industry might be over. This autumn it looks worse than ever. The Semiconductor Industry Association of the United States has cut its forecast of chip sales by American and European companies this year to just over \$US 9 billion, a growth rate of only 6 per cent. A year ago, its guesstimate was for 17 per cent growth this year. Now, even 6 per cent will be too high. The Wall Street brokers Merrill Lynch expect sales to grow by 4 per cent, and one glum chip maker is counting on only a meagre 2 per cent rise. Bad for an industry used to growing faster than 30 per cent a year. Very bad for Intel, Advanced Micro Devices (AMD), and National Semiconductor, America's last three big independent chip makers. Severe price competition and the costly investments they need to make to remain technology leaders are hurting them more than their competitors, who are all parts of larger, wealthier companies. Their Japanese rivals are owned by big multinationals. Texas Instruments and Motorola, two big American competitors, make lots of other things besides chips. And several previously independent American chip makers now have big companies behind them. Mostek has been bought by United Technologies, Signetics by Philips and Fairchild by Schlumberger. Going it alone is tough. National Semiconductor lost \$US 10.7 million on sales of \$US 1.1 billion in the year to the end of May and is still losing money. Intel's post-tax profits for 1981 tumbled 72 per cent to \$US 27.4 million on sales of \$US 788.7 million. AMD managed only a slender 0.5 per cent pre-tax margin for much of last year on sales of \$US 282 million.

Price competition remains intense, particularly for 64k ram chips (which store about 64,000 bits of computer information apiece). These chips were selling in America for \$US 6 each in early summer. The price is now \$US 4.25 and falling. Intel has also driven down the price of its new 16-bit microprocessor chips to persuade its customers to switch from 8-bit chips.

To make matters worse, spiralling development costs are raising the ante. It costs up to \$US 100 million to rear up to produce 64k rams in large volumes. Signetics and Mostek are raising capacity, aided by the fat cheque books of their parents, but Intel and National Semiconductor are pruning back investment and running costs. National Semiconductor has also laid off part of its workforce. Intel is determined to maintain its technical leadership. Over half its current sales are products less than a year old. Intel has just announced that it is trying to make all its products using complementary metal oxide silicon (CMOS) instead of metal oxide silicon. The complementary stuff uses different impurities in the silicon to cut costs. If all goes to plan, Intel will have many CMOS products early next year. National Semiconductor is weak both in 64k rams and in 16-bit microprocessor chips. Its main strength lies in its ability as a producer of a broad product line of fairly basic chips. So it depends more than most on a strong recovery in semiconductor sales. It also sells IBM-compatible computers, including Hitachi's. The smaller rival AMD is borrowing Intel technology and looking for profitable market niches for military, telecoms and special consumer chips. (The Economist, October 1982.)

Semiconductor industry European market reviewed

After an excellent first half year, the semiconductor industry is now facing another slump. This was the despondent message at Motorola's annual market review last week. Dedy Saban, Motorola's director of marketing for Europe summed up the semiconductor industry's prospects in a few sentences: "In January there was a step function - new orders went up overnight by 40 per cent, and we were selling as much as we could ship. That continued for six months, not just for Motorola, but for everyone. But September was a disappointment and although October was a good month for us, we believe it was generally slow. We are facing a new slow down in electronics." Saban forecasted this sluggish market would continue until the second quarter of next year, at least - and he has the backing of some of the world's top financial analysts. Against this grim financial background Saban outlined the prospects and trends in the semiconductor industry. His most enlightening analysis was of which countries get most business in the world's biggest markets - the US, Japan and Europe.

Surprisingly, the figures showed Japan's share is much smaller than it is perceived. Only 6 per cent of the semiconductors sold in Europe are made in Japan, according to Motorola's figures. Saban said this is lower than we are led to expect by the media. If the amount of coverage the 'Japanese threat' gets were representative of sales the Japanese would have 90 per cent of the market. The US sells more than eight times as many semiconductors in Europe as Japan, a massive 50 per cent of the market, or a total of \$US 1.45 billion sales. These figures are admittedly from a source which could be accused of bias, but they agree with figures recently revealed by Dataquest. At Dataquest's Semiconductor Industry Conference in Monterey, Michael Placko, director of the company's European semiconductor industry service said Japanese companies supplied just 5 per cent of the European market, of \$US 159 million. The figures for Japan and the US indicate that both are more 'protectionist' than they admit. Some 92 per cent of all the semiconductors sold in the US are made there, and 90 per cent of the semiconductor sales in Japan were of Japanese origin.

Saban said the total free world growth rate for semiconductors will be 9 per cent this year and 11 per cent next. This is poor for semiconductors. Most companies in the business are used to a 25 per cent per annum growth rate. "But possibly the 20 per cent we were used to will not happen again. It was usual for three good years and one poor. Perhaps we'll now have to get used to three bad years and one poor one," said Saban.

The picture for Europe was slightly better. Motorola's figures predict a 14 per cent growth in Europe this year. This will drop to 11 per cent again next year. Of the European semiconductor giants, the UK has fared best in the recession. It has increased its market share in Europe from 17.2 per cent in 1980 to an expected 19.3 per cent this year, overtaking France. Most European countries kept their share of the market over this period, except Germany, which dropped 2 per cent. It would appear the UK took its gains directly from Germany. (See also table below.) (Electronics Times, 4 November 1982.)

COUNTRY	MILLION \$				%			
	1980	1981	1982	1983	1980	1981	1982	1983
W. GERMANY	1,246	867	885	953	32.8	31.1	30.8	31.5
UK	651	505	555	583	17.2	18.1	19.3	19.3
FRANCE	700	523	530	534	18.4	18.8	18.4	17.6
ITALY	354	252	271	275	9.3	9.0	9.4	9.1
SCANDINAVIA	320	255	242	249	8.4	9.2	8.4	8.2
BENELUX	220	150	163	182	5.8	5.4	5.7	6.0
SWITZERLAND	100	72	68	73	2.6	2.6	2.4	2.4
IBERIA	100	75	71	76	2.6	2.7	2.5	2.5
AUSTRIA	60	41	41	46	1.6	1.5	1.4	1.5
ROE ⁽¹⁾	49	45	50	57	1.3	1.6	1.7	1.9
TOTAL	3,800	2,785	2,876	3,028	100.0	100.0	100.0	100.0

WESTERN European semiconductor market by country - 1980-1983. ⁽¹⁾Excluding Eastern Europe. Source: Motorola.

PRODUCT	1977	1982	1987	CGR, %	
				77/82	82/87
SMALL SIGNAL TRANSISTORS	320	350	330	2	(3)
POWER TRANSISTORS	380	540	730	7	6
OTHER DISCRETES ⁽¹⁾	160	180	290	2	10
TOTAL DISCRETES	860	1,070	1,320	4	4
BIPOLAR DIGITAL	220	410	720	13	12
LINEAR IC'S	220	570	1,000	20	12
MOS LOGIC	80	250	680	26	22
MPU	50	220	820	35	30
MOS MEMORIES	70	360	970	39	22
TOTAL MOS	200	830	2,470	33	24
TOTAL IC'S	650	1,810	4,150	22	18
TOTAL COMPONENTS	1,300	2,880	5,510	14	14

THE IC market by product family (\$ in millions, 1982 exchange rates). ⁽¹⁾Including optoelectronics. Source: Motorola.

Intel signs technology exchange agreement

For the third time this year, Intel has confounded industry observers by selling its much coveted process technology. It has just signed a seven year technology exchange agreement with Philips, and its US semiconductor subsidiary Signetics, under which Philips/Signetics attains access to Intel's latest HCMOS process.

The Dutch electronics group thus becomes a major European second source for Intel's latest 8bit single chip microcomputers, the 80C49 and 80C51, launched two weeks ago. In return, Intel gets access to technology for two Philips developed serial buses that allow various integrated circuits in consumer products to be linked together. One is the inter ic (I²C) bus that serves as a communications link between ics and modules in consumer products. The other is a dibital data bus (D²B) which links different pieces of equipment such as TVs, VCRs and videodisc players, and is a strong contender as the European standard for interconnection of electronic equipment in the 'home of the future'. Intel will become a major second source for the 84C20 and 84C40 microcomputers, both of which will integrate the I²C bus, and are based on Intel's 80C48 architecture.

Earlier this year, General Electric and its Intersil semiconductor subsidiary gained access to the HCMOS technology for what Intel described as 'offereing processes in return for business opportunities'. And last month, IBM bought design and process technology that will allow it to make Intel's 64k dynamic ram. Although Philips/Signetics already has the resources to make high density CMOS parts, these do not have the performance that can be achieved using Intel's HCMOS. The next generation of single chip microcomputers from Philips/Signetics will be designed with the new process in mind. As Mike Hackworth, senior vice president at Signetics said: "the agreement will result in new products that permit consumer and industrial market oems to implement quickly their ideas for tomorrow's high volume electronic systems". Intel is clearly being choosy about who purchases its technology. Philips is the jewel in Europe's electronics crown; IBM is, well, IBM. Both have enormous capital equipment output and consequently massive future needs for Intel's products. Intel may be selling seedcorn, but in return it is securing its largest and most prestigious customers. (Electronics Times, 4 November 1982.)

And sells 12 per cent stake to IBM

International Business Machines (IBM), the US computer and office equipment company, is to buy a 12 per cent stake in Intel, the semiconductor manufacturer, for \$US 250 million. The agreement, which was announced jointly by the two electronics companies yesterday, follows the close customer-supplier relationship which has developed between them in recent years. IBM chose Intel's 16-bit microchip for use in its highly successful personal computer and has been working with the semiconductor manufacturer on the next generation of microchips. In September, IBM and Intel signed an unusual agreement which provides IBM with access to Intel's design and manufacturing expertise for the latest generation of computer chips. (See above news item.) The computer giant has agreed to limit any future Intel stock purchase to a maximum of a 30 per cent stake. (Financial Times, 23 December 1982.)

Philips in US CAD/CAM pact

Philips, and Scientific Calculations of Fishers, New York have announced an agreement on mechanical CAD/CAM systems. According to this agreement Scientific Calculations will further develop and market worldwide a new generation of the systems, based on certain proprietary mechanical design technology licensed from Philips. In announcing the agreement, Jeffrey M. Wales, SC's vice-president of marketing, indicated that his company expects to concentrate its efforts in three principal directions. These are the development of an integrated CAD solution to the problem of electromechanical product packaging and design, the development of a comprehensive factory-floor system to permit the interactive flow of CAD data to numerically-controlled production equipment, and the advancement of three-dimensional modelling and visualisation techniques to support the conceptual design and documentation of packaging-intensive industrial and consumer products. "We are convinced," said Wales, "that SC's technical resources in the field of computer-aided graphics, coupled with the Philips mechanical design technology, will contribute to a unique solution to the market's requirement. We look forward to the prospects this venture creates for the future." introduction of the system is planned for the first quarter of next year. (Computer Weekly, 20 October 1982.)

Electronics giants in R&D deal

Europe's two electronics giants, Dutch Philips and German Siemens, have joined forces in long-term information technology research and development. The two companies spend a combined £1.5 billion a year on R&D. Their initial outlay in backing the EEC call for a \$US 400 million strategic plan, Esprit (European Community's Strategic Programme on Research and Information Technology), is \$US 3.7 million and 50 scientists. A Philips spokesman said that closer co-operation could follow. Both companies stress that short-term product development - less than five years - is excluded from the current agreement and that the companies will remain rivals. The deal is aimed specifically at products related to the computer industry, and included semiconductors, microelectronics, computer-aided design and speech recognition.

This is the fourth in a series of joint deals that Philips has started this year. It has concluded a second source agreement with US micro maker Intel for its CMOS chip, with Intel to get consultancy advice from Philips on communications structures for its micro-computer. The Dutch giant is holding talks with German electronics firm Grundig, in which it holds a 24.5 per cent share. The French State-owned company Thomson-Brandt is trying to take over the remaining 73.5 per cent of Grundig but is opposed by Philips. And Philips is currently talking to US telecommunications giant AT&T "about a new joint venture in the field of telecommunications," a Philips spokesman said.

Siemens said that its deal with Philips would have its quickest impact on its power engineering division which is developing micros for computer-aided design and manufacture, but that its data processing division, which makes the Siemens mainframe, would not be directly affected. Philips expects the Siemens agreement to benefit future versions of its recently announced micro. (Computer Weekly, 16/23 December 1982.)

Westinghouse plans to buy robot manufacturer

Westinghouse Electric, the electrical equipment maker, plans to acquire for \$US 100 million Unimation, one of the world's leading robotics manufacturers and the largest maker of industrial robots in the US. The proposed deal represents a major strategic move by Westinghouse in its effort to become a dominant supplier of automated products and systems for the "factory of the future". The purchase which analysts say will help propel Westinghouse into a leadership position in the new automated products business, is also likely to revive the traditional rivalry between Westinghouse and General Electric, the US leader in electrical equipment.

Unimation is credited with having installed the world's first industrial robot in 1951 and says it has installed more than 7,500 Unimate robots worldwide. The company employs about 600 people in the US and about 120 at a manufacturing centre at Telford in UK. Westinghouse said yesterday it will use the same workforce at Unimations. (Technical Times, 7 December 1982.)

US telecommunication giant ruled by US court to break up

The last instalment of the longest running courtroom drama in US history, the United States of America, versus American Telephone and Telegraph occurred recently. Judge Harold Greene signed the consent decree which gave AT&T six months to draw up a plan for the breaking up of the largest company in the world.

During the next six months there will be much speculation on the fate of the company which controls 30 per cent of the telecommunications market in the US. While some information has been released there is uncertainty among Bell System employees and even more concern about the fate of Bell Labs, arguably the most famous and accomplished research institution in the world.

The big question over Bell Labs is what the new slimmed down company will want from it and what money will be available to do the more long-term, less product orientated research for which the Labs is famous. The agreement will allow AT&T to enter new markets which were closed to it under a previous antitrust suit settled in 1956. At the time the company had no idea how large the computer market would be so the discoveries of Bell Labs, some of which led the whole industry, have not been available on the open market but have been concealed inside telephone equipment made by Western Electric, which could not be sold outside the Bell system, or else licensed to other manufacturers. Under the new regime AT&T can exploit these discoveries which could mean it will enter the merchant semiconductor market or it may use its computer expertise at Western Electric to enter the office automation market.

In theory there is no restriction on what Western Electric can make in future but company spokesmen have said many times that it will stay in the telecommunications systems business and will not start making coffee cups or dog food. But as the opened up telecoms market becomes more competitive, Western Electric will probably want more of a say in the type of research carried out at Bell Labs. The local operating companies have never been under any obligation to buy equipment only from Western but until now only about 37 per cent of their equipment budgets have been spent outside Bell.

Under the settlement, the local companies will be allowed to sell equipment for customers' premises but the local Bell Phone Centres will face increasing competition from other firms which can compete freely. This will probably lead to pressure for the local companies to sell a broader range of equipment which means either Western will have to make a wider range, or more equipment will be bought from outside.

The first sign of the new AT&T came in June this year when the company announced the formation of a subsidiary, American Bell to operate in the data processing market. The company has been dubbed 'Baby Bell' and although owned by AT&T it will operate separately. The agreement with the Federal Communications Commission which allowed the formation of American Bell is separate from the Department of Justice suit and placed onerous conditions on the company to ensure it was autonomous. Research groups at Bell Labs working on American Bell's first venture, Advanced Information Systems/Net 1, were kept behind locked doors and AT&T management went to great lengths to ensure they both were, and were seen to be, at arms length from Baby Bell.

The Baby Bell situation looks a little ridiculous in the light of the Department of Justice settlement and it is thought likely that American Bell will be allowed to integrate into the mainstream of AT&T. Its first product is a system which allows computers using incompatible protocols to communicate with each other and is aimed at small companies which may want to communicate directly with suppliers or customers' computers. This will undoubtedly be the first of a long line of data processing/communications products and services based on discoveries at Bell Labs.

There is some feeling that Bell Labs will have to pay its way by working solely on projects of this sort which will directly result in saleable products quickly both to expand AT&T's business areas and to give Western Electric a technological edge when it tries to expand its business both inside the US and on the export market.

The break up of AT&T has many similarities with the breaking up of the British Telecom monopoly proposed by the present government and no doubt the results of the break up will be watched closely in the UK. In the US, most people think the break up will be beneficial in some ways both to the US public and AT&T. Competition may reduce charges to some and new business may make AT&T an even more successful company. But there is a fear that the US electronics industry, as a whole, may suffer by not having the basic research of Bell Labs which has contributed much to the establishment of Silicon Valley and the US lead in all fields of electronics.

At present the plans for the restructuring are being considered by a series of AT&T management task forces which must report back to Judge Greene within six months and must put these plans into effect by January 1984. Whatever the result the antitrust suit will make the next three years both interesting and trying for an industry more used to steady growth and a cosy controlled market. Bell Labs could undoubtedly survive on technology alone but only the market can decide whether the Bell system can survive the competition the rest of the industry has always had to work against. (Electronics Times, 14 November 1982.)

Asian telecommunications equipment market

Asia represents the fastest growing market for telecommunications equipment, according to studies by Arthur D. Little, Inc. the Cambridge, Mass., consultancy. The Asian market is projected to grow over the next five years at about 10 per cent compounded annually, followed by an 8 per cent growth each for Latin America, Africa, and North America; Europe and Oceania will grow an estimated 7 per cent. The figures, along with analysis and product market projections, were presented to the public at a recent Telecommunications Forum in Boston. In projected 1987 market shares, North America will represent 42 per cent of the market, followed by Asia with 28 per cent, Europe with 25 per cent, Latin America with

3 per cent, and Africa with 1 per cent. The North American telecommunications market in 1982 will be \$US 20 billion, growing to \$US 29 billion in 1987. The key trend in the world communications market, the company said, is a changing competitive situation, reflected most dramatically in the US market, where AT&T's deregulation is having tremendous effect. Among the Asian countries spending the most on telecommunications in the next five years will be Japan, India, Thailand, and Malaysia, the latter expected to spend some \$US 4.5 billion during that period. Despite the advance in technology seen in the US, however, telephone equipment will remain the bread-and-butter telecom business for most of the world throughout this decade. (Datamation, December 1982.)

Britain's chip firms aim for the specialists

The do-it-yourself approach to designing chips - this is at the heart of the strategy by Britain's biggest information-technology firm to make an impact in semiconductor production. Marconi Electronic Devices Ltd (MEDL), a subsidiary of GEC, plans to provide customers with computer terminals with which they can work out how their semiconductors will look. The information will then be sent to MEDL's plant in Lincoln where the chips are made. GEC ranks 18th in the world league table of information-technology firms, according to a report last year by PA International, a firm of consultants. Sales (in 1979) of IT products accounted for about one-third of the annual turnover of £3,500 million. According to the table, 10 of the world's top IT firms in terms of sales are American; the most highly placed British companies after GEC are ICL, Plessey and Thorn EMI, ranked 33rd, 35th and 37th respectively.

In chip production, British companies have concentrated on custom-built components, which are sold in far lower numbers than the high-volume "standard" semiconductors in which American and Japanese firms specialise. Ferranti has built up a reputation in custom chips called universal logic arrays. Each chip contains a basic layout of circuits with room for others that are added later on, when the customer has decided on the exact application for the component.

In its approach to custom chips, GEC has followed a different line. The company is using a technology for making chips developed by a Canadian firm, Mitel. This is what is called the Cellmos process, a way of packing a lot of electronic functions into a small space. MEDL's chips are "hand-crafted": each is tailor-made to suit a specific application. MEDL started up two years ago, and is turning out about 20,000 chips per week. About 80 per cent of the production goes to other companies within the GEC group. Half the chips are used in military equipment, for example for communications; 45 per cent end up inside hardware for office terminals and telephone switching; this leaves 5 per cent that form part of general industrial equipment, for instance robots and instruments.

The pattern will change over the next few years, according to Hamish McLaren, a MEDL marketing manager. He wants to set up deals with other companies outside GEC. The firms would design their chips on their own premises with computerised techniques. Firms in this category would call up over the telecommunications network data held in a GEC computer in London; these data would detail for instance, designs of components that have already been produced. When satisfied, the designer would send a stream of data to Lincoln asking the plant to make a set number of the chips of a particular specification.

McLaren says he wants to reach agreements with five such companies over the next year. They would be expected to spend at least £500,000 per year on MEDL's chips. One firm with which MEDL is already working is Plessey. The two companies are collaborating on ways of putting Mitel's technology into production.

Setting up a semiconductor company does not come cheap: GEC has invested £17 million in MEDL and plans to spend another £20 million over the next couple of years. It will invest roughly equal sums in new computerised design equipment, basic R&D and hardware for chip production. (New Scientist, 9 December 1982.)

SOCIO-ECONOMIC IMPLICATIONS

Lack of common goal threatens European industry

Unless European countries begin to collaborate more in strategic areas of high technology they could lose their place in world markets and some of their independence as well, according to a strongly pro-European report published this week by FAST, the European Commission's long-range planning group for research and development.^{2/} The report says that if Europe "fails to master the new technologies of automation, information and communication the survival of the economy and industry of Europe, as independent entities in a free-market world economy will be in danger". This would, in turn, bring a corresponding threat to the social, cultural and political independence of European societies.

FAST (Forecasting and Assessment in the Field of Science and Technology) was set up in 1978 by EEC's Council of Ministers to set long term priorities in the community's research funding. Preparing the report involved 36 projects in 54 European research centres. Five years on, FAST sees the role of EEC-funded research as building European industry around the two axes of the agro-chemicals industry (which may provide new sources of energy) and new space and electronics technology. FAST also says the EEC should help the Third World "by placing European science and technology at the service of the Third World", while at the same time guarding against competition. The community spends only 2 per cent of the already small amount (about 1 per cent of gross national product) spent by member countries on their own research. Allocating these meagre resources, the report says, should be guided by the overall goals of building a European society built on biotechnology and informatics, and creating new jobs. The report points out that fundamental changes in the types of employment available will involve at least 50 per cent of the population living within the community (women and older employees will be especially affected) and there are likely to be over 15 million people out of work within the EEC by 1985). Automation and new information and communications technologies are only partly responsible for this, FAST says, and the systematic application of new developments could partly fill the gap with between four and five million new jobs by the end of the decade. But without a common strategy, "only a fraction" of the new jobs will be obtained, the rest being won by their overseas competitors, particularly the US and Japan. (New Scientist, 4 November 1982.)

Will new techniques pose threat to jobs?

A little under 20 years ago design processes had not been touched by automation. The lengthy, detailed work of the draughtsman/designer was one of the last applications for computer technology. Traditionally time-consuming, the problems of producing fast accurate designs and, more important, amended designs, seemed to be the one area where computers were simply not applicable. Today CAD/CAM is being used in most of the major industries. This is not merely a product of the "because its there" mentality that finds applications where none is necessary. In purely economic terms, the use of CAD/CAM has been taken up by those companies which realise that their survival depends on being able to produce accurate, detailed designs - fast.

Two questions arise: What does this mean in terms of the current (and future) employment problem? And what are the benefits? Taking the latter first, without doubt there are certain high technology applications to which CAD/CAM is now indispensable - in the electronics and aerospace industries for instance. The accuracy, reliability and (yet again) speed of CAD/CAM is the only means to meet design and manufacturing requirements. The time-saving of CAD/CAM cannot be dismissed. In the time it once took to produce one design, several can now be made. Complex design/manufacture procedures can all be stored centrally on a CAD/CAM database to provide easy access to information for management. In all, the savings are huge, the products better and more reliable and the stored information easy to update and amend.

The first question, on employment, is probably more applicable to the CAM side of the double act, or more specifically, it will be when the separate discipline of robotics becomes fully integrated into CAD/CAM. There is little doubt that at this stage CAD/CAM (or Computer Integrated Manufacture, as it will most likely be know) will lead to job losses in the manufacturing industries. The Japanese have already embraced the robotics side wholeheartedly, and plans to develop "seeing" and "sensitive" robots are well underway. If

^{2/} The FAST programme, volume 1, results and recommendations, pp. 278, volume 2, research projects, Commission of the European Communities, September 1982.

we are concerned to protect British jobs, we must ask if it is really necessary to join the race. The Japanese, unlike many UK manufacturers, are not particularly concerned with whether robots are a "good thing", but are concerned only with speeding up the whole process of producing a totally robot-integrated manufacturing industry.

This poses one large problem. If the UK trades unions oppose the introduction of robotics on the grounds that it will exacerbate the unemployment problem, how can we expect to compete with the proven greater productivity of countries such as Japan which use robotics? That production is better and faster is rarely questioned. Even in the UK robots are used to do the repetitive manufacturing tasks such as spot and arc welding and (to humans, potentially dangerous) paint spraying. The more sophisticated these robots become the greater their capacity for taking over more of the "line" manufacturing processes. To compete on the international market the UK must therefore give serious consideration to the extensive use of robots in manufacturing. A country that is uncompetitive has little chance of survival, and even less of prosperity.

A recent report sponsored by the Engineering Industry Training Board (EITB) and produced by Sussex University's Science Policy Research Unit (Spru) discovered that eight out of 34 engineering companies investigated had found industrial relations to be one of the main problems associated with the implementation of CAD systems. Spru concluded: "Most users visited were in little doubt that in the long term CAD would reduce their employment of draughtsmen." This is a view realistically echoed by Ed Hoskins, chairman of CAD supplier Applied Research Limited of Cambridge (Arc). "In our experience," he said, "a new CAD system gives the user the ability to take on more work with his existing staff, and to level out the peaks rather than to rush into redundancies. "What is possible," he said, getting down to the nitty gritty, "is that designers who have been made redundant for other reasons, such as company liquidations, will find it perhaps more difficult to obtain re-employment in a computerised company. It may also have some effect upon the use of outside contract draughtsmen." In short, the implementation of CAD/CAM will undoubtedly have an increasing effect on employment levels in the manufacturing industries. In the short term, this is likely to be limited to white-collar employees, but in the long term, as the CAM side of CAD/CAM integrates with robotics, this will also include large numbers of blue-collar employees. No matter how difficult to make, the actual choice is very simple. Do we accept a healthy manufacturing industry with even fewer jobs than at present - or do we choose to cling to existing job levels and let industry die altogether? (Computer Weekly, 9 December 1982.)

Workers worried over robot threat

Fears are mounting among Japanese car workers that the increasing use of robots on the assembly line is a threat to job security. At Datsun's Tochigi factory north of Tokyo, workers who were at first pleased to be liberated from the tedious or dangerous jobs, are now worrying that clever machines could oust them from other areas of employment.

What action the workers might take about the march of the robot is not clear, but it would certainly be confirmed by the firm involved - there are no craft unions or inter-firm unions in Japan, and each firm has within it one union which covers the interests of employees of all craft levels.

Tochigi, which makes the Cherry model, including those exported to Britain, has 200 robots. As their number has increased over the 10 years of the plant's existence, productivity has increased from five to 10 units per employee per month. Jobs over the same period had increased from 6,000 to 8,300, but no more jobs are now being created. "When we consult the worker about more robots, they are increasingly cautious," said general production manager Kohsei Minami. "In the future when we want to automate we shall have to talk closely to the workers in order to allay their fears over job security." So far at Tochigi, which makes about 36,000 cars a year, no-one has lost his job because of a machine. As in all Japanese factories suggestions by workers figure largely - last year Tochigi employees made 99,000 suggestions and four out of five were adopted. (Computer Weekly, 15/22 December 1983.)

Battling it out on the factory floor
(excerpted from an article by Barry Wilkinson 3/)

At the heart of attempts by firms in Britain to introduce modern technology is a battle for control of the shopfloor between management and factory worker. As a result, the precise direction of innovation by the companies that introduce new technology often has little to do with improved efficiency or better production, but depends on the different political interests of the managers and workers involved.

Microelectronic applications to production machinery usually come in the form of control devices; so, on the factory floor at least, new technology is essentially bound up with control over the pace of production and the quality of output. By setting or programming these devices, a worker can predetermine the movement of machinery. This eliminates the need for an operator at the machine itself to intervene continually in the production process. As a result a company may have a golden opportunity to remove its operators from their central role in controlling production.

Most people's view of how technology alters the workplace barely takes into account this shift in the emphasis of who controls production. In the conventional view of technological change in factories, computer-controlled machinery inevitably sweeps through industry because of the enormous competitive advantages. Firms that fail to take advantage go bust. And the people on the receiving end of technological advance, so the wisdom goes, simply have to adjust to the consequences. You can't stand in the way of progress!

If this picture held true, then one would expect it to be confirmed in the real world of industry. In particular, one would expect to find two things. First the motivations of managers in introducing new technology would be simply economic - to increase efficiency, productivity, and so on. Secondly, the social consequences of the technology would be inevitable, following directly from the logic of the change. More skills might be needed here, fewer there; some jobs might become redundant, but on the other hand others would probably be created.

In my case studies this picture almost invariably did not hold true. Motivations other than economic ones were often predominant... (For full article see New Scientist, 9 December 1982.)

Office systems: 'Human interface' is a major factor

As technological advances continue towards the end of the century, the 'human interface' will be a major consideration in the quest for increased productivity. 'Everything should start from the user requirements. Particularly important is user participation. The goal should be to reduce frustration in carrying out office tasks, to provide user-friendly systems, which speed up communications processes, and generally to improve the quality of working life as well as office productivity and human effectiveness. The 'integrated work station' will form a major component of the future integrated office.'

Finally, integrated offices may well result in a significant change in the working patterns of society. Tom Stewart, a consultant at Butler Cox and Partners, explains: 'It is no longer necessary to bring all the employees into a central location to share the bulky, complex and expensive computer equipment. Increasingly each individual can have a terminal. 'Computers are becoming small enough to be carried around. 'What this trend does permit is greater decentralisation of work. Geographical dispersion makes sense for many organizations and the benefits of reduced office costs are encouraging the move away from city centres.' (Computing, 8 July 1982.)

Effect of automation on labour force

... Robotics, widely considered the quintessence of the futuristic, actually is something new only in the technological sense. Economically, it is no more than the most recent phase of a continuing process that dates back to the very beginning of the industrial revolution: the substitution of machine labor for human labor in performance of specific,

3/ Dr. Barry Wilkinson is in the Department of Adult Education at the University of Nottingham and the author of The Shopfloor Politics of New Technology, to be published by Heinemann in February.

discrete tasks. Whether the machine is controlled mechanically, electromechanically, or electronically is economically irrelevant. For all its microcircuitry, a robot is first cousin to the sewing machine and the farm combine.

Robotization obviously will eliminate some jobs, causing what labor economists call "temporary dislocations" in the labor force. Such dislocations can be extremely damaging to workers and businesses alike, but there are also ways of keeping the damage within acceptable limits. By way of evidence, there is the recent history of the printing trade.

When highly automated printing and typesetting machinery first appeared on the scene, unions and management almost reflexively locked horns. The upshot was a rash of bitter, often long-drawn-out strikes, which helped to kill off a significant number of major newspapers. Eventually, the unions recognized that featherbedding was not the answer to their problem, and management discovered the advantages of work force reduction by attrition and by attractive severance pay and pension offers. In the end, automated machinery was accepted as a fact of life by everyone in the printing industry. Against the demise of those metropolitan newspapers can be set the appearance of a considerably larger number of successful suburban and neighborhood papers, most of which owe their existence in large part to the favorable economics of printing automation.

The effects of automation on white collar work outside the office are comparably straightforward and predictable. The classic instance probably is the supermarket scanner, which makes it unnecessary to put a price label on every item on the shelves and eliminates much of the human labor involved in inventory control, checkout, and the like. This kind of automation, too, is putting some people out of work - but not in the supermarket chains making the most extensive use of scanning, according to a recent study by the federal Department of Labor. On the contrary, these chains have been growing and are employing more clerical workers than ever before. As they have expanded, though, they have forced some smaller supermarkets and grocery stores out of business. This is where jobs are being lost.

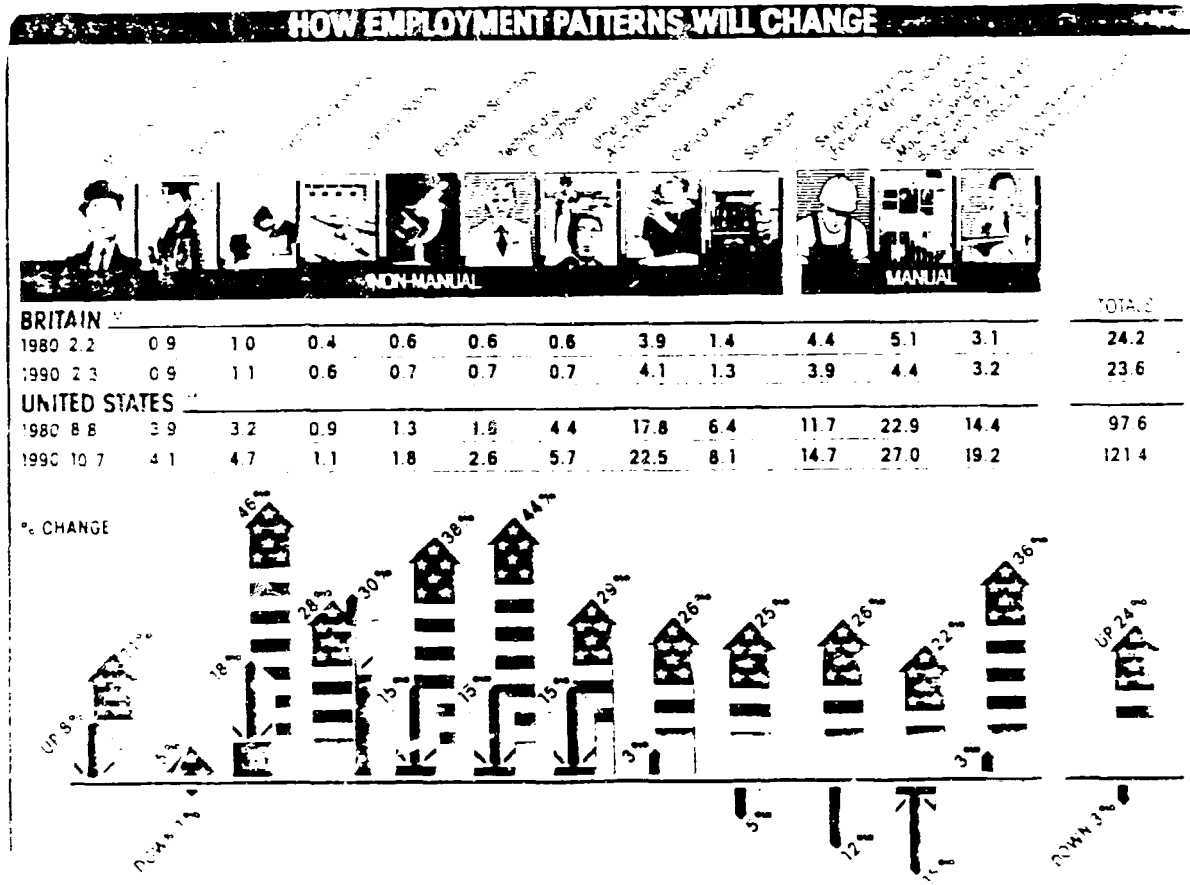
If these effects of automation can be predicted, why are the implications of office automation so much harder to sort out? For one thing, because the numbers are so much larger. According to the latest estimates something like 10 million office employees in the United States already work with video terminals, and this number is bound to keep rising sharply, considering the 40% growth rate that the office automation industry is expected to sustain into the mid-'80s. This is automation on a scale that neither robotics nor retail-level devices like the supermarket scanner will soon, if ever, attain.

Another, more basic cause of uncertainty is that no one yet knows what the chief justification for office automation will turn out to be: cutting costs or promoting growth. These two objectives are not mutually exclusive, but even so, they are profoundly different in their implications. Not the least of the differences is that cost-cutting tends to be a short-term objective, while expansion in the nature of things must be a longer-term goal....

... Most of the people who are apprehensive about the effects of office automation acknowledge that, in principle, it can make white collar work more productive as well as more satisfying. In their view, economic pressures and traditional management attitudes will combine to make cost-cutting rather than growth promotion the decisive motivating force in the application of office automation. As a result, the traditional office pyramid will be pinched in at the waist: the jobs primarily slated for elimination are clerical supervisors and other skilled clerical workers.

In geometric terms, the outcome predicted by the pessimistic scenario is a discontinuous figure: a shortened and narrowed pyramid atop a broader base of routine drudgery more soul-destroying than ever before. At the higher skill levels, automation indeed will make office work more satisfying, but at the bottom "the office of the future means little more than a re-creation of the factory of the past." Low-level clerical work will be more rigidly and extensively compartmentalized, compelling each worker to repeat the same sequence of routine chores all day long. As control and monitoring functions are automated, workers will become veritable extensions of the machinery, which will dictate the pace at which they must perform. The continuous and varied human contact characteristic of conventional office work will become a thing of the past, and so will the chance of advancement to supervisory positions and higher skill levels.

The prospects for significant action on behalf of clerical employees either through legislation or by unions are the harder to assess because of yet another imponderable aspect of office automation: what follows from the fact that four out of every five clerical workers in the country are female? Does that make it more or less likely that office routines will become jobs for low-caste workers permanently set apart from the rest of the white collar labor force? (Excerpted from an article by E. Kirchner in Datamation, September 1982.)



(US Bureau of Labour Statistics)
 (New Scientist, 9 December 1983)

Changing role of database manager

Les King continues his series on changing job functions and titles. (see also p.27 of Issue 4)

The concept of the database has been with us for a dozen years or so. In the late Sixties, when integrated management information systems were all the rage, the idea of holding all corporate information on one file, rather than dozens, began to emerge. At this time, database was not conceived as "clever" file access software and the main object of the single file concept was to eliminate redundancy of data by cutting out the maintenance of the same information on several files. Additionally, the existence of a central pool of information improved its accessibility giving rise to the definition of database as "an organised collection of data with minimum redundancy and maximum availability". However, to make effective use of such a good idea, more sophisticated access software was required and this began to appear in the early Seventies firstly as bodged up versions of report generators or bill of materials processors and subsequently as true database management systems such as Relial and IMS. Another major development was the data dictionary which maintains a record of all data items with standard field names, contents and location.

To take full advantage of these extremely powerful technical innovations, new database jobs began to appear, principally the position of database administrator and database designer. Generally, the database administrator is a kind of technical systems analyst who has the ability to consider data in abstract terms, quite independently of the applications which will make use of the data. The main part of the job is data analysis, exploring the relationships between sets of data with a view to maintaining this data on the computer in a form which anticipates the likely demand for the information. In theory, this data analysis should lead to the creation of the database before the actual applications are designed. In practice, however individual databases serving broadly related applications areas have been favoured over "total" corporate databases.

I spoke to an old colleague who has worked in this area for over 10 years. He felt that in the future the main justification for the existence of the data processing department will be its database of corporate information. He also sees the database administrator evolving into an information manager or data manager with responsibility for the management of all information, including that held manually, within an organisation. Such a person would know what data is available and how it is organised giving him the ability to respond directly to ad-hoc user requests without the intervention of time-consuming intermediaries. (Computer Weekly, 18 November 1982.)

SOFTWARE AND TRAINING

EEC debating INSIS

European software houses are holding their breath while the future of the EEC Insis (Inter-Institutional Information System) project is debated in Copenhagen by the Council of Ministers and the Commission. Insis was initiated over two years ago to build a private communications network to link the institutions of the EEC and relevant organisations in member countries. Decisions arising from the initial stages of the project need to be adopted formally by the European Council of Ministers. Insis is still at the stage of architectural definition and planning, but is moving into the pilot development phase. However, the next round of the work programme needs to be approved and adopted by the Commission. There is no formal budget for next year and this is expected to be decided. (Computer Weekly, 9 December 1982.)

And approves computerized automatic translation system

The five-year Common Market sponsored research programme aimed at developing a computerised automatic translation system has now been formally adopted by the 10 EEC member states.

This was announced in a statement published by the Council of Ministers and setting out the objectives and timetable for the programme. "The multilingual nature of the European Community is of high cultural value, but is also in practice an obstacle to closer ties between the peoples of the Community, to communications and to the development of the internal and external trade of the Common Market," says the statement. "The development of computational linguistics is likely to help overcome this barrier."

The programme will cost around £9m but it is hoped that if the results are used industrially or commercially, leading to the award of licences, the EEC authorities may be able to recoup some of their investment. On completion, "an operational system prototype" should be available in a limited field and for limited categories of text. This would provide the basis for development on an industrial scale once the current programme is completed. A two-year phase of basic and applied linguistic research costing £4.8m will follow leading to the development of the linguistic models. Finally the results will be evaluated and the linguistic models extended until the lexical basis contain about 20,000 entries in all the languages. This will then leave the way clear for the development of an operational system on an industrial scale and to the stage of commercial exploitation. (Electronics Weekly, 8 December 1982.)

Singapore software technology centre

The Singapore government is building a S\$16m (about £3.6m) Software Technology Centre in the island's republic's Science Park. The Centre will house the National Computer Board (NCB), the fully government-owned Singapore Computer Systems Pte. Ltd. (SCS), Systems Education Centre Pte. Ltd. (SEC) and other selected computer software firms.

The Software Technology Centre will consist of two buildings with a total floor space of about 20,000 square metres, to accommodate 1,500 to 1,800 computer personnel. At present the NCB, SCS, and SEC have 400 computer professionals, with the number being expected to double to around 800 personnel by 1984. The design and construction of the first building, to be owned by the NCB, is expected to be completed by the middle of 1984. Construction of the second building is expected to be completed by the end of the same year. The Science Park Admission Committee, in consultation with the NCB and EDB, will select the companies to be admitted to the Software Technology Centre. Organisations at the Centre will emphasise research and development as well as export-oriented software development. According to the Singapore Economic Development Board, the establishment of the Software Technology Centre is in line with the government's policy to promote research and development, computer services and software development as part of the ongoing re-structuring of Singapore's economic and industrial base. The Science Park is located next door to the National University of Singapore and it is expected that the close proximity of the two institutions will encourage contact between computer professionals employed by the Science Park's tenants and staff from the University's Institute of Systems Science and the Computer Centre. (Electronics Weekly, 20 October 1982.)

Stanford adopts new system for marketing software

Stanford University is breaking new ground in marketing homegrown computer software. And it believes that its methods - enshrined in a new set of rules for providing access to research - could be applied to other potentially valuable areas of research such as plasmids, the design of silicon chips and E Coli engineered vectors.

The university has spent the past two years testing a three-tier system for distributing computer programs to industry and other universities.

- In tier one the recipients are university laboratories, non-profit research institutes and government agencies. They pay a fee to cover costs. The move is necessary because mere publication in a journal was often no longer an effective way for an advancing science.

- In tier two software is offered to industry for use in research and development. A flat-rate royalty fee is charged. IBM has already bought into this system.

- In tier three an outside firm takes over and is granted a licence to develop the software and then to sub-licence it to others. Again a royalty is paid.

Stanford insists that its primary concern with the new arrangement is to improve the flow of information for research. But it acknowledges that there is money to be made. During the two-year trial period the university has earned more than \$1.3 million in cash, lab equipment and discounts. Niels Reimers, Stanford's director of technology licensing, believes that the scale of the Stanford marketing programme for computer software is unique. (New Scientist, 4 November 1982.)

INMOS to market new language

INMOS, UK state-supported semiconductor firm, is marketing an evaluation kit for its new programming language, which is to be called Occam. The State-backed chip manufacturer announced its intention to go into software in September. Now plans for the new language have been revealed. Occam has been written by Tony Hoare, director of research at Oxford University, and David May of Inmos. The main principle is to use concurrent operations instead of sequential ones. It is named after the 14th century philosopher William of Occam whose rule "keep it simple" became known as Occam's Razor. Inmos argues that this concept will be vital for the complex multiprocessor systems of the fifth generation.

The language is designed to speed up the writing of systems software. A £100 evaluation kit, including language and compiler manuals, installation instructions and example programs, will be available in January.

"Our main target area has been the universities, but of course we are hoping that it will become established in industry too," says INMOS. Already there has been interest in the project from Japan, where there is heavy investment in fifth generation technology. (Computer Weekly, 9 December 1982.)

Old languages lie dying as the new are lauded

There is now little doubt that conventional programming languages like Fortran and Cobol are terminally ill, but after ruling the computer industry for 20 years they have developed great resilience, and look likely to splutter on into the 1990s, particularly in large commercial IBM installations. Meanwhile the next generation of languages has just been born into the world after being nurtured in the womb of the academic community. The embryo of this next generation is the belief that languages should return to the mathematical principles that underlie them. Expressions like $X = X + 1$ which simply add one to the current value of X are the main meal of conventional languages. This is clearly a pollution of mathematics since expressions on both sides of the equal sign are supposed to be equal at one point in time and not at slightly different times. Therefore some languages like Basic use $X = X + 1$ for the same operation. But the effect is the same. Fortran, Cobol, Basic and other old generation languages are called procedural, because they require every miniscule detail of a problem to be spelled out. The compiler merely converts directly into lower level machine code for execution. Most big companies now recognise that procedural languages will eventually die.

The new generation has really split into two. The program generators for straight well-defined commercial applications like payroll are gradually ousting Cobol from its throne. But for scientific, engineering and the new artificial intelligence applications, there is still need for a more direct dialogue with the computer. Two kinds of language are vying for attention: functional languages, such as Lisp, widely used for artificial intelligence in the US, and so-called logic languages like Prolog, which is the language favoured by the Japanese for the fifth generation project.

Academics have argued bitterly among themselves about the merits of the two language classes, which makes one suspect they are really very similar. But there definitely are differences. Clarity, for one. A Prolog program is far easier to read than a Lisp program. Yet the odd thing is that Lisp supporters boast how easy to read their programs are, which is another danger sign. Whenever anyone says their language is easy to read, what they really mean is that it is easy for them to read after a year of experience. Lisp was by far the earliest of the new languages, being conceived in 1960 by John McCarthy, a computer scientist at the Massachusetts Institute of Technology. The idea was to dispense with the idea of assigning a value to a symbol such as X and manipulating that value in mathematical expressions. In Lisp, the computer has to be told what each piece of data is for before it is entered. If calculating the area of a rectangle, for example, the computer must be told that the length and breadth, which are multiplied to give the area, are single dimensional, and that the area is two dimensional. The ability to manipulate lists of information make Lisp number one among artificial intelligence designers. But for 17 years Lisp was strictly confined to the backwaters of academia. Then in 1977 it received the perfect pick-up.

The idea of functional programming which lay behind it was endorsed by a computer scientist called John Backus, acknowledged as the father of Fortran. If programmers were to write manageable programs in the future, he said, the ideas suggested by the grammarians of computer science, like himself, had to be taken further. Fortran and even the newer Pascal, could not be adapted to fit new standards, he said. At a stroke, functional languages had been christened and canonised.

Hot on Lisp's heels are the logic languages, epitomised by Prolog. Logic languages are sometimes called algebraic because they are based on algebra rather than functions. Everything is related to something else that has already been defined. A typical Prolog statement is: "X is the husband of Y if X is married to Y and X is a man". It is plain to see that Prolog is readable to outsiders, and for this reason it has been used for teaching children by Imperial College, where a lot of pioneering work in the language has been done.

Both Prolog and Lisp are difficult to use in their pure form, because of their lack of input/output and file manipulating facilities. For this reason, both have been corrupted in practice, with a version of Prolog known colloquially as dirty Prolog being used for development and teaching by Imperial College.

A mixture of Prolog and Fortran has been widely used for many applications including medicine and engineering in Hungary. Similarly a dirty version of Lisp has been used in all the US artificial intelligence systems. (Computer Weekly, 9 December 1982)

Computers writing in Japanese

A British computer software company has landed a £200,000 contract in Japan - to teach computers there how to write in Japanese! It is a remarkable achievement, because even Kanji, the simplified form of Japanese accepted as the standard language for the country's industry, has more than 6,000 individual ideograms (picture characters). What Micro Focus has developed is a "compiler", which converts these into a form the computer can handle. The system does not, of course use a keyboard with 6,000 characters. Instead, the user types the instructions in Cobol - the standard business computer language - and then adds the Japanese data in Katakana, which is the official form of Japanese written in the western alphabet. There is no need to spell out the whole Japanese character. As the word is typed, the computer decides what the Kanji for it will be. Usually it needs only half a dozen letters as a clue. It then displays the Kanji ideogram on the screen.

Japanese computer programmers usually have enough linguistic ability to be able to write programmes in Cobol. Like everyone else, the Japanese feel happier with a computer that works in their own language. Since those employing the British company's software will not only see Kanji characters on the computer's display but will also still be able to use normal Japanese words for the data of the business world, the system helps to make the computer "user-friendly." That means it eliminates some of the apprehension and sense of strangeness that most people feel when confronting a computer for the first time - an important step towards making the "electronic office" catch on in Japan. (The Sunday Times, 12 December 1982.)

Software science

Dr. Ian Ross, president of Bell Telephone laboratories, in a recent interview, said that all the thrust of the "Labs" was changing due to the plummeting cost of microelectronic devices. Its emphasis in future would be less on designing new types of components and more on developing the software. Asked what the most exciting breakthrough was that he wished to see he replied that this was a science of software - a dramatic breakthrough which would change the whole underpinning of the way software is produced. Software, which already accounted for most of the cost of developing a modern digital telephone exchange, was almost entirely labour-intensive requiring the unstinting application of highly skilled brains. But because its principles were still not fully understood it remained something of a hit and miss business and productivity had stayed almost static for years. (Financial Times, 20 January 1983.) (See also item on dismantling of AT&T's empire and the need to redefine the "Lab" role on page 27.)

Computer training: a promising market

Computer literacy is rapidly becoming as important in modern society as reading, writing, and arithmetic. Experts say 100 million Americans will need some form of computer instruction in the next decade if the promise the personal computer offers for productivity gains is to be fulfilled. "I would love to buy a personal computer for my business if I weren't so intimidated by it and someone could show me how to use it," says one typical potential user, veterinarian Bruce M. Feldmann.

To capitalize on that need, hundreds of independent training companies are springing up to provide seminars, classes, and on-site company instructions. They are being joined by hardware manufacturers, software writers, and retailers, who also recognize that training is becoming a lucrative business. Indeed, Dataquest Inc., a market research company in Cupertino, Calif., estimates that the training industry will capture \$3 billion of the \$14 billion spent on personal computers by 1986. (Business Week, 1 November 1982.)

Software maintenance

The unsung business of computer maintenance could be all that stands between survival and failure for many computer companies as sales are hit by the recession. So says a report 4/ on field service by the research firm Input, which shows how important the maintenance and repair business has become to computer suppliers. The report says field service now accounts for a fifth of equipment supplier's income in the US and is growing far more quickly than the hardware market. Spending on field service is increasing by 19% a year and will top \$9,000 million in the US in 1982, says Input. By contrast computer systems suppliers are growing at only 13%. The difference in growth is even more significant in terms of profit, says the report. Field service income is less likely to be hit by recession than sales. One area where suppliers could make more money is software maintenance. The report says software maintenance is seriously underpriced and could become the main source of new growth in field service over the next five years. (Computer Weekly, 2 December 1982.)

Detecting computer criminals

A system which can help detect unauthorised alteration of computerised data files or transmissions has been developed by a Stockholm EDP consulting firm, SAKdata AB. Known as the Seal method, it consists of an advanced cryptological programme that seals each bit of data in a data file or transmission by signing off with a sophisticated hash total. The protected information itself is unaffected and remains in plain text. It is claimed to combat computer-related crime, especially those involving electronic payments. This, together with the clearing of cheque transactions between banks and salary-depositing from companies, is the main field of use at the moment.

The system works as follows: First, one or more password keys of 35 digits to be kept secret among groupings of authorised senders and receivers of the computerised information are established. Then, the appropriate key is entered as part of a computer run of the information to be protected, allowing the software's algorithm (i.e., a set of calculations) to operate on the key and characters of file or message data involved. This results in an 18-digit hash total - the seal - which is stored at the end of the data file or message. The algorithm provides that if any one piece of data is changed, a different hash total will show up when the key is re-entered and the programme applied to the protected data at a later date.

The method, which has been passed by the Swedish Bankers' Association as a bank standard for EDP protection, has been used by the Swedish Bank Giro Centre since February 1981 and will be adopted by other Scandinavian countries. The method is suitable for all types of computers, SAK-data AB says. (Electronics Weekly, 20 October 1982.)

Computer firms revise pirate war

When the personal computer boom began two years ago, the leading software manufacturers, mindful of how piracy had drained profits from the record and videotape industries, declared war on entrepreneurs who illegally copy computer programs. The war is not over, but by most accounts the program pirates have won the first battle. Although legitimate manufacturers are pursuing legal remedies more vigorously, they have largely given up time-consuming and expensive efforts to encrypt their most popular software with codes designed to prevent the copying of programs. Without these codes, most medium-priced home computers can make a duplicate of a complex word processing, accounting or game program in seconds. But even some highly sophisticated codes, the manufacturers learned, are not enough to stop a determined pirate or a computer hobbyist who revels in the challenge of code breaking.

4/ 1982 Field Service Annual Report. 189 pp. £2,000. Input, Airwork House, 35 Piccadilly, London W1V9B.

The companies say they are battling two kinds of pirates: The computer buff who makes a copy for a friend, and the merchant who runs a mail-order business from his basement and sells thousands of illegal copies at prices substantially below retail. The manufacturers privately acknowledge that they can do little to stop users who trade copies of programs informally, although they have tried to bring pressure on some computer "user groups" that have sprung up across the country. Several of the groups, the manufacturers have charged, allow trading on a large scale. The companies are also cracking down on school districts that purchase one copy of an educational program and make reproductions for each member school.

Industry representatives say that even with the failure of encryption efforts they still have a few weapons available to combat piracy. Some manufacturers are placing serial numbers on their software and refusing to offer help to any user who cannot identify where he purchased the program. Others are hoping to stay one step ahead of the pirates by regularly releasing improved versions of their programs. Other companies meanwhile, are trying to attack the problem by developing better hardware. One such method would emboss a computer program with the machine's serial number the first time the program is used. The computer user could make unlimited copies, but they would only work on the machine that bears the same serial number. (International Herald (New York Times Service) Tribune, 8/9 January 1983.)

CAD/CAM

Car industry pushes for integrated CAD/CAM

Tomorrow Ford launches the Sierra, the replacement for the Cortina. About 20% of the design work was computer-aided, double that for the Escort. The company still had to build 63 prototypes, each costing around \$500,000, but points out that it may well have been as many as 100 without computer-aided design.

Ford, like all the major car companies, is working towards an integrated CAD/CAM system which will turn out new cars in one to two years rather than five years as at present. It will probably take another 10 years to get there, reckons Hans Kuschnerus, systems manager, product development for Ford of Europe. It is difficult to believe this when the company tots up its investment to date in CAD/CAM. Worldwide it has 350 design stations and 500 analysis terminals. It has over 40 mainframe computers and large minicomputers for engineering. But Kuschnerus points out that with 20,000 engineers and designers, at least a quarter of whom work on a drawing board, 350 terminals don't go very far - even if two people use one terminal. "We still have a long way to go before we computerise the Ford Motor Company".

The biggest problem, says Kuschnerus, is that there is no software to let the computers talk to each other. "This needs a massive effort." Ford is doing its bit. This year it set up a high-powered worldwide CAD/CAM co-ordination committee to focus on system integration - to try and arrive at a strategy for data and graphics communications. (It believes, as an initial step, it will actively support the "S-developed Iges - Initial Graphics Exchange Specification.) Other motor companies are also doing the same. Is the plan to present a fait accompli to the CAD/CAM vendors? "We don't want to coerce the suppliers to do anything," says a cautious Kuschnerus, but he recognises the persuasive power of a single co-ordinated requirement. Certainly much of the impetus and expertise to produce the integrated system must come from the user companies because, as Kuschnerus notes, "The suppliers are less equipped to produce an integrated system because it is beyond their scope to understand the needs of an industry as large as Ford. We've also looked for consultants, but they can't comprehend it either." Kuschnerus hopes that companies like Control Data, General Electric and IBM will develop an integrated system. Ford seems willing to help them along with the development work to defray the high costs involved. It has also been meeting with like-minded car companies in Europe (Audi, BMW, Daimler Benz, Opel, Porsche and Volkswagen) to swap information on systems and discuss the requirements for an integrated system.

"Integration will get us back to in-parallel design rather than in-sequence. This is easy for the small company with five engineers. All it needs is a two-station CAD/CAM system and it has an integrated system." At present at Ford any productivity improvements are generally lost because the engineers in one section are not yet equipped to pass on information to the next. "They use the time to iterate the designs," says Kuschnerus. This assumes that CAD/CAM is faster. "They say for design stations you can get a 3:1 productivity increase, but we have no hard measurement to confirm this even today. You have to spend at least two years putting information in to a database - a 3:1 productivity increase is becoming a statement of faith". Why invest? "Competitive pressure," says Kuschnerus. "You don't necessarily make more money by using CAD/CAM, but those that don't use it won't be in business." In the next five years he predicts that the emphasis will be on "penetration and integration." Large companies, he believes, must have integrated systems to get the best out of CAD/CAM. (Engineering Today, 20 September 1982.)

Automated Renault

Not all Europeans are behind the times. Renault Véhicules Industriels has installed a fully-automated flexible manufacturing system, controlled by a real-time computer, at its Bouthéon factory near St. Etienne, in France. The company claims that the system is the first of its type in the world. It was installed at a cost of £4 million and will be used to machine castings for a new truck gearbox. Seven numerically controlled machine tools are linked by eight robot trucks which transport gearbox castings from one machine to the next. Twenty-five robots are used to place castings from the robot trucks on to the machines. The whole system is controlled by a computer which monitors the progress of castings through the machining processes. If one machine breaks down, the computer redirects castings to keep production going. (Engineering Today, 20 September 1982.)

Europe has fastest growing CAD/CAM market

Europe is now the fastest growing market in the world for computer aided design and manufacturing (CAD/CAM) systems. According to the market leader, US company Computervision, its European turnover has grown from \$10 million in 1977 to \$100m in 1981. Europe's share of its world sales has been constantly increasing and now stands at 36.5%, the firm says. "We believe that more design work is done in Europe than in the US," Patrick Alias, European vice president said. "The US dominates in terms of volume production, but there is a greater demand in Europe for design tools like CAD/CAM." Alias said that because production levels were generally lower in Europe than in the US, productivity was even more important, and CAD/CAM was providing this. He was speaking at a press conference held to launch a specialised 32bit processor, developed to cater for the most recent market demand. This was for tools suitable for designing complete products, and not just greater speed, Alias said. This involves the control of a very large and complex database, which must be fully interactive. The 32bit processor provides the information for the complete design and manufacturing process, from engineering to design, planning and scheduling of materials to manufacture. It uses a high speed bus with a bandwidth of 14.4 megabytes, and consists of a series of 32 bit processors connected in parallel.

Computervision has also introduced a new software package called Solidesign, which enables users to design products using fully realistic, solid images, as opposed to the wire frame images that have been the standard CAD until recently. Using the 32bit processor, Solidesign means a designer can create complete geometric descriptions of such things as mechanical parts and buildings. Designing with solid images makes three dimensional work much quicker and easier, and means the mass properties of any part - weight, volume, centre of gravity and so on - can be calculated with a single command. (Electronics Times, 16 September 1982.)

Cheap CAD/CAM training

Computer-aided design and manufacturing (CAD/CAM) education and training is expensive. For most universities and polytechnics in Britain, the cost of installing even a CAD system is prohibitive, while for companies which have bought systems, it is often difficult to find the time to train everyone. Now the Mormon Brigham Young University, one of the leading US academic institutions in CAD/CAM, has come up with a possible solution. It is now running the first prototype CAD/CAM mini-laboratory. Brigham Young has an impressive array of full-

scale equipment - Computervision, Applikon and Cadma CAD systems, an Evans & Sutherland simulation system, a lab full of micros, several robots, several machine tools and machining centres, and two automatic storage and retrieval systems. And it has recognised the need to provide a cheap grounding in CAD/CAM.

The lab it has developed is a miniature replica of a full CAD/CAM system. It consists of a Tektronix graphics system for the design work, a CNC lathe, a CNC milling machine, a robot and an automatic storage and retrieval system. John Kunzler, chairman of the technology department at Brigham Young, reckons that it can be produced for under \$100,000. Already US firms have shown some interest in the product and the US Air Force recently agreed to fund product development. (Technology, September 1982.)

APPLICATIONS

How manufacturing applications are currently performed in West Europe

Application	Computerised	Manually	Not done
	%	%	%
Inventory control	75.1	21.2	3.7
Bill of material	65.6	25.9	8.5
Material requirement planning	61.4	30.5	8.1
Production cost estimation	53.6	37.5	8.9
Purchasing	52.2	44.8	3.0
Production scheduling	49.3	45.6	5.1
Job cost reporting	47.2	31.7	21.1
Production routeing	42.0	42.5	15.5
Capacity requirement planning	39.5	41.3	18.7
Production forecasting	36.9	46.3	16.8
Variance plan reporting	36.2	38.4	25.4
Shop floor reporting	33.4	52.3	14.3
Process control	26.4	33.3	40.3
Computer-aided manufacture	14.0	-	86.0
Computer-aided design	9.6	-	90.4
Average	43.9	34.6	21.5

Source: International Data Corporation

Planned applications in next two years

Application	Users planning to computerise	Own software	Hardware vendor's software	Independent software package	Other
	%	%	%	%	%
Production scheduling	39	33	46	21	—
Production routeing	34	38	40	19	3
Production forecasting	32	49	36	13	2
Capacity planning	32	37	48	13	2
Purchasing	31	50	32	14	4
Cost estimation	31	41	38	17	3
Variance reporting	31	46	31	21	2
MRP	29	30	49	19	2
Shop floor reporting	29	43	42	11	4
Job cost reporting	26	43	35	16	6
Bill of material	21	33	46	21	—
Inventory control	20	35	43	19	3
Process control	12	35	39	9	17
CAD	11	10	50	40	—
CAM	6	17	58	25	—

Source: International Data Corporation
MRP = Material Requirement Planning

(Computing)

Echo-cancelling chips

A customised echo-cancelling chip, which was developed using automated design system of ZyMOS Corporation, Sunnyvale, California, has drastically reduced size and cost while boosting the performance of a new modem design used in the telecommunications products of A/S Elektrisk Bureau of Oslo, Norway. According to Dr. Marcus Bayegan, manager of R&D, practically the entire product line benefits from the new chip, which combines the functions of echo cancellation, line-signal encoding and decoding, scrambling and unscrambling, and phase adjustment. Elektrisk Bureau, established 100 years ago, is Norway's largest electronics company. Employing about 4,500 people, the firm supplies telecommunications equipment to over 40 countries throughout the world. These products include public and private telephone exchanges, telephone sets and components, transmission equipment for power networks and mobile communications systems, radio link systems, maritime communications and point-to-point long-range communications systems.

"Since its beginning six years after the invention of the telephone, EB's products have exhibited cutting-edge technology in performance, appearance and ease of use," says Dr. Bayegan. "Accordingly, EB has embarked on a comprehensive technological program to reduce manufacturing costs and product size by replacing printed circuit boards with customised integrated circuits wherever possible, while still meeting the electrical and mechanical requirements of the end-product." According to Dr. Bayegan, the company elected to develop the new modem chip on the ZyP automated design system because of the power and flexibility of the advanced CAD approach. After a brief training period at the ZyMOS Sunnyvale headquarters, EB designers were able to develop the custom modem chip using the ZyP system. Following the successful completion of this project, EB installed the appropriate circuit simulation software in their in-house computer. The key to the ZyP design is three libraries of standard cells - metal-gate CMOS, silicon-gate CMOS and silicon-gate NMOS - each of which comprises over 200 elements. The cells, which range in complexity from simple gates to a microprocessor, can be likened to miniature full-custom integrated circuits. Interfacing through a proprietary logic simulation program called ZyP-SIM, the designer inputs a logic description of the customised assemblage of standard cells, and the ZyP system yields a mask set and test program for manufacturing the custom IC. (Electronics Weekly, 17 November 1982)

Talking on the level

Speech synthesisers have been installed at six level crossings on the German Federal Railway where drivers and pedestrians operate the barriers themselves. The 'spoken' warnings supplement notices giving detailed instructions on the procedure. When the pushbutton is pressed and conditions are safe for crossing the line, the announcement is: 'Stand clear - the barrier lifts automatically'. If a train is coming the barriers remain closed and the user is told: 'Attention! Train coming. Please wait'.

After they have opened, the barriers reclose automatically after one minute unless the button is pressed again. A yellow light warns that they are about to be lowered, and the speech synthesiser gives two spoken warnings at an interval of 10 seconds. The installations are experimental and are on farm roads or footpaths where the barriers are normally closed because the crossings are infrequently used. (Electronics Weekly, 1 December 1982.)

Microprocessor-based adaptive control techniques

Adaptive control techniques provide an additional layer of intelligence to basic control and are able to influence the performance of a system. A basic control strategy may only be able to provide a 'best effort' performance over a range of operating conditions, but adaptive control attempts to achieve high overall performance by adapting to changing conditions and complex control problems.

Many of the traditional control areas are open to this kind of approach, for example, in raw materials blending, steel rolling, distillation, paper making and power generation. However, many entirely new application areas have been opened up by the possibility of adaptive control using microprocessors. These are the applications where advanced control is integrated into a product manufactured on small, medium or large scale, such as robots and manipulators, automotive electronics, microwave communication systems, network communication systems, military systems, medical electronics and many forms of instrumentation. ERA is shortly to begin work on an important experimental project to evaluate and develop microprocessor based adaptive control techniques. ERA has already discussed this project with

several organisations who have shown a keen interest in the work proposed. As a result of comments received it is planned to fund the work on a two tier basis. Those companies with a strong direct interest in exploiting the techniques will be invited to support the whole programme and will receive full details of the experimental work, including software. Those with a lesser interest will be able to obtain a review of adaptive control techniques and an assessment of the control strategies selected for experimental implementation. (ERA Technology News, No. 4., 1982.)

ROBOTICS

Us and Japanese reports look at industrial robots

According to the joint University of Michigan/Society of Manufacturing Engineers report entitled Industrial Robots: A Delphi Forecast of Markets and Technology, the predominant users of robots in the 1980s will be the automotive and light manufacturing industries. Sales to casting and foundry works will decline because many are too old to adapt to the new technology. Those picking up the slack will tend to be non-manufacturing industries such as mining and agriculture which are expected to increase robot purchases five-fold by the middle of the 1980s.

The reasons given by industry for buying robots are mainly linked to cuts in labour, although this is forecast to decline in the US. In 1980-85 the proportion of the costs saved by installing robots attributed to labour substitution was 59%. This falls to 49% in 1985-90 and 38% in 1990-95. Over the same period product quality is forecast to increase in importance from 22% in 1980-85 to 25% in 1990-95.

In the six manufacturing occupations - assembling, checking, packing, painting, welding and machining - most likely to be taken on by robots, only 3.3% of the workforce will have been displaced by 1985. This will rise to 5.6% by 1990. It is argued that since the six occupations represent only one-third of all manufacturing employment in the US, the net effect on jobs will be relatively small. Nor can displacement figures be related to unemployment. He suggests that to date around 88% of displaced employees have been transferred to other jobs and he expects little change in the future. Almost two-thirds of displaced workers are expected to be retrained for robotics-oriented work while another quarter are forecast to continue to work within the company but without additional training in the 1985-90 period. About 12% will leave, of which half will retire voluntarily. That leaves 6% without a job. Six per cent of the 2% total displacement in manufacturing gives an unemployment rate of about 0.1% or 24,000 workers by 1990.

One side benefit of installing robots is improved worker safety. It is pointed to an 11% decline in factory accidents where robots have been installed by 1985. (Technology.)

The newly released study "Japanese Industrial Robots and Their Impact", by Information Researches Inc., points out that the 80s will be the decade in which industrial robots will thoroughly penetrate every field in the manufacturing sector: high-level units such as playback, NC, and intelligent robots will be the major part of demand. Particularly, intelligent robots are projected to reach Y11bn in 1985 and Y43bn in 1990 with annual average growth rate at 44 per cent between 1980-1985 and 31 per cent between 1985-1990.

Demand will also gradually begin to take off in non-manufacturing fields. By 1985, it is expected that demand from non-manufacturing will centre on robots for "nuclear-power related areas and oceanic development". By 1990, it is expected that the market will diversify to robots for "transport, warehousing and material handling, etc." (Electronics Weekly, 17 November 1982.)

Robot types and their uses

The Japanese recognise six basic types of machinery to which they give the title "robot":

Manual manipulators function like arms and hands but they have to be operated by a person. About 10 per cent of the 20,000 robots made in Japan in 1980 were this type. They accounted for four per cent of production by value - which means they are relatively inexpensive. Many work in intra-factory automated transport and materials handling, particularly in metal casting and forging firms as well as machine tool manufacturers. The largest users are iron and steel companies followed by firms that make goods such as cars, cement, ceramics and chemicals.

What the Japanese call fixed sequence robots are by far the most widely used type. They accounted for 67 per cent of total production in 1980 (31 per cent by value). These machines are preset or designed to perform specific repetitive tasks such as spot-welding, plastics injection moulding, die-casting or "pick and place" assembly. They are mainly found in Japan's car industries and synthetic resin factories. Other major users include metals and electronic and electrical equipment firms. Such robots operate in car spraying booths.

Variable sequence machines can be reset and adapted to do new jobs. They do not have the limitations of their fixed sequence cousins. Applications include automobile and, to a lesser extent, electrical and electronics and resin production. They have some of the dexterity of a sophisticated robot hand.

Playback robots are even more sophisticated; and the most basic type according to the US and the UK. They appeared in 1977 and accounted for 10 per cent of 1980 unit production (21 per cent of value). These can be programmed to perform complex operations involving movements that must be recalled as necessary or in sequence. This type of work occurs in electrical appliance or electronics assembly, arc-welding in lines or curves and automobile body painting. Many are found in the highly automated Japanese automobile industry. They can "learn" to paint complex interiors and surfaces.

Numerical control or CNC robots (accounting for five per cent of 1980 unit production and 29 per cent of value) are recently developed and expensive assembly machines. They rely on digital rather than mechanical switches and can be reset easily using computer tapes or cards. British robots of this type are available.

Intelligent robots imitate human sense, perception and judgement. Very few are made. Production of these robots added up to one per cent of unit production in 1980 and three per cent of value. Most numerical control and intelligent robots are used by electrical and electronics firms. One prototype is a "guide robot" for the blind. (New Scientist, 6 January 1982.)

French and Japanese link up to sell industrial robots

The French electrical concern, Compagnie Electro-Mecanique (CEM), is to co-operate with Yaskawa Electric of Japan in selling robots throughout the two countries, in what is believed to be the first Franco-Japanese accord on industrial robot technology. The agreement is in a field which the French government views as vital for the country's industrial regeneration. It underlines the willingness in Paris to collaborate with Japan over high technology projects, in spite of the much-publicised trade rows between the two nations.

Under the CEM-Yaskawa agreement the French company will sell in France large industrial robots developed by Yaskawa, used mainly in factory assembly work and for transport. Yaskawa will help market in Japan the smaller robots produced by CEM. It will also give the French company technical assistance to broaden its range of robots, which are used essentially by the motor and electrical industries. CEM is owned 77 per cent by the Swiss-based Brown, Boveri engineering group. Under a plan being studied by the French Government it is, however, expected to come under state control soon. Alstom Atlantique, part of the nationalised CCE group, is planned to take a majority stake.

The CEM spokesman could give no financial details on the Japanese deal yesterday. He said CEM's robot turnover, including that under the Yaskawa agreement, was expected to double this year to FFfr 30m (\$4.45m) from FFfr 15m in 1982. CEM would initially be selling more of its robots in Japan than Yaskawa would in the French market. Hypothetical figures were of the order of 20 Yaskawa robots to be sold in France this year and 100 next year, while 200 CEM robots could be sold in Japan. The Yaskawa equipment differed from the robots at present on offer by French manufacturers because they were powered electrically rather than hydraulically, he added. (Financial Times, 4 January 1983.)

UK government encouraging automation of manufacturing industry

The Department of Industry's £60m robot support scheme, launched in March last year, and aimed at automating Britain's flagging manufacturing industry, has offered grants totalling some £4m so far, to assist firms in robot consultancy studies, installations, as well as robot manufacturing projects. Secretly, officials at the Department are disappointed at industry's response to the scheme so far. Addressing a seminar on robots, held at the IEE in London last week, the Minister for Industry and Information Technology, Kenneth Baker, said that he wanted to see more applicants for assistance. At present, the Department is offering

grant assistance for 46 installation projects, involving 97 robots, plus 44 consultancies and 18 manufacturing projects. The scheme also covers flexible manufacturing projects as a whole.

According to the British Robot Association (BRA), the UK robot population should now be over 1,000. A spokesman for the BRA told EW that the growth in the UK robot population would be an exponential one, and that it should increase significantly from now on. Estimates for this year indicated a growth rate of between 50 and 80 per cent. "It has to be remembered that it takes around six to 12 months to identify a particular robot application, and then it takes another six to 12 months to get DoI approval to go ahead," he said. At the present time, the average cost of a stand-alone, general-purpose machine is between £30,000 and \$40,000. However, this price has to be multiplied by a factor of two at least in order to obtain a complete system. Even at that price, robots look increasingly attractive to Europe's manufacturers, because the real cost of labour is at least twice as high as the salary paid, and the pay-back time for a robot is between two and three years. (Electronics Weekly, 1 December 1982.)

Singapore forms robot association

The Singapore Robotics Association has been formed recently and already the Association is reported to have 25 corporate members and 35 individual members. According to Pro-tem Committee Chairman of the Association, Steve Choo, its first aim is to promote the use of robots in Singapore to ensure the competitiveness of the island republic's products and services overseas. Another important aim is to promote the development and application of robots locally to launch Singapore into the forefront of robotic technology. It is planned that the Association will act as an advisory, consultative and co-ordinating body for the local robot industry. It will also help in the development of skills and resources necessary for the growth of the industry.

The Singapore government sees the use of robots as a step towards increasing productivity as well as the answer to a reduced workforce. The government-supported Skills Development Fund (SDF) has already announced its commitment to back the growth of robotics in Singapore and has approved \$1.3m (about £290,000) in grants to help companies purchase robots. The Association is organising two missions to Japan during the second half of the year to study the use of industrial robots and flexible manufacturing systems. The cost of the trips will be subsidised by the SDF. According to Choo, the Association will publish a quarterly newsletter to keep members in touch with developments in robotics and of automation plans in Singapore. Among local corporate members of the Association are Chartered Machine Tools, of which Choo is general manager, Chartered Industries of Singapore, Chartered Electronics Industries, Singapore Manufacturers Association and Singapore Mint. Among foreign-owned corporate members are ASEA Singapore, BBC Brown Boveri, ESAB Singapore and GTS German Tooling Systems. (Electronics Weekly, 27 October 1982.)

Singapore robots to double in number

The number of robots is expected to double to 400 within the next four years, according to Steve Choo, chairman of the Singapore Robotics Association. The application of robots in Singapore, according to Choo, is at present confined to the plastics industry for spray painting and extraction of parts from injection-moulding machines. They are not being used on welding jobs except in the furniture industry, but Choo expects the use of robots in welding to pick up over the next few years. He also expects their prices to drop and labour costs to rise.

The country's Skill Development Fund and the Economic Development Board have now launched five financial schemes to encourage investments in robots. They include the interest grant for mechanisation schemes (IGM), SDF training grants, development consultancy scheme and the investment allowance scheme. While the IGM scheme awards a grant to reduce the interest cost of financing incurred in the purchase of equipment and machinery, the small industries scheme grants loans to small companies with fixed production assets of not more than S\$2m. Choo is confident that Singapore will soon start manufacturing robots, first as assembly work with imported expertise. (Electronics Weekly, 1 December 1982.)

Singapore company to sell Kawasaki robots

Kawasaki Heavy Industries of Japan has appointed the Ordnance Development and Engineering Company of Singapore as the sole distributor in Singapore for its Unimate Puma Series robots - one of the most widely used models in the world. Ordnance, a state-sponsored company, is also the sole distributor for robots in Malaysia and Indonesia. The model that

will be available in Singapore will be an electrically driven one with computerised intelligence, with movements closely resembling that of the upper part of the human body and capable of performing a wide range of jobs including welding, painting, assembling and sealing.

Considered to be a very intelligent and sophisticated series, Unimate is manufactured by Kawasaki under the licensing agreement with Unimation, a leading United States robot maker. Most of the robots on the Japanese car assembly lines are designed by Unimation and built by Kawasaki under the agreement. Both Kawasaki and Unimation share each other's research findings. This helps Unimation to stay on top of the development in the Japanese market. Ordnance says that it won the distributorship for the robots because of its strong engineering back-up and its experience both in the precision engineering industry as well as its knowledge of application and installation of the robots.

Unimation to market robot vision packages

The first commercially available "off-the-shelf" version packages for industrial robots are expected to appear on the market within two to three years, and they will probably be American made. Joe Engelberger, president of the American robot manufacturing company Unimation and robot industry authority, said that the quest for a low-cost off-the-shelf vision package had now reached a critical stage. The current generation of vision systems can only identify silhouetted parts that are spaced out. They have difficulty in picking out parts from a bin of mixed components or partly obscured parts. Such systems are generally expensive too. "The whole subject is a hotbed of activity right now, and there is hardly an engineering department in any university around the world that is not doing some research into robot vision. Japan may use more robots than any other country, but it does not have the lead in technology" he said.

The biggest single problem facing robot manufacturers is one of improving their machines' assembly capabilities. Around 35 per cent of the entire workforce of the industrial nations is concerned with the manufacture of piece parts, and much of this effort is a matter of joining and assembly.

Although the European companies are equal to the task technically, specially in the field of converting grey-scale images from a TV camera into signals that enable a computer to identify components that may be similar in shape, it is difficult to see low-priced commercially available offerings coming from Europe in the near future.

Vision is vitally important to the robot makers, because it offers them the opportunity of adding value to their product. A number of vision systems makers say that some form of applications engineering will always be needed, and that is where they see their opportunity for making larger sums of money. (Electronics Weekly, 1 December 1982.)

British robot production starts at Colchester

The first British unmanned factory (called SCAMP) opened in Colchester, Essex last week - thanks to government grants. Patrick Jenkin, the industry secretary and Sir Jack Wellings, chairman of the 600 Group which built the factory, agreed, that "robots will safeguard employment". But said Jenkins, "it will be different employment: fewer back-breaking jobs, but jobs all the same. Jobs which might disappear if the other fellow automates first."

Two Systeme computers run the factory. They command the operators, who come in from time-to-time to load the plant with metal blanks, using a visual display unit. The VDU asks for blanks to be loaded in a particular pattern. After that the robots take over. When the batch is completed the computer gives the operator a programme to tool up the plant for a new batch. (New Scientist, 9 December 1982.)

Robot plan for Telco (India)

The Tata Engineering and Locomotive Company (Telco) is negotiating with Hitachi of Japan and Asca of Sweden to manufacture industrial robots in India. According to a Telco official the 'issue was at a preliminary stage' and it would take some time before the technical collaboration was signed. Telco is keen on using industrial robots at its Pune truck plant for a number of repetitive, but specialised jobs. By using a mixture of industrial robots and computers, the company envisages to produce vehicles for export at its Pune truck unit. Telco exhibited one computer-controlled and one pneumatically-controlled industrial robot at the India International Trade Fair held in Delhi last year. (Electronics Weekly, 1 December 1982.)

Czechoslovakia's home-made robot

The Type PRAM 01 robot is the first machine of its kind to be made entirely in Czechoslovakia. It employs three-phase induction motors on all axes of freedom as well as on the gripping mechanism. Participating in the development of the robot were the VUSE Electric Machinery Research Institute of Brno, which evolved the mechanical end of the robot, and the VUSE Electric Engineering Research Institute of Bechovice near Prague, which designed the control end of the robot. The robot is intended for handling objects in hot and dusty factories, direct handling of hot objects up to the permissible carrying capacity, etc.

The active part of the robot has five degrees of freedom plus operation of the gripper, a carrying capacity of 20kg and another 15kg of the gripper mechanism. The angular speed is 1.57 radians per sec, while the straight line speed is 1000mm per sec. The accuracy in the individual axes of freedom is ± 5 mm. The operating programme is generated through the intermediary programming cabinet - which forms part of the control system - by feeding it into the Type NS 910 programmable automat with a possibility of editing the control programme by means of the Type NS 911 programming apparatus.

The PRAM 01 robot is already in use at the MEX-Frenstat Moravian Electrical Engineering Works Concern Corporation of the ZSE Electrical Engineering Works concern, where it operates in conjunction with a punch press in the production of rotor and stator punchings for electrical machines. The next developmental stage of robots of this kind is the Type PRAM 02, which is controlled by DC motors and is built by the MEZ-Brno Moravian Electrical Engineering Works, part of the ZSE Electrical Engineering Works Concern. In addition to the different drive employed, it differs from its predecessor by a repeat positioning accuracy of less than 1mm. Its large action radius is made possible by rotation of its column, rotatable grippers, stroke and extension of the arm. (Computer Weekly, 15/22 December 1982.)

MPU-based control system for robots

A new microcomputer-based control system for industrial robots has been introduced by ASEA, the Swedish-based electrical engineering group. Programming takes place as a continuous dialogue with the control system, which poses questions in plain text. The operator can select the language he prefers to use, for instance English, French, German or Swedish. Programs can be divided into main programs and sub-programs, which saves time when programs are prepared for different variants of a component. Another time-saving feature is the possibility to run the robot around a defined working point (Tool Centre Point) such as the tip of the welding electrode for arc welding. Up to 10 different working points may be programmed. (Electronics Weekly, 1 December 1982.)

Robots for nuclear plants

Tokyo Electric Power Company, Hitachi Ltd and Toshiba Corporation are to begin a research study on the use of robots in highly radioactive points in atomic power plants, a Kyodo report from Tokyo said. The research study to begin in the coming fiscal year will primarily be aimed at developing and manufacturing such robots for work inside the primary container vessels and below turbines in two stages. While the first-generation power plant robots would have the functions of monitoring and checking, the second-generation robots would be capable of doing emergency work. Remote-controlled monitoring devices, according to scientists, are currently in use in checking such things as wall thickness of steam generator tubes, welded parts of reactor vessels and the nuclear-fuel cladding tubes. The developing of proposed robots, they say, would eliminate the risk of exposing workers to high-level radiation. (Electronics Weekly, 5 November 1982.)

UK college buys a robot

A £16,000 Robot bought by Wigan College of Technology forms the subject of a 15-week evening course for mechanical engineers. "We're just getting to know it at the moment," said Wilf Lloyd, dean of the faculty of engineering and construction, "but we shall be developing it to its full capability." One of the electrical engineering staff, Derek Green, is to do a two-year PhD course through Liverpool Polytechnic writing software for the robot. The supplier was Dainichi-Sykes Robotics of Preston, which is to arrange lectures by its automation experts for the students and put on visits to its factory. The college is to put on a one-year full-time course aimed at unemployed engineers and secondments from industry starting next September. (Computer Weekly, 9 December 1982)

Robotics news in brief
(as published in Technology Update)

USA: The DOD is calling for a supportive role fostering the US development of robotics technology. Because of lagging US robotics industries, pressure is being put on Congress to develop a national robotics plan. The DOD, on the other hand, sees robotics as a widely dispersed technology that deserves support in terms of basic research, information sharing, standardization and appropriate technology. One problem with the concept is that robotics, while creating some jobs, could displace many more, especially in such industries as automobile manufacture and other basic manufacturing. By 1985, Japan will possess about 100,000 robots, the USSR about 42,000, and the US about 15,000 units. (Countmrnsr, August 1982.)

USA: The NBS Authorization Act for FY83 emphasizes robotics R&D. It specifies that a formal R&D effort to improve robotics performance measures, programming languages and standards, visual and tactile sensors, and hierarchical control strategies is needed at NBS and should be mounted. Some \$3.2 mil in expenditures has been agreed upon for such NBS robotics activities in FY83. In addition, a funding floor of \$10 mil has been voted for the Inst for Computer Sciences & Technology to promote orderly growth and international competitiveness of US computer and data processing industries. (Elec News, 6 September 1982.)

France: Will raise its robot population to 5,000 units by 1987 vs 850 units in 1982, thereby decimating production costs in manufacturing industries. It will also develop a major domestic robotics and automation industry through the nationalised companies. This is part of the government plan to invest in 'productique', integrated automation of manufacturing industries. This project, necessitating investments of F2 billion over 5 years, includes production of numerical control machines, robots and computing equipment and the development of specialised programmes and the application of artificial intelligence in actual factory environments. (Computing, 9 September 1982.)

Bulgaria: Plans to produce 3,500 industrial robots and material handling units in 1981-85, including 3,000 for engineering. Also 1,520 industrial robots will be imported from the USSR, E. Germany and Czechoslovakia. The Berco combine in Stara Sagora is the largest industrial robot producer. (Technology Update, Aushandel, 8 August 1982.)

Japan: Fujitsu's new robot 'sees' where and how it is moving its arm and 'learns' quickly where and how it should do so in performing a series of assigned jobs. When given several jobs at a time, it can locate any objects to work on within its arm's reach after initial zigzag trial-&-error movements of its arm to find the way to approach a given work through its electronic 'eye,' and 'learn' how to approach a given work through such groping and steadily quicken the pace of its arm movements. If an operator wants the robot to do several jobs quickly by skipping the groping process, the robot at once can extend its arm to a given work in response to an infrared light of a light emitting diode, of which several units are installed on the work platform when the light or lights are put on. The first and main capacity of the robot, whose actions are centrally controlled by a built-in 16-bit microcomputer, will be useful in unskanned operations, and the second in automatic operations with an attending operator. (Jpn Econ J, 24 August 1982.)

Japan: Toshiba is developing a robot for use in inspecting hostile chemical and radio active environments, and will introduce the robots in 1985 for about \$110,000. The 7.4' arm consists of 8 universal joints, and is equipped with 107 touch centers and a video camera. Software offering 4 control modes allows operators to move the unit. (Chem Week, 17 November 1982.)

Japan: Toshiba has developed and put into operation the world's first visual sensor-equipped robot system. The arms and hands of two assembly line robots work together to duplicate the complicated movements of human production-line employee. The development means that assembly processes in which employees use their eyes and both hands could be totally automated. One of the two articulated robots has a camera that serves mostly as the eyes of the system, monitoring positions of objects. The other robot performs several mechanical tasks. (NY Times, 27 November 1982.)

Japan: Mitsubishi Heavy Industries and Tokyo Electric Power have jointly developed an underwater robot to clean the walls and bottom of the machine-cooling sea or lake water intake channels of nuclear or other electric power stations with more efficacy than human labor and at a lower cost. Capable of clearing 1,000 m²/hr of the interiors of each channel of shellfish, algae and other sticky obstacles, the 520 kg, 1.78(L)x1.27(W)x0.8(H)-m robot is mainly made of reinforced plastic and operable by one person through remote control

and underwater TV. Fully run by hydraulic pressure, the robot moves ahead or sideways after finishing a section within a 110 m dia, the length of its hydraulic hose, sticking to each area by 2 reverse water jets from its impellers. A large, strong revolving scoring brush does the cleaning. (Jpn Econ J, 16 November 1982.)

USA: Advanced Robotics (Hebron, Ohio) will exchange research with Carnegie-Mellon's Robotics Inst (Pittsburgh, Pa.). The Industrial Affiliates Program will transfer all non-proprietary technical advancements to its sponsoring corporate members. To support the project, the firm is making an in-kind contribution of equipment, including a robotic welding work cell consisting of a Cyro 750 welding robot, 2 robotic positioners and process equipment, along with the training needed for its programming and operation. (Matri Hand, December 1982.)

Flexible manufacturing systems are being billed as building blocks for the automated factory. The most advanced systems use robots in integrated configurations serving multiple machining centers and combine vision and laser-based inspection modules under hierarchical computer control. Many of the systems can operate totally unattended for hours at a time. (Electronic, 22 September 1982.)

The next generation of industrial automation applications bears much stiffer requirements. To find out how these needs will be met, Electronic Products surveyed manufacturers of board computers regarding the economic, hardware, and software issues of industrial automation. There was wide consensus on several points: industrial automation is the 'boom' market for boards over the next several years; current bus implementations are adequate for 16-bit systems but inadequate or marginal for high performance 32-bit processors and high speed RAMs; all the necessary technology exists to build boards or modify existing architectures to meet the demands of automation; and getting boards onto the factory floor will require a higher level of software support from vendors. (Elec Prod, 25 October 1982.)

USA: Technology to give robots a sense of touch is being developed at MIT. The device is composed of 3 layers, has 256 tactile sensors and lifts on the tip of a finger. The inner layer is a printed wiring board with parallel unidirectional conducting lines etched on its surface. The outer layer is a sheet of conductive silicone rubber that also conducts in one direction. The point where the conducting lines meet are the touch sensors. Tactile identification first determines general shape, looks for any bumps or depressions in the object, and sees if the object can roll. Future research will be aimed at texture recognition, thermal conductivity and the ability to construct a picture of an object through touch. (Elec News, 29 November 1982.)

USA: Overcrowding by manufacturers in the industrial robot market may make profitability more difficult, according to Venture Development Corp (Wellesley, Mass). Presently, the number of robot producers is growing faster than market demand. In 1981, the average revenue from robot sales was \$8.7 mil/manufacturer, but that will decline sharply to \$6.6 mil/manufacturer in 1982. The enormous start-up investment will contribute to a decline in the number of robot manufacturers over the next several years, with 21 survivors by end-1983 vs 29 robot producers in 1982. Further, the average revenue will most likely rebound to the \$8-12 mil/manufacturer in 1983, from the \$6.6 mil level in 1982. By 1987, the average revenue is expected to reach \$20-30 mil, with industry leaders shipping \$200 mil+/yr in robots. (Ventr Dev, 27 September 1982.)

The auto industry use of robots will decline from 40% of total robot population in 1980 to 33% in 1985, 26% in 1990 and 14% in 1995, even though the auto industry will increase its use of robots 23%/yr through 1995, according to Predicasts Inc (Cleveland, Ohio). Electrical/electronic manufacturers will increase their use of robots 40%/yr through 1995, particularly assembly, inspection and material handling pick-and-place robots which will make parts for use in other robots. Aerospace manufacturers are the next fastest growing segment, having 10,000 units in place in 1995. Aerospace future use includes arc welding and inspection robots. Light manufacturing, which will use all types of robots, will increase robot use 37%/yr. Heavy manufacturing and foundries will experience a 32%/yr growth rate. (Auto News, 6 September 1982.)

PATENTS AND STANDARDS

Why bother with computer patents

Should computer companies bother to protect their products with patents?. The computer industry says it wants better protection, but some firms seem to manage very well without any protection at all. The BBC computer, which Acorn of Cambridge makes, has carried a "patents pending" label for the past year. In fact, there is only one application on the computer, British application 22298, which Acorn filed on 2 August 1982. But it is a basic canon of British patent law that once something has been sold it cannot be patented. So Acorn's patent could not protect anything in the basic computer. The "patents pending" label looks good but has no legal significance. Acorn says the patent protects its so-called Tube, which is a high speed interface between the computer and its peripherals. The Tube is behind schedule and not yet on sale - so a patent could still protect it.

The government is obviously not too worried about patent protection. The Department of Industry is coughing up £13 million to meet half the cost of installing computers in primary secondary schools. If Acorn can win support from both the BBC and the government without protecting its product, is there any point in other computer firms bothering with patents?. (New Scientist, 2 December 1982.)

Working towards standardization

As manufacturers of office equipment, industrial machinery, and home appliances integrate microcontroller chips into their products, the whole world begins to go on-line. With a simple phone call, its being promised, such devices can be turned on and off, which means a wrongly dialed number can be quite consequential. But before that stage arrives, there must be some standardization in things like chip design, the way controllers are integrated into equipment, and how those products interface with the outside world.

The ability of disparate devices to talk to each other is one of the benefits of industry-wide standardization. Groups such as the Network Users Assn. have been formed expressly to push for standards, hoping thereby to get equipment from different vendors to readily interface over a communications link. Indeed, there's an abundance of groups seeking the establishment of one standard or another.

Within the Institute of Electrical and Electronics Engineers (IEEE), for example, is a software engineering standards committee that has spawned several working groups to come up with standards, guidelines, and recommended practices. The California Tape Standards Assn. seeks the adoption of standards for half-inch computer tape for newer high-density drives. In the world of microcomputers, scads of people are working to establish standards for things like the S-100 backplane bus, the Multibus, STD bus, and VERSAbus, not to mention something called the Binary Floating Point Arithmetic subcommittee, which is addressing a need to specify methods of implementing the arithmetic on an IC chip.

Between 1979 and 1982, the group at the American National Standards Institute working on standards in computing, the so-called X3 Committee, processed an average of 30 letter ballots each year. These ballots are not only on proposed standards and the establishment of new projects but also on international activities and draft standards. Through the first nine months of this year, however, that number had tripled to 92. Records of the committee serving as the secretariat of X3 show that it reviewed 675 documents in 1980, including proposals for new projects. Through the first nine months of '82 it was 894.

But the benefits that derive from something like the IEEE 488 standard were examined recently by Maris Graube, an engineer at Tektronix Inc. who spends most of his time in standards-making work. The HP design became a standard in 1975, and today more than 100 manufacturers are using it on one or more pieces of equipment, a total of more than 1,000 different machines, he found. Sales of those devices, all using IEEE 488 interface, exceed \$800 million.

Not only does it become easier for the buyer to connect equipment from different vendors, but the manufacturers too avoid the headache "of designing a new kind of interface, documenting it, training our field guys to understand what it's all about, and then convincing customers that it's a good thing," says Graube. "That's really very expensive." He estimates that Tektronix spent some \$1.5 million just setting up the field support for that one interface. And if the company had to spend that kind of money for each type of interface that engineers might devise, it wouldn't be economically feasible.

Just as the adoption of a standard can result in the interchangeability of tape cartridges, so also there can be software portability that nets out when standards are adopted in the world of graphics. Such portability, of course, helps protect the investment of users when they move to newer, more powerful systems, eliminating a total rewrite of the software. It also means that graphics programmers can avoid having to relearn their art when moving from one vendor's system to another. In the past, this latter factor tended to argue against the adoption of standards, for vendors preferred to lock their users into that one system environment.

Improved software portability is but one of the benefits being promised with the adoption of the so-called Virtual Device Interface (VDI), a proposed standard that defines the interface between graphics utility software on the one hand and a wide variety of graphic I/O devices on the other. Thus it provides for a certain degree of device independence. The utility software commands must be translated by software device drivers for each type of hardware - printer, plotter, or graphic display. Such device drivers do not come cheap, but it is expected that a VDI standard would make each device driver much easier to write.

A second proposed graphics standard is the North American Presentation Level Protocol Syntax (NAPLPS), a communications protocol to be used in the transmission of graphics information. Developed by the Canadian Department of Communications and subsequently adopted and enhanced by AT&T, it is currently being considered for adoption by ANSI.

Even before the adoption of any NAPLPS standard, however, work proceeds on the design of an NAPLPS videotex decoder in chip form, followed by a board set based on such a graphics controller chip. The same applies to the VDI standard, which will be implemented in silicon and thus produce cost savings to system implementer and price savings to users. (Datamation, December 1982.)

INFORMATION TECHNOLOGY

Convención Informática Latina

Over 500 delegates from 19 countries attended the 1982 edition of CIL, the Convención Informática Latina. For the 1983 convention to be held in Barcelona in June, 138 proposals for papers have so far been received from 15 countries. From these and others received in the coming months only 50 will be finally selected for presentation and discussion. They will be divided into the following main areas: new developments, specialist informatics, industrial informatics, informatics in organisations and in the small and medium-sized company. (Electronics Weekly, 15/22 December 1982.)

Facsimile network connecting Sweden and UK

It is now possible to send information via facsimile to 100 points within Sweden and 50 locations in Britain from Swedish telephone retail outlets and post offices.

In Sweden, 125 telephone shops and 21 post offices are equipped with fax, enabling users to transmit an A4 page of text or picture within three minutes. After the information has been received, it is forwarded to the addressee as an express letter or as ordinary post.

Express deliveries are usually in the hands of the addressee within two hours of the post office or telephone shop receiving the information. Addressees can also be telephoned so that they can personally collect the text or picture. (Electronics Weekly, December 1982.)

Telecom deal for Malaysia

The Malaysian government Department of Telecommunications is poised to make another large contract award, this time for the supply of pulse code modulation equipment worth about M\$150m (about US\$7.5m). According to Malaysia's financial daily, Business Times, details of the contract have already been finalised between the Telecommunications Department and Perusahaan Mahkota Sdn Bhd.

Perusahaan Mahkota is a joint venture between General Electric Malaysia, a subsidiary of GE of the United States, which owns 30 per cent of the company, and the Malay Teachers Union of Peninsular Malaysia which owns 70 per cent of the company. Pulse code modulation is a system used to space out voice transmission over a common telephone line. The type of

equipment to be supplied by the joint venture firm is reported to be of the latest generation and is compatible with the modern stored programme control exchanges currently being installed by the Telecommunications Department. Perusahaan Mahkota was established seven years ago and also makes GEC ceiling fans. The awarding of the contract is expected to give the company a big boost. (Electronics Weekly, 1 December 1982.)

Microcomputer-based information: big rewards for small agencies
by Gary Garriott 5/

Debates rage on whether the advent of the information revolution made possible by the falling costs and increasing power of microelectronics technology will have a net positive or negative effect on developing countries. Disagreements on whether microelectronics have really anything to offer the poor are even more pronounced. For example, nonprofit agencies such as private voluntary organizations and church-related groups (reportedly as many as 300 in Kenya alone) provide significant levels of development assistance, yet often cannot avail themselves of the benefits of computer power.

A Washington DC (USA) consortium provides a possible model for effective use of a microcomputer as a self-sufficient information system. The Washington Council of Agencies is made up of over 100 small non-profit organizations which pay a membership fee based on each group's annual operating budget (typically in the US\$50,000-250,000 range). Besides advocacy functions, the Council provides support services to its member agencies that if done individually would consume significant amounts of time and financial resources, which small organizations often cannot afford. A microcomputer with "floppy" disk drives, a "hard" disk mass storage device, two CRT (cathode ray tube) terminals capable of being used simultaneously, and a printer are employed to provide a variety of information services including the management of mailing lists, maintenance of skills banks, compilations of contributions made and of other reports and directories, bulk mailings, word processing for repetitive letters and newsletters, and a dues and subscription service. Accounting packages are being developed. For these services, member agencies pay a fee that is below the typical commercial rate, but above cost. Nonmember organizations can also contract for these services; two to five new accounts are added monthly.

The result is that income generated from these microcomputer-based information services averaged about 25 percent of the Council's total revenues during the first-six months of 1982. This is expected to more than double by the end of the year. The Council reports few start-up and implementation problems with the system. Adaptation of commercially available "user-friendly" software was performed by a local software house. Two years ago the system cost approximately \$18,000 including software development; the same set-up today would be 10 to 15 percent less.

The Council deals with psychological resistance to computers by encouraging users to come to its facility to see the equipment in operation or to even operate it themselves. They will also arrange demonstrations held at the member agency's convenience. The Council offers discussion seminars for newcomers, covering computer terminology and concepts, microcomputer information applications for organizations, as well as guidelines for evaluating microcomputer systems. Most data to be processed is either brought personally to the Council's office or sent through the mail, though eventual data transmission via telephone is contemplated once a number of agencies have acquired remote terminals. In fact, the Council is supportive of the concept of microcomputers networking together instead of time-sharing is supportive of the concept of microcomputers networking together instead of time-sharing their established system because of the added flexibility and independence provided to each member agency. Revenues probably would not be greatly affected since the number of organizations still requiring information services is likely to be much greater.

That modestly endowed groups are increasingly supporting these information services is an indication that the package offered saves them both time and money while simultaneously turning a "profit" for the consortium. Throughout the United States, half a dozen other consortia or agencies interested in supplying similar services are establishing their systems on the Washington Council of Agencies model. There is also a potentially greater indirect payoff in that nonprofits - notorious in both the US and abroad for their isolation from each other - learn that they can work together in certain activities for greater overall efficiency without compromising programmatic goals.

5/ Gary Garriott is a Senior Technical Advisor at Volunteers in Technical Assistance and is currently coordinating microcomputer initiatives for that organization.

While a direct transfer of this concept to nonprofits working in developing countries should be possible, other variations would appear quite feasible as well. For example, enterprising individuals or small businesses could market themselves as "data management service bureaus" to the private sector as well as to government or parastatal groups. Database searching is an additional capability valuable for research and developmental units and the private sector.

The Washington Council of Agencies experience illustrates that the delivery of useful microcomputer-based information services is not the purview only of large database management firms, but that it lies also within reach of less sophisticated agencies and groups.

(For more information on how the Council and/or the microcomputer information system functions, contact the author at: Volunteers in Technical Assistance, 1815 N. Lynn Street, Suite 200, Arlington, Virginia 22209, USA.)

Intergovernmental Bureau of Informatics

The Intergovernmental Bureau of Informatics (IBI) is concerned with professional applications of electronic information, and keeps careful track of trends through two publications, IPI Newsletter, and Agora, a journal for "Informatics in a Changing World." Agora devotes an issue to an area, such as informatics and agriculture, features articles on country activities, on the setting up of regional informatics centers, training programs, meetings and a calendar of events, legal issues, and educational applications. Much of the journal's focus is on the developing world, and it is available in English, French, and Spanish.

For information regarding subscriptions to either the newsletter or the journal, contact IBI, Viale Civiltà del Lavoro 23, 00144 Rome, Italy.

RECENT PUBLICATIONS

A bibliography of relevant documents published by UNIDO's Technology Programme during the last two years is listed below.

- UNIDO/IS.246 and Corr.1 Implications of Micro-Electronics for Developing Countries: A Preliminary Overview of Issues.
- ME 2 Application of Micro-Electronics for Development: Issues for Consideration by Sang Joon Hahn.
- B.P. 1 Future of Electronics and Technology Transfer by K.V. Ramanathan.
- B.P. 2 Large-Scale Integration: Intercontinental Aspects by Ian M. Mackintosh.
- B.P. 3 An Overview of the Electronics Industry in Europe by Ian M. Mackintosh.
- B.P. 4 From the Second to the Third Industrial Revolution by Gérard Lafay.
- B.P. 5 Semiconductor Industry and R+D in India by K.V. Ramanathan.
- B.P. 6 Policy and Planning of Computer Education by Shigeichi Moriguchi.
- B.P. 7 Experiences Around University Computer Centers by Shigeichi Moriguchi.
- B.P. 8 The Software Market - Conditioning Factors and Possible Future Trends. An Analysis Undertaken from a Third World Perspective by Dieter Ernst.
- B.P. 9 Potential Application of Computer Conferencing in Less Developed Countries by Carl-Göran Hedén.
- B.P. 10 Implications of Micro-electronics in Developing Countries by Mohammad Aslam.
- B.P. 11 Micro-Electronics and Employment by Ernest Braun.
- B.P. 12 Futures with Micro-Electronics by Ernest Braun.
- B.P. 13 Implications on Technological Advances in Micro-Electronics for Developing Countries: A Suggested Programme of Policy Studies and Action by Dieter Ernst, Kurt Hoffman, Raphael Kaplinsky, Juan Rada and Howard Rush.
- UNIDO/IS.230 Technological Perspectives in Machine Tool Industry with Special Reference to Micro-Electronics Applications by S.M. Patil.
- UNIDO/IS.242/ Rev.1 and Corr.1 Report on Exchange of Views with Experts on the Implications of Technological Advances in Micro-Electronics for Developing Countries, Vienna, Austria, 10-12 June 1981.
- UNIDO/IS.331 Prospects of Microelectronics. Application in Process and Product Development in Africa by Michael Radnor.
- UNIDO/IS/338 Proceedings of the First Meeting on Co-operation between Scientific and Industrial Sectors in Microelectronics held at Mexico City, 14 and 15 June 1982.
- UNIDO/IS.351 Microprocessor Applications for Developing Countries by James Oliphant.
- ID/WG.372/1 Prospects of Microelectronics Application in Process and Product Development in Developing Countries by Michael Radnor.
- ID/WG.372/2 Microelectronics and Government Policies: The Case of a Developed Country by Ernest Braun, Kurt Hoffman and Ian Miles.
- ID/WG.372/3 Microprocessors and Productivity: Cashing in our Chips by Robert T. Lund.
- ID/WG.372/4 Microelectronics and Telecommunications in Latin America by Juan F. Rada.
- ID/WG.372/5 Microelectronics: Its Impact and Policy Implications by Juan F. Rada.

- ID/WG.372/6 Potential Applications Suitable for Microprocessor Implementations: Some Illustrative Possibilities by James Oliphant.
- ID/WG.372/10 Elementos para el Establecimiento de un Programa Regional de Acción en el Area de la Microelectrónica (Perú) por Carlos Aguirre y Roberto Heredia.
- ID/WG.372/11 Telecomunicaciones y Microelectrónica: Algunas Observaciones por E. Calli, M. Welch y R. Herrera.
- ID/WG.372/12 El Desarrollo de la Microelectrónica en la Argentina por O. Filipello y R. Sagarzazu.
- ID/WG.372/13 Cultural Aspects of Microelectronics Technology by Carlos I.Z. Mammanna.
- ID/WG.372/14 Microprocessor applications and Industrial Development by Robert T. Lund.
- ID/WG.372/15 Microelectronics and the Development of Latin America: Problems and Possibilities for Action by ECLA/UNIDO Joint Industry and Technology Division and Eugenio Lahera and Hugo Nochteff.
- ID/WG.372/16 Microelectronics in Peru by R. Herrera.
- ID/WG.372/17 Report. UNIDO/ECLA Expert Group Meeting on Implications of Microelectronics for the ECLA Region, Mexico City, Mexico, 7-11 June 1982.
- ID/WG.384/5 Microelectronics and Developing Countries: Towards an Action-oriented Approach.
- ID/WG.384/14 Reports of Working Groups. Expert Meeting Preparatory to International Forum on Technological Advances and Development, Moscow, USSR, 29 November to 3 December 1982.
- ID/WG.384/16 Report on Expert Meeting Preparatory to International Forum on Technological Advances and Development, Moscow, USSR, 29 November - 3 December 1982.
- ID/WG.383/3 Licensing Computer Software. Basic considerations as to protection and licensing of computer software and its implications for developing countries.

Dieter Ernst's study for UNIDU, is now available as a book: The Global Race in Micro-electronics: Innovation and Corporate Strategies in a Period of Crisis. David Noble of MIT prepared the foreword. Though there may soon be a U.S. publisher, the original publisher of this English-language study is Campus, Myliusstr. 15, 6 Frankfurt am Main 1, F.R. Germany.

Computer Programming in Cobol (Melinda Fisher. Teach Yourself Books, Hodder and Stoughton 1982. £2.95.)

Teaching yourself Cobol today would be a bit like learning to make fire by rubbing two sticks together, were it not that most of the data processing world is committed to the language like a prisoner to a cell. However, there was a shortage of cheap and readable paperbacks on the topic and, although no one can really become a programmer by studying a textbook, no doubt plenty of beginners will be enabled by this to get into the subject and a number of old hands will be pleased to have a lightweight reference work close to the elbow.

Melinda Fisher had practical experience in the industry before moving on to head ICL's teaching team. Her English is simple and clear; and she gets right to the point. Having at page one assumed no previous knowledge she takes us on by page 28 to discuss verbs. Quizzes are thrown in to make sure the reader has been paying attention and gives a quick introduction to the art of debugging. The chapter on indexed sequential files - obviously a vital one these days - is especially well put over. The author explains, as some other manuals do not, that a programmer is not just a coder but has a variety of other troubles to face up to, not the least of which is interpreting specifications. The sequence in which subjects are introduced seems unusual, but there is nothing like classroom experience for a tutor to find out in what order to tackle things. The book is a vast improvement on some of those manufacturers' and systems houses' manuals which are like wading through glue. And, for beginners, let us just say that if you have managed to run a modern washing machine from the accompanying blurb, Cobol will be a piece of cake to you. If Ms. Fisher achieves nothing more than to help these new readers make up their mind whether a career in programming would suit them, then it will have been worthwhile. (Reviewed in Computer Weekly, 16/23 December 1982.)

When machines replace people (edited by John Kirk SSRS*, pp. 147)

When Machines Replace People starts from the premise of the society which published it, namely that technologists, engineers and scientists have a broad social and political responsibility for their work. The society welcomes the potential offered by microprocessors but believes that unemployment of a large proportion of the population is a real possibility. The authors in the book address two major questions: "How will the wealth in the society be distributed (to ensure that) ...everyone has a reasonable standard of living?; and how will those people not in employment occupy their lives?"

The papers cover an unusually wide range of subjects and despite their brevity (most were presented at a conference) contain considerable detail and some original contributions. In addition to dealing with employment, government policies, education and work sharing, they also cover studies of the balance between rural and urban economic and social patterns, criminality and alternative life styles.... (Reviewed in New Scientist, 9 December 1982.)

For Better or for Worse (edited by G. Friedrichs and A. Schaff, Pergamon. pp 366, £17.50, pbk £4.95)

The Club of Rome, an institution created to monitor the state of the world, has as its central preoccupation "the predicament of mankind". All its previous reports, beginning with the Limits to Growth, have focused on one aspect or another of this predicament. It is not surprising, therefore, that the Club of Rome has addressed itself to the foremost technology to emerge in the 1970s: microelectronics and its related information technology.

The report consists of 11 papers by experts, some of whose writings have appeared elsewhere. As such, it is a useful compendium of a variety of topics relating microelectronics to society. The book has the disadvantage of entering a field that has seen several good books on the subject in recent years. On the other hand, because it is a Club of Rome report, the book has an authoritativeness and, in particular, an international dimension, lacking in many similar works.

*Society for Social Responsibility in Science (ACT), Box 48, PO O'Connor, Canberra, ACT 2601.

Among the most interesting papers is Frank Barnaby's "Microelectronics in war" in which he reminds us that about 40 per cent of the world's scientists and engineers are engaged on military projects, and that the fruit of all this labour is bound to revolutionise still further warfare conducted on land, in the air and at sea. Turning to more pleasant aspects, "The technology" by Thomas Randal Ide is a very useful overview. Supplemented by Ray Curnow and Susan Curran's "The technology applied", this is an excellent introduction to microelectronics. The latter point to the common feature that characterises the myriad of developments and applications: "Microelectronics essentially facilitates communications, instrumentation and automation - every application shows what has sometimes been called the coming of the Age of Control."

In "A Third World perspective", Juan F. Rada provides some startling statistics about the International Information Order: in developing countries, 1 in 30 persons gets a daily newspaper - 1 in 500 has a television set. In the developed countries the figures are 1 in 3 and 1 out of 12, respectively. Similarly, 83 per cent of the world's books are produced in the advanced countries, while only 10 per cent of the world's telecommunications equipment (including telephones) is found in developing countries. Large Western banking firms possess more computer power than the whole of India, and the 1980 value of the world's electronic market roughly equalled the combined GNP of Africa. The sad fact is that the "information gap" will widen in the 1980s. In recent times, the main threat to jobs in developing countries has been tractors and the mechanisation of farms. What will happen now as robots in advanced countries begin to produce more cheaply than cheap labour in the poor countries?

It is not possible to review all 11 papers; but Alexander King's contribution, "Microelectronics and world interdependences", contains a paragraph that summarises the concern of the book: "Microelectronics emerges as a new force ... We live under the Damocles' sword of nuclear annihilation, surrounded by many 'little' conventional wars, in economic difficulties, creeping desertification and other forms of environmental deterioration which threatens health and climate, population explosion, increasing violence and alienation of individuals from society. The basic question for humanity is whether this new force, while possibly increasing the material prosperity of some, will be allowed to aggravate this situation still further or whether we can generate the wisdom to use it positively to shape new forms of society ..." King thinks it is possible to achieve a new society with dignity, modest prosperity and human fulfilment for all.... (Excerpted from a review by Tom Stouler, professor of science and society at the University of Bradford in New Scientist, 9 December 1982.)

ABBREVIATIONS AND GLOSSARY
of technical terms frequently used in articles
reproduced in the Microelectronics Monitor

AMPL	-	Advanced microprocessor prototyping laboratory
CCD	-	Charge-coupled device
CRT	-	Cathode ray tube
CMOS	-	Complementary metal oxide on silicon
ECL	-	Emitter coupled logic
EEPROM	-	Electrically erasable read-only memory
EPROM	-	Erasable read-only memory
IC	-	Integrated circuit-chip
ICE	-	In circuit emulation
LED	-	Light emitting diode
LSI	-	Large-scale integration
MDS	-	Microprocessor development systems
MOS	-	Metal oxide on silicon

MPU - Microprocessor
 OCR - Optical character recognition
 RAM - Random access memory
 ROM - Read-only memory
 TTL - Transistor-transistor logic
 VLSI - Very large scale integration

Bit. An abbreviation of binary digit, one of the two numbers - 0 and 1 - to encode computer data. A bit is expressed by a high or low electrical voltage.

Byte. A group of eight bits used to encode a single letter, number, or symbol.

Chip. A small piece of silicon that is a complete semiconductor device, or integrated circuit.

EPR0M (erasable programmable read-only memory). A type of memory in which stored information can be erased by ultraviolet light beamed in a window of the chip package. EPROMs can be reprogrammed repeatedly.

Gate. This term has two distinct meanings in semiconductor technology: the controlling element of certain transistors, or a logic circuit that has two or more inputs that control one output.

Printed circuit boards (PCB). Insulated substrate (usually plastic) upon which interconnected wiring (usually between components and integrated circuits) has been applied by photographic techniques.

Integrated circuit. A semiconductor circuit combining many electronic components in a single substrate, usually silicon.

K. Usually an abbreviation for kilo (1,000). A 1K memory chip, however, contains 1,024 bits because it is a binary device based on powers of 2. Thus a 64K memory can store 65,536 bits of information (64 x 1,024).

LSI (large-scale integration). This term is generally applied to integrated circuits containing from 500 to perhaps 20,000 logic gates, consisting of transistors, or 1,000 to 64,000 bits of memory.

Logic. The fundamental principles and the connection of circuit elements for computation in computers.

Mask. A glass photographic plate that contains the circuit pattern used in the silicon-chip fabrication process.

Memory chip. A semiconductor device that stores information in the form of electrical charges.

Microprocessor. An integrated circuit that provides in one chip functions equivalent to those contained in the central processing unit of a computer. A microprocessor interprets and executes instructions and usually incorporates arithmetic capabilities and some memory.

RAM (random-access memory). A memory in which any piece of information can be independently stored or retrieved. Its contents are held only temporarily.

ROM (read-only memory). A memory chip in which information is permanently stored during the manufacturing process.

Semiconductor. An element whose electrical conductivity is less than that of a conductor, such as copper, and greater than that of an insulator, such as glass.

Small scale integration (SSI). Integrated circuits, each with the capacity to process less than 32,000 bits of information.

Transistor. A semiconductor device that acts primarily either as an amplifier or as a current switch.

Uncommitted logic array (ULA). Often called "gate-arrays". A method in which all the logic elements (called gates) can be built into the lower layers of an integrated circuit allowing the final user to make the connection between the different gates, each of which represents a bit of information. This is a rapidly evolving technology.

VLSI (very large-scale integration). Integrated circuits containing on the order of 20,000 logic gates, or more than 64,000 bits of memory.

Wafer. A thin disk of semiconductor material on which many chips are fabricated at one time. The chips are subsequently separated and packaged individually.

REQUEST FOR MICROELECTRONICS MONITOR

For new subscribers only

Please type or print in block letters:

NAME

TITLE

ORGANIZATION

ADDRESS

CITY

COUNTRY

and send to:

UNIDO
Technology programme
Division for Industrial Studies
P.O. Box 300
A-1400 Vienna, Austria (Europe)

